

DIALog

Academic partner(s) : Aix-Marseille University, KU Leuven, Concordia University

Financial partner(s) : CNP Assurances

Scientific director(s) : Katrien ANTONIO, Xavier MILHAUD and Samuel STOCKSIEKER (from 2024)

Website : <https://chaire-dialog.fr>

RESEARCH PROGRAM DESCRIPTION

The DIALog Chair (Digital Insurance and Long-term risks) is primarily focused on three distinct areas of study, including operational issues that will be addressed within the framework of the project.

- Short-term horizon (approximately 1.5 years): Concept of customer value in the context of digital transformation in the insurance sector.

This area focuses on two main themes, namely:

1. The customer in the digital age: redefining customer value in the digital age, detecting and targeting profiles, optimizing product offerings, and improving certain conversion rates.
2. Customer behavior in the digital age: acquiring new customers, retaining customers, studying cancellation and arbitration behaviors in life insurance.

More specifically, the topics are as follows:

- Literature review on customer value in the digital age:
- Redefining customer value in the digital age: improving financial vision/management control/foresight/profiles...
- Focus on customer interactions: valuation of potential/investment capacity (up/cross-selling, new products)
- Considering information asymmetry for behavioral analysis.
- Arbitration behaviors:
 - Application to high-end contracts/legal entities - savings.
 - Application to other types of behaviors.
- Dynamic behavioral law:
 - Link with ALM (Asset Liability Management): asset allocation, model points, BEL (Best Estimate Liabilities) estimation;
 - Link with the strategy for acquiring new prospects and retaining customers.

- Medium-term horizon (approximately 3 years): Improvement of management processes and control of technical risk in Life and Non-Life insurance.

This area proposes to study mainly:

1. Pricing and provisioning issues in Life and Non-Life insurance. It aims to enrich internal data with external data to improve risk knowledge, better anticipate risk deviations, and redefine best practices in terms of pooling versus segmentation.
2. Optimization of claims processing to improve customer satisfaction: services automatically triggered following a claim, etc.

More specifically, the topics considered are:

- Pricing process:
 - Reflection on pooling/segmentation/individualization
 - Technical aspects: segmentation (bias with multifactorial covariates)
 - Considering unobservable heterogeneity through a non-parametric Machine Learning approach
- Underwriting process:
 - Creation of scores
 - Machine Learning approach during online underwriting of loan insurance
- Reserving process (pilots: K. Antonio, X. Milhaud):
 - Line-by-line provisioning in non-life (protection and borrower insurance)
 - Multi-period provisions (between 1-year vision and ultimate vision)
- Claims and risk management process:
 - Detection of claims with automatically triggered benefits
 - Definition of the granularity of model points, IFRS 17 links
- Long-term horizon (approximately 5 years): Study of future impacts related to the evolution of environmental factors in insurance.

This involves reflecting to gain a forward-looking vision on:

1. The impact of increased life expectancy in life insurance (mainly dependency risk) and the delay in retirement age (work stoppages, psychological effects).
2. The use of AI to measure the impact of environmental risks (on insurance claims and health): climate change, etc.

More specifically, the topics considered are:

- Effects of increased human life expectancy:
 - Evolution of dependency in the elderly, connection with broader industry reflections
 - Delayed retirement age: consequences on health (work stoppages, illnesses, etc.), physical and psychological capacities of employees, CSR (Corporate Social Responsibility), etc.

- Improvement of existing health models with external data:
 - Integration of health data to improve forecasting in protection insurance, such as the comprehensive database on inter-regime health insurance expenses (DAMIR)
 - Use of external databases (open data/medical follow-up files on accident victims) to monitor health status following severe accidents
- Evaluation of the consequences of environmental risks like climate change:
 - Measuring impacts on mortality/morbidity and liabilities
 - Defining indicators to anticipate the value of companies related to climate commitments

RESEARCH TEAM

Researchers

Samuel STOCKSIEKER, Aix-Marseille University (from beginning of 2024)
Xavier MILHAUD, Aix-Marseille University
José GARRIDO, Concordia University
Christophe DUTANG, Université Grenoble-Alpes (UGA)
Denys POMMERET (left the project), Aix-Marseille University

Katrien ANTONIO, KU Leuven
Pierre-Olivier GOFFARD, Université de Strasbourg
Anne EYRAUD, University of Lyon
Claude LEFEVRE, Université Libre de Bruxelles (ULB)

Postdoctoral Researchers

Mathias VALLA, University of Lyon

PhD Students

Mathias VALLA (PhD defended 15th march of 2024)
Jean-Luc GOUTHON, Aix-Marseille University
Alban KAMGA, Université Grenoble-Alpes

Interns

Dabakh KANE, Ecole Nationale Supérieure d'Informatique et de Mathématiques Appliquées de Grenoble (ENSIMAG, INP Grenoble)

