ARNAUD GERMAIN

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Dessus de la ville 16
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Personal information
Birth year: 1999
Citizenship: Belgian

RESEARCH INTERESTS

Machine learning in finance, credit risk, portfolio selection

EDUCATION

UCLouvain, PhD in Economics and Management Sciences *Dec. 2022 - Present*
Thesis title: *The utility of clustering in finance: applications to loan selection and default prediction*
Supervisor: Frédéric Vrins (UCLouvain)
Committee: Raffaella Calabrese (University of Edinburgh), Corentin Vande Kerckhove (UCLouvain)
Expected graduation: summer 2026

KULeuven, M.Sc in Business Engineering* - Data science, *Summa cum Laude* *2020-2022*

UCLouvain, M.Sc in Business Engineering* - Financial engineering, *Magna cum Laude* *2020-2022*

* As part of the Double Degree program between UCLouvain and KULeuven.

UCLouvain, B. Sc. in Business Engineering, *cum Laude* *2017-2020*

REFERENCES

Frédéric Vrins
UCLouvain
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Georges Hübner
ULiège
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Nathan Lassance
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PUBLICATIONS

Credit selection in Collateralized Loan Obligation: efficient approximation through linearization and clustering [Link]
Co-author: Frédéric Vrins
European Journal of Operational Research - ABS4

Despite its role in the global financial crisis, collateralized loan obligation (CLO) remains a powerful tool to direct funds towards the real economy. In particular, it enables development banks to increase credit supply to SMEs. Public financial institutions thus face the challenge of identifying a subset of credits to be pooled in a CLO for the sake of reaching a specific financial target. This is a mixed-integer nonlinear program, known to be NP-hard. In this paper, we provide an efficient method to tackle this problem by relying on the large pool approximation combined with clustering and linearization of ancillary variables. As illustration, we consider two objective functions. We rely on the celebrated one-factor Gaussian copula in the main examples, but make clear that this assumption is not a restriction and can be relaxed. Our results contribute to reduce the funding cost of SMEs and are of direct interest for securitization stakeholders such as public financial institutions, commercial banks and pension funds.

JOB MARKET PAPER

Early Warning System for Non-Performing Clients
Co-author: Frédéric Vrins

In its "Guidance to banks on non-performing loans", ECB requires banks to implement an Early Warning System (EWS) to identify potential non-performing clients at a very early stage. Relying on a unique dataset provided by a systemic European bank including 5.5 million observations of anonymized data from 2018 to 2022, we aim to predict the corporate clients who will become non-performing in a given warning horizon. We propose two solutions to address time and client

heterogeneity issues. Regarding the latter, we divide our dataset into several clusters using k-means, fit a prediction model on each cluster, and combine those models together. This boosts the out-of-sample performance compared to a case where we fit a single prediction model on the whole dataset and a case where we rely on domain knowledge to determine the clusters. Second, to address time heterogeneity, we forecast the unconditional probability to be positive using macroeconomic variables and then rescale the output of the prediction model using Bayes theorem. This enhances the out-of-sample performance compared to a case where the macroeconomic variables are directly included as predictors of the prediction model. Both approaches are complementary in the sense that the best predictive performance is achieved by combining them together. Our findings help to increase the performance and the robustness of EWS.

WORK IN PROGRESS

Clagging: Cluster aggregating as an efficient alternative to bootstrap aggregating

We consider an ensemble learning strategy called *Cluster aggregating (Clagging)* where we (i) cluster the training set, (ii) fit a model on each cluster and (iii) combine the predictions of each model. We introduce a new combination scheme exploiting the distance of a test point to the clusters' centroids. The intuition of using clustering over random bootstrapping or partitioning is to create *meaningful diversity*. We perform an extensive horse race study where we benchmark Clagging against state-of-the-art methods on 20 datasets. Our empirical evidence suggests that Clagging often outperforms bagging, where a bootstrapped sample is traditionally created by drawing observations with replacement until the size of the bootstrapped samples coincide with the size of the original training set.

SCHOLARSHIPS AND PRIZES

ING Chair 2022-2026
4 years of fully-funded scholarship for a PhD thesis.

Rotary Chimay-Couvin Rhetorical Contest 2017
Audience award, *Tournoi des idées.*

Rallye Math 2016-2017
Math contest organized by Université de Namur - 1^{st} *place both years.*

CONFERENCE TALKS

2025	41th International Conference of the French Finance Association (University of Dijon), 14th International Conference of the Financial Engineering and Banking Society (MBS), Credit Scoring and Credit Control Conference XIX (University of Edinburgh).
2024	International Conference on Computational Finance - ICCF (University of Amsterdam), Actuarial and Financial Mathematics Conference - AFMath (Brussels).

TEACHING EXPERIENCE

UCLouvain *Credit and interest rate risk* (TA, Graduate, ENG): fall 2025, fall 2024.

WORK EXPERIENCE

Euroclear Intern in capital modelling: summer 2021.

OTHER TALKS

2025	LIDAM PhD seminar, LFIN Internal seminar, LFIN PhD seminar.
2024	LIDAM PhD seminar, LFIN Internal seminar, LFIN PhD seminar, DSM PhD Day.
2023	LFIN Internal seminar, Communication & Writing skills seminar.

MISCELLANEOUS

Refereeing	*Statistical Methods & Applications, Frontiers in Applied Mathematics and Statistics.*
Certifications	Bloomberg Market Concepts (2020).
Services	Scientific member of LFIN Board (2024-2025). Organizer of PhD seminar (2024-2025). Organizer of the LFIN team building (2024).
IT Skills	R, Python, LaTeX, MS Office.
Languages	French (native speaker), English (C1), Dutch (B2).