Szeregi czasowe - opis przedmiotu

Informacje ogólne

Nazwa przedmiotu	Szeregi czasowe
Kod przedmiotu	11.1-WK-MATD-SC-L-S14_pNadGenMH8KN
Wydział	Wydział Matematyki, Informatyki i Ekonometrii
Kierunek	Mathematics
Profil	ogólnoakademicki
Rodzaj studiów	drugiego stopnia z tyt. magistra
Semestr rozpoczęcia	semestr zimowy 2020/2021

Informacje o przedmiocie

Semestr	4
Liczba punktów ECTS do zdobycia	8
Typ przedmiotu	obieralny
Język nauczania	polski
Sylabus opracował	

Formy zajęć

Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Laboratorium	30	2	-	-	Zaliczenie na ocenę
Wykład	30	2	-	-	Zaliczenie na ocenę
Ćwiczenia	30	2	-	-	Zaliczenie na ocenę

Cel przedmiotu

Learning models of time series and their forecasting methods.

Wymagania wstępne

Probability Theory, Mathematical Statistics.

Zakres tematyczny

Lecture

1. Linear difference equations, polynomial characteristic; solution form; G-Transform (4 hours)
2. Time series as a stochastic proces and statistical data;Classical decomposition of time series; .Modelling of trend and seasonality; Smoothing methods (moving-avagrege, exponential smoothing, Holt method). *ex ante* and *ex post*. forecastings (4 hours.)
3. Linear time series: Autocovariance and autocorrelation function, weakly and strictly stationary time series, estimation of autocovariance and autocorrelation function, spectra properties of stationary models, periodogram and its relationship with estimation of autocovariance function; sampling spectrum; power spectrum and spectral density function; generating function of autocovariance; conditions of stationarity and invertibility. (8 hours.)
4. Autoreggresive models AR(p): stationarity and invertibility conditions, Autocorrelation; spectrum, Yule-Walker equations; Partial autocorrelation function; identification of models AR; estimation of parameters and forecasting. (4 hours.)
5. Moving average models MA(q): stationary and invertibility conditions, Autocorrelation function, spectrum, identyfication of models MA, estymation of parameters, forecasting. (4 hours.)
6. Mixed models of autoregression and moving average ARMA(p,q): stationarity and invertibility conditions; autocorrelation function; spectrum; identification of ARMA; forecasting (2 hours)
7. Linear stationary models ARIMA(p,d,q): representation in difference form, random impulses and inverse form, identification of models ARIMA, forecastings. (4 godz.)

Class

1. Solving difference equations. (4 hours.)
2. Smothing of time series (analytic and mechanics metods). (3 hours.)
3. Computing of seasonal indicators. (2 hours.)
4. Computing of ex post and ex ante forecasts. (3 hours.)
5. Verification of stability of linear filters. (4 hours.)
6. Verification of weak and strict stationarity of time series. (4 hours)
7. Computing of autocorrelation and partial autocorrelation function in models AR, MA, ARMA, ARIMA. (4 hours.)
8. Calculation of parameters of models using Yule-Walker equations. (2 hours)
9. Calculation of forecastings of models AR, MA, ARMA, ARIMA. (4 hours)

Laboratory

1. Polynomial models of trend. (3 hours)
2. Seasonal variation models. (2 hours)
3. Prediction based on trend and seasonall models. (3 hours)
4. AR(p) models. (4 hours)
5. MA(q) models. (4 hours)
6. ARMA(p,q) models. (4 hours)
7. Verification of stationarity of model: unit root test. (2 hours)
8. ARIMA(p,d,q) models. (4 godz.)
9. Procedurs of elimination of seasonality. (4 godz.)

Metody kształcenia

Lecture. Class. On laboratory – solving tasks using computer package GRETL, R.

Efekty uczenia się i metody weryfikacji osiągania efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
Student can explain and verify the stability of unstability of linear filter	• K_U05	• test • Current control in class	• Ćwiczenia
Student can determine a forecast based on the time series model.	• K_U13	• test • Performance of laboratory reports	• Laboratorium • Ćwiczenia
Student can determine a proper model of time series adapter to data and determine its parameters	• K_U13	• Performance of laboratory reports	• Laboratorium
Student knows matematical models of time series and understand their applicability.	• K_W06	• test	• Wykład
Student can calculate the function of autocorrelation and partial autocorrelation in ARMA models.	• K_U10	• test • Current control in class	• Ćwiczenia

Warunki zaliczenia

A student performs a report (laboratory) in which selects and solves a forecasting problem using time series models. The positive mark from laboratory is possible if the mark from report is positive. A student not attending to laboratory is not classified. Two tests (class) with mathematical tasks. The person not attending to class is not classified. One test (lecture) multiple choice.

Final mark O is a weighted average of marks from laboratory OL, from class OC and lecture OW, and is determined by the formula: O=0.4*OL+0.4*OC+0.2*OW.

Literatura podstawowa

1. P. J. Brockwell, R. A. Davis, Introduction to time series and forecasting, Springer, New York, 2002.
2. G. Kirchgaessner, J. Wolters, *Introduction to modern time series analysis,* Springer, Berlin, 2007.
3. R. S. Tsay, *Analysis of Financial Time Series*, Wiley&Sons, New Jersey, 2005.

Literatura uzupełniająca

1. G. E. P. Box, G. M. Jenkins, *Analiza szeregów czasowych. Prognozowanie i sterowanie*, PWN, Warszawa, 1983.
2. T. Kufel, *Ekonometria. Rozwiązywanie problemów z wykorzystaniem programu Gretl*, PWN, Warszawa, 2007.

Uwagi

Zmodyfikowane przez dr Alina Szelecka (ostatnia modyfikacja: 18-09-2020 13:46)