

MATHEMATICAL STRUCTURES SEMINAR

DATE: Thursday, 10 April 2025 | 10h15 – 11h00 SAST

VENUES:

- Department of Mathematics, University of the Witwatersrand
- Online

TALK 1

A Riesz spaces approach to ergodic theory

Dr Marwa Masmoudi
(Tunis El Manar University)

ABSTRACT:

In recent literature, several concepts from probability theory have been reformulated and examined in the measure free framework of Riesz spaces. This talk introduces abstract formulations of notions from ergodic theory in the setting of vector lattices, focusing on Riesz space generalizations of recurrence and ergodicity for iterative processes. Conditional expectation and conditional supremum operators serve as crucial tools in this study. Under mild assumptions, it is shown that every conditional expectation preserving process is conditionally ergodic with respect to the conditional expectation generated by the Cesàro mean associated with the iterates of the process. Furthermore, Riesz space conditional versions of the Poincaré Recurrence Theorem, Kac formula and Kakutani Rokhlin Lemma are developed. When applied to processes in $L^1(\Omega, \mathcal{F}, \mu)$, where μ is a probability measure, these yield new conditional versions of the above theorems.

BIOGRAPHY:



Marwa Masmoudi has a PhD in Mathematics from the University of Tunis El Manar, specializing in operator theory and Riesz spaces. Her research extends ergodic theory into a measure-free framework and has been published in leading journals. As an associate professor, she has taught courses ranging from calculus to functional analysis, and she's passionate about making mathematics accessible and impactful.

TALK 2

Conditional indicators applied to arbitrage theory and pricing in mathematical finance

Dr Dorsaf Cherif

(Preparatory Institute for Engineering Studies, Tunisia)

ABSTRACT:

We introduce a broad class of conditional indicators on a complete probability space with respect to a sub σ -algebra H . This concept extends the traditional conditional expectation. The key idea is to replace the conditional expectation by an H -measurable mapping. In addition to definitions, we provide nontrivial examples relevant in finance, with a focus on the conditional supremum. This mapping, being nonlinear and possessing the tower and projection properties, is thoroughly characterised. After a detailed mathematical study of these indicators, we employ them to characterize financial markets. We establish a general framework for continuous-time financial market models defined from simple strategies through conditional topologies that avoid stochastic calculus and do not necessitate semimartingale models. Comparisons with standard no-arbitrage conditions (e.g., NFL, NFLVR) and the recent AIP condition are made using appropriate pseudo-distance topologies. We demonstrate that these conditions hold in continuous time if and only if they hold in discrete time. The proposed pseudo-distance, is examined in various aspects, including topology generation and convergence.

BIOGRAPHY:

Dorsaf Cherif is an Associate Professor of Mathematics at the Preparatory Institute for Engineering Studies in Tunisia.



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