ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ — ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

ΣΧΟΛΗ ΕΠΙΣΤΗΜΩΝ & ΤΕΧΝΟΛΟΓΙΑΣ ΤΗΣ ΠΛΗΡΟΦΟΡΙΑΣ — SCHOOL OF INFORMATION SCIENCES & TECHNOLOGY

ΤΜΗΜΑ ΣΤΑΤΙΣΤΙΚΗΣ — DEPARTMENT OF STATISTICS

ΚΥΚΛΟΣ ΣΕΜΙΝΑΡΙΩΝ ΣΤΑΤΙΣΤΙΚΗΣ – ΔΕΚΕΜΒΡΙΟΣ 2016

Διονύσιος Χριστόπουλος

Καθηγητής, Technical University of Crete

Modeling Earthquake Recurrence Times using Physical Insights and Statistical Analysis

ΠΕΜΠΤΗ 15/12/2016

13:00 – 15:00

ΑΙΘΟΥΣΑ 607, 6ος ΟΡΟΦΟΣ,
ΚΤΙΡΙΟ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ
(ΕΥΕΛΠΙΔΩΝ & ΛΕΥΚΑΔΟΣ)

ΠΕΡΙΛΗΨΗ

The times between consecutive earthquakes are referred to as earthquake recurrence times (ERT). The ERT probability distribution is a topic of continuing research interest, because it is a key element for earthquake risk assessment. Various probability distributions have been proposed as potential ERT models including the lognormal, Poisson, gamma, and the Weibull functions. Some proposals are based purely on statistical evidence, some are derived by numerical simulations, e.g., the epidemic type aftershock sequence (ETAS) model, whereas others are based on the principle of universality and the theories of self-organized criticality and critical phenomena. There is evidence, based on the analysis of earthquake catalogs, that the ERT ---at least in certain cases--- follows the Weibull distribution. I will show that a stochastic stick–slip model which connects the crustal shear strength of the Earth with ERTs, supports a Weibull ERT distribution. Earthquake time series data from the island of Crete are used to test this theory. The Kolmogorov–Smirnov test and the Akaike Information Criterion are used to investigate the fit of the experimental ERT distributions from Crete and Southern California earthquakes with theoretical models. Finally, I motivate an extension of the Weibull distribution that allows for deviations in the upper tail of ERT distributions [2,3]. In particular, if the system that we observe has a finite number of elementary links (RVEs) which may interact with each other, the κ- Weibull distribution function is shown to be a more suitable choice than the Weibull. The upper tail of the κ-Weibull distribution decays as a power law in contrast with Weibull scaling. If the time permits, I will also discuss evidence from numerical simulations of fibre-bundle models.

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ΤΜΗΜΑ ΣΤΑΤΙΣΤΙΚΗΣ
DEPARTMENT OF STATISTICS

AUEB STATISTICS SEMINAR SERIES – DECEMBER 2016

Dionissios T. Hristopulos

Professor, Technical University of Crete

Modeling Earthquake Recurrence Times using Physical Insights and Statistical Analysis

THURSDAY 15/12/2016
13:00 – 15:00

ROOM 607, 6th FLOOR,
POSTGRADUATE STUDIES BUILDING
(EVELPIDON & LEFKADOS)

ABSTRACT

The times between consecutive earthquakes are referred to as earthquake recurrence times (ERT). The ERT probability distribution is a topic of continuing research interest, because it is a key element for earthquake risk assessment. Various probability distributions have been proposed as potential ERT models including the lognormal, Poisson, gamma, and the Weibull functions. Some proposals are based purely on statistical evidence, some are derived by numerical simulations, e.g., the epidemic type aftershock sequence (ETAS) model, whereas others are based on the principle of universality and the theories of self-organized criticality and critical phenomena. There is evidence, based on the analysis of earthquake catalogs, that the ERT ---at least in certain cases--- follows the Weibull distribution. I will show that a stochastic stick–slip model which connects the crustal shear strength of the Earth with ERTs, supports a Weibull ERT distribution. Earthquake time series data from the island of Crete are used to test this theory. The Kolmogorov–Smirnov test and the Akaike Information Criterion are used to investigate the fit of the experimental ERT distributions from Crete and Southern California earthquakes with theoretical models. Finally, I motivate an extension of the Weibull distribution that allows for deviations in the upper tail of ERT distributions [2,3]. In particular, if the system that we observe has a finite number of elementary links (RVEs) which may interact with each other, the κ- Weibull distribution function is shown to be a more suitable choice than the Weibull. The upper tail of the κ-Weibull distribution decays as a power law in contrast with Weibull scaling. If the time permits, I will also discuss evidence from numerical simulations of fibre-bundle models.