

UČNI NAČRT PREDMETA / COURSE SYLLABUS							
Predmet:		Časovne vrste					
Course title:		Time series					
Študijski program in stopnja		Študijska smer		Letnik		Semester	
Study programme and level		Study field		Academic year		Semester	
Magistrski študijski program Matematika		ni smeri		1 ali 2		prvi ali drugi	
Master's study programme Mathematics		none		1 or 2		first or second	
Vrsta predmeta / Course type				izbirni			
Univerzitetna koda predmeta / University course code:				M2521			
Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samost. delo		ECTS
Lectures	Seminar	Tutorial	work		Individ. work		
30	15	30			105		6
Nosilec predmeta / Lecturer:				prof. Mihael Perman			
Jeziki / Languages:		Predavanja / Lectures:		slovenski/Slovene, angleški/English			
		Vaje / Tutorial:		slovenski/Slovene, angleški/English			
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:				Prerequisites:			
Vsebina:				Content (Syllabus outline):			

<p>Uvod: primeri časovnih vrst, trend in sezonska odstopanja, avtokorelacijska funkcija. Kreпка in šibka stacionarnost. Hilbertovi prostori in napovedovanje, časovne vrste v R.</p> <p>Stacionarni procesi: linearni procesi, ARMA modeli, vzročnost in obrnljivost ARMA procesov. MA procesi neskončnih redov. lastnosti, avtokorelacijska funkcija, napovedovanje stacionarnih procesov.</p> <p>ARMA modeli: avtokorelacijska in parcialna avtokorelacijska funkcija, ocenjevanje parametrov, diagnostične metode, napovedovanje.</p> <p>Spektralna analiza: spektralna gostota, Herglotz izrek, periodogram.</p> <p>Nestacionarne in nelinearne časovne vrste: ARCH in GARCH modeli, Momenti in stacionarne porzdelitve za GARCH procese. Eksponentni ARIMA modeli, SARIMA modeli, napovedovanje pri nestacionarnih časovnih vrstah.</p> <p>Statistika stacionarnih procesov: Asimptotični rezultati, ocenjevanje trendov in sezonskih vplivov. Neparometrične metode.</p> <p>Večrazsežne časovne vrste: stacionarnost, večrazsežni ARMA in ARIMA modeli, ocenjevanje parametrov, napovedovanje, razcep variance.</p>	<p>Introduction: Examples of time series. Trend and seasonality. Autocorrelation function. Multivariate normal distribution. Strong and weak stationarity. Hilbert spaces and prediction.</p> <p>Introduction to R.</p> <p>Stationary sequences: Linear processes. ARMA models. Causality and invertibility of ARMA processes. Infinite order MA processes.</p> <p>Partial autocorrelation function. Estimation of autocorrelation function and other parameters. Forecasting stationary time series.</p> <p>Modeling and forecasting for ARMA processes. Asymptotic behavior of the sample mean and the autocorrelation function. Parameter estimation for ARMA processes.</p> <p>Spectral analysis: Spectral density. Spectral density of ARMA processes. Herglotz theorem.</p> <p>Periodogram.</p> <p>Nonlinear and nonstationary time series models: ARCH and GARCH models. Moments and stationary distribution of GARCH process. Exponential GARCH. ARIMA models. SARIMA models. Forecasting nonstationary time series.</p> <p>Statistics for stationary process: Asymptotic results for stationary time series. Estimating trend and seasonality. Nonparametric methods.</p> <p>Multidimensional time series: stationarity, multidimensional ARMA and ARIMA models, parameter estimation, forecasting, variance decomposition.</p>
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Temeljna literatura in viri / Readings:

P. J. Brockwell, R. A. Davis: Introduction to Time Series and Forecasting, 2nd edition, Springer, 2002.

C. Chatfield: The Analysis of Time Series: An Introduction, 6th Edition, Chapman & Hall/CRC, 2003.

P.J. Brockwell, R.A. Davis: Time Series: Theory and Methods, Springer, 1991.

W.N. Venables, B.D. Ripley: Modern Applied Statistics with S-Plus, Springer, 1994.

W.N. Shumway, D. Stoffer: Time Series Analysis and Its Applications, Springer, 2006.

Cilji in kompetence:

Časovne vrste so eno od temeljnih področij uporabne statistike z možnimi uporabami tako v tehniki kot tudi v ekonomiji. Osnovni koncepti časovnih vrst so del statistične izobrazbe, poleg tega pa poglobijo in na novo osvetlijo že znane pojme iz statistike.

Zaradi nepostredne uporabnosti vsebin bodo pri predmetu sodelovali tudi strokovnjaki iz prakse.

Objectives and competences:

Time series course is one of fundamental courses of applied statistics with several applications to engineering and economics. Basic concepts of the time series analysis are part of necessary background of any statistical education. They deepen and shed new light on basic notions of statistics.

Since the content is of great practical importance we expect that also specialists from financial practice will present their work experience during the course.

Predvideni študijski rezultati:

Znanje in razumevanje:

Predmet predstavi pomembno področje statistike, ki je vedno bolj pomembno v modeliranju finančnih in ekonomskih podatkov.

Uporaba

Makroekonomski analitiki ter ponudniki električne energije ali goriv uporabljajo časovne vrste za svoje napovedi. Poleg tega področje osvetljuje že prej znane pojme iz statistike.

Refleksija

Medigra med uporabo, statističnim modeliranjem, povratno informacijo ekonomije

Intended learning outcomes:

Knowledge and understanding:

Understanding of statistical applications to economics, modelling of economics and financial data.

Application:

In macroeconomic analysis or on energy markets, time series methods are the fundamental forecasting tool. This analysis deepens and sheds new light on basic notions of statistics.

Reflection:

The interplay between application, statistical modelling, economics feedback information, and application stimulation for mathematical

in tehnike in spodbude iz uporabe za matematično razmišljanje.

Prenosljive spretnosti – niso vezane le na en predmet

Spretnosti so neposredno uporabne v finančnem in zavarovalnem sektorju, predstavljajo pa tudi pomembno orodje za ekonomiste.

reasoning.

Transferable skills:

The skills are directly applicable in finance and insurance. They are also an important tool for the economists.

Metode poučevanja in učenja:

predavanja, vaje, domače naloge, konzultacije, seminarske naloge

Learning and teaching methods:

Lectures, exercises, homeworks, consultations, seminars

Načini ocenjevanja:

Delež (v %) /
Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt): izpit iz vaj (pisni izpit)		Type (examination, oral, coursework, project): written exam
ustni izpit		oral exam
Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)	50% 50%	Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

Mihael Perman:

– PERMAN, Mihael. Order statistics for jumps of normalised subordinators. Stochastic Processes and their Applications, ISSN 0304-4149. [Print ed.], 1993, vol. 46, no. 2, str. 267-281 [COBISS.SI-ID 12236633]

– HUZAK, Miljenko, PERMAN, Mihael, ŠIKIĆ, Hrvoje, VONDRAČEK, Zoran. Ruin probabilities and decompositions for general perturbed risk processes. Annals of applied probability, ISSN 1050-

5164, 2004, vol. 14, no. 3, str. 1378-1397 [COBISS.SI-ID 13168985]

– BLEJEC, Matjaž, LOVREČIČ SARAŽIN, Marko, PERMAN, Mihael, ŠTRAUS, Mojca. Statistika. Piran: Gea College, Visoka šola za podjetništvo, 2003. X, 150 str., graf. prikazi, tabele. ISBN 961-6347-43-8 [COBISS.SI-ID 122243328]