PUBLICATIONS OF THE YEAR DIRECTLY RELATED TO THE RESEARCH PROGRAM

Published

	Titre	Auteurs
1	Sequential Monte Carlo samplers to fit and compare insurance loss models. <i>Scandinavian Actuarial Journal</i> ; 2023 (8)	Pierre-Olivier Goffard
2	Including individual customer lifetime value and competing risks in tree-based lapse management strategies. <i>European Actuarial Journal</i> . 14 , 99–144 (2024). https://doi.org/10.1007/s13385-023-00358-0	Valla, M., Milhaud, X. and Olympio, A
3	Two-sample contamination model test. <i>Bernoulli</i> 30(1): 170-197 (2023). doi:10.3150/23-BEJ1593	D. Pommeret, X. Milhaud, Y. Salhi, P. Vandekerkhove
4	Estimation and prediction with data quality indexes in linear regressions. <i>Computational Statistics</i> (2023). https://doi.org/10.1007/s00180-023-01441-6	Chatelain, P., Milhaud, X.

5	Abel-Gontcharoff polynomials, parking trajectories and ruin probabilities. (2023) <i>Dependence Modeling</i> , 1-17.	Lefèvre, C. and Picard, P.
6	Collective epidemics with asymptomatics and functional infection rates. (2023) <i>Stochastics</i> , 1-22	Lefèvre, C. and Simon, M.
7	On clustering levels of a hierarchical categorical risk factor. (2023) <i>Annals of Actuarial Science</i> , accepted	Campo & Antonio
8	Adjusting Manual Rates to Own Experience: Comparing the Credibility Approach to Machine Learning, (2023) <i>Variance</i>	C. Dutang, G. Spedicato, Q. Guibert

Under review

	Titre	Auteurs
1	The definition of a French actuarial climate index; one more step towards a European index. 2023. (hal-04491982)	José Garrido, Xavier Milhaud, Anani Olympio
2	Measuring climate change from an actuarial perspective: a survey of insurance applications. 2024. < 04507165 >	Nan Zhou, José Luis Vilar-Zanón, Jose Garrido and Antonio José Heras Martínez
3	Contamination source based K-sample clustering. (preprint, 2023) https://hal.science/hal-04129130	Milhaud X., Pommeret D., Salhi Y. and Vanderkerkhove P.
4	Neural networks for insurance pricing with frequency and severity data: a benchmark study from data preprocessing to technical tariff. (2023) Preprint sur arXiv: https://arxiv.org/abs/2310.12671	Holvoet, Antonio & Henckaerts

5	An engine to simulate insurance fraud network data. (2023) Preprint sur arXiv: https://arxiv.org/abs/2308.11659	Campo & Antonio
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Working papers

	Titre	Auteurs
1	Market-based insurance ratemaking. 2023. (hal-04297811)	Pierre-Olivier Goffard, Pierrick Piette, Gareth W. Peters
2	A longitudinal framework for lapse management in life insurance. (2023) Preprint, (hal-04178278v2)	Mathias Valla
3	An example to incorporate climate risk in longevity models. Preprint (2023)	Gouthon, Jean-Luc et Milhaud Xavier
4	Multivariate mortality rates prediction using LSTM networks. Working paper (2023)	Gouthon J.-L., Garrido J. and Milhaud X.
5	Neural networks for insurance pricing with frequency and severity data: a benchmark study from data preprocessing to technical tariff. (2023) Preprint sur arXiv: https://arxiv.org/abs/2310.12671	Holvoet, Antonio & Henckaerts
6	An engine to simulate insurance fraud network data. (2023) Preprint sur arXiv: https://arxiv.org/abs/2308.11659	Campo & Antonio

MAJOR COMMUNICATIONS RELATED TO THE RESEARCH PROGRAM

Major academic conferences, invited speaker, etc.

	Titre	Auteurs
1	22ème Congrès des actuaires, June 2023, Paris, France (conférence)	José Garrido, Xavier Milhaud et Anani Olympio
2	26 th Insurance: Mathematics and Economics (IME), July 2023, Herriot-Watt University in Edinburgh, Scotland (conference)	José Garrido
3	XXIV Jornadas Nacionales y Latinoamericanas Actuariales, October 2023, Consejo Profesional de Ciencias Económicas de la Ciudad Autónoma de Buenos Aires and the U. of Buenos Aires, Argentina (conference, invited speaker)	José Garrido
4	26 th Insurance: Mathematics and Economics (IME), July 2023, Herriot-Watt University in Edinburgh, Scotland (conference)	Pierre-Olivier Goffard
5	Visite de recherche à University of California Santa Barbara (UCSB). 1 mois environ. Plusieurs conférences et séminaires donnés.	P.-O. Goffard
6	Temporal dynamics in tree-based models and applications to lapse behaviour in life insurance. Séminaire Galea and associates, Data Lab, 08/02/2024	Mathias Valla
7	fitdistrplus : An R Package for Fitting Distributions. (2023) R package version 1.1-11	M. Delignette-Muller, C. Dutang et A. Siberchicot
8	20th Applied Stochastic Models and Data Analysis (AMSDA), juin 2023, Hellenic Mediterranean University à Heraklion, Crête (conférence)	C. Lefèvre

Events organized by the program

A – Breakfast #1

Cet événement s'est déroulé en présentiel dans des locaux loués à côté de la Tour Montparnasse. Il a eu lieu le 14 mars 2023 de 9h30 à 12h. L'événement pouvait aussi être suivi à distance (format hybride). Sur place, l'événement a réuni une 13 personnes. En distanciel, il y a eu environ 53 connexions.

Le thème général de l'événement était le climat. Le programme de cet événement a été le suivant :

- 9h : *welcome* ;
 - 9h30-10h30 : *Max Popp (EcoAct). Climate models and climate projections.*
 - 10h30-11h : *coffee break and discussions* ;
 - 11h-12h : *Geoffrey Ecotto (CCR, responsable Actuariat & Provisionnement) : How to take into account climate risk and actuarial risk management processes– **Zoom on droughts***
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B – Breakfast #2.

Cet événement s'est déroulé en présentiel à l'Institut Louis Bachelier, place de la Bourse à Paris. Il a eu lieu le 7 juin 2023 de 9h30 à 12h. L'événement pouvait aussi être suivi à distance (format hybride). Sur place, l'événement a réuni une quinzaine de personnes. En distanciel, il y a eu 20 à 30 connexions sur la durée.

Le thème général de l'événement était le risque climatique.

Le programme a été le suivant :

- 9h : *welcome words* ;
 - 9h30-10h30 : *Soulihanh Thao (research engineer from LSCE) : **Quelques éléments clés pour comprendre les études d'attribution d'événements extrêmes***
 - 10h30-11h : *coffee break and discussions* ;
 - 11h-12h : *Thierry Cohignac (CCR, vice head of réassurances et fonds publics) : **Impact du changement climatique sur le coût des catastrophes naturelles.***
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C – Web coffee.

Cet événement s'est déroulé en distanciel le 28 septembre 2023, de 15h à 17h.

Le thème de l'événement était « Indices Actuariels Climatiques ».

L'événement a été un succès avec plus de 65 connexions par moment hors membres de l'équipe de recherche de la Chaire et intervenants.

L'orateur, José GARRIDO (professeur émérite, Université Concordia), nous a parlé de la construction d'indices actuariels climatiques à travers le monde, et établit une comparaison Amérique du Nord – Europe.

D – Technical seminar.

In person or remotely. From 8.30 am to 3pm on the 15th of november, 2023.
50+ participants.

Various speakers, from CNP Assurances collaborators and research team members to external researchers.

Link tot he event : <https://chaire-dialog.fr/evenements/seminaire-technique/>

Program :

- 8h30: welcome and coffee ;
- 8h40-8h55 : main research axis (K. Antonio + X. Milhaud) ;
- 9h-9h30 : Ratemaking without data (P.-O. Goffard) ;
- 9h35-10h05 : coffee break - discussions
- 10h10-10h40: CLV-targeted machine learning techniques to optimize retention strategy (M. Valla);
- 10h45-11h50 : Longevity and climate risk (K. Antonio + J. Garrido);
- 11h55 - 12h : closing words ;
- 12h - 15h : lunch and team works.

E – Annual French Actuarial Congress.

Participating to talks during the 22th Actuarial Congress, on 22th of June, 2023 in Paris

Speakers : A. Olympio, J. Garrido, X. Milhaud.

Title : CLIMATE RISK IN LIFE INSURANCE : SOME EXAMPLES OF ACTUARIAL TOOLS FOR RISK MONITORING AND MANAGEMENT.

Cet atelier a vocation à sensibiliser la communauté actuarielle à l'importance de la prise en compte du risque climatique dans les calculs de solvabilité d'un assureur. Déjà largement conscients des impacts potentiels que pourrait générer le réchauffement climatique, de nombreux législateurs et organes de réglementation prudentielle proposent à ce titre un calcul standard pour la prise en compte de ce risque. Néanmoins, le scénario considéré ne reflète qu'une partie du marché, au sens notamment où ce scénario n'est calibré que sur une zone géographique bien définie, dans des conditions de climat bien spécifiques. À travers l'étude du risque climatologique sous-jacent, nous présenterons la sensibilité des scénarios climatiques au paramétrage des modèles physiques qui les sous-tendent, et donc la sensibilité des impacts au niveau des assureurs. Nous nous concentrerons sur le lien entre dérive climatique et mortalité