David Vencato

(+39) 366 9388 155
Personal email: david.vencato@gmail.com
Academic email: d.vencato@studenti.unipi.it

Academic Interests

- Stochastic Calculus.
- Optimal Transport.
- Applied Probability.

Education

University of Pisa — Pisa, Italy
Master's Degree in Mathematics — 2022 - 2024

- Graduation score: 110/110 cum laude.
- Thesis: *"Exploring the Optimal Reinsurance Problem: Convex Linearization, Optimal Transport and Case Studies"*, supervised by Prof. Dario Trevisan and Prof. Hansjörg Albrecher.
- Courses: Stochastic Calculus, Mathematical Finance, Machine Learning, Game Theory, Harmonic Analysis.

EPFL — Lausanne, Switzerland
SEMP Exchange Program — February 2024 - July 2024

- GPA: 5.71/6.
- Awardee of a Scholarship granted by the SEMP program to the University of Pisa.
- Semester Project: *"Some Important Aspects of Sustainable Portfolio Allocation"*, supervised by Prof. Michael Schmutz.
- Courses: Martingales in Financial Mathematics, Machine Learning in Finance, Integer Optimisation.

University of Pisa — Pisa, Italy
Bachelor's Degree in Mathematics — 2018 - 2022

- Graduation score: 110/110 cum laude.
- Thesis: *"Colorazioni di nodi tramite quandle"*, supervised by Prof. Roberto Frigerio.

Liceo Francesco Redi — Arezzo, Italy
High school scientific diploma — 2013-2018

- Graduation score: 100/100 cum laude.

Experiences

Istituto di Istruzione Superiore Tecnica e Liceale Russell-Newton — Scandicci, Italy
Substitute Teacher — 28 Frebuary 2025- 10 June 2025

University of Pisa, Faculty of Data Science — Pisa, Italy
Teaching Assistant for Analysis 1 Course — October 2023- January 2024

- Provided tutoring support to students and assisted with course materials.

University of Pisa, Accademia Giovani per la Scienza — Montecatini Terme, Italy
Speaker for Conference on Betti Numbers — October 2023

- Two days of lectures about Betti numbers for high school students organized by University of Pisa and "Accademia Giovani per la Scienza" of Pistoia.

Individual National Mathematics Olympiad — Cesenatico, Italy
Honorable Mention, National Stage — 2018

Kangaroo of Mathematics — Ravenna, Italy
20th Place, National Finals — 2017

Skills

Languages: Italian (Native), English (Advanced).

Programming: `Python`, `Lean`, LaTeX.

Other: Member of Mensa (since 2018).

Master's Thesis

Title: "Exploring the Optimal Reinsurance Problem: Convex Linearization, Optimal Transport and Case Studies."

Supervisors: Prof. Dario Trevisan and Prof. Hansjörg Albrecher.

Abstract: In this work, initially, we present a preliminary chapter on Optimal Transport, with a focus on the one-dimensional case. The second chapter introduces the optimal reinsurance problem, beginning with a classical existence result for optimal treaties. Then, we analyze the case of a finite number of inequality constraints using a convex linearization approach. By identifying a convex set where the directional (right) derivatives of the considered functionals are convex linear, we derive key properties of the measures defining optimal contracts. Under additional assumptions, we further characterize the support points of these measures, providing practical insights into their implementation. Afterwards, we broaden the scope of constraints and address the problem using optimal transport. We reformulate the problem into a nested minimization, which, in the one-dimensional case reduces to a minimization problem over deterministic functions. Finally, the practical applications of both approaches are explored in the concluding chapter. The convex linearization method proves particularly effective in addressing constraints such as the Value at Risk, while the optimal transport framework offers a novel perspective for tackling classical and new problems in reinsurance.

Semester Project

Title: "Some Important Aspects of Sustainable Portfolio Allocation"

Supervisor: Prof. Michael Schmutz.

Abstract: Leveraging stochastic analysis for defining continuous financial markets with a riskless asset, we establish the Growth Optimal Portfolio (GOP) through unconstrained optimization. It is notable that any benchmarked portfolio, if the GOP is used as benchmark, exhibits a local nonnegative martingale property, rendering it a supermartingale. Expanding our analysis to continuous financial markets without the riskless asset reveals a duality in GOP formulations, consistently affirming the benchmarked portfolio's supermartingale property. In view of this, we are able to give a reasonable definition of approximating sequence for the so-called stock GOP. In parallel, we discuss the HWI, an index based on hierarchical diversification of stocks and the EWI, which is a trivial case of it. We then present and prove the Diversification Theorem, which immediately implies that the sequences of portfolios constructed with HWI and EWI serve as approximations to the GOP. At the end, we summarize some empirical evidence highlighting how portfolios based on a deeper hierarchical structure outperform in terms of optimal growth, opening to a possible discussion on various types of sustainable strategies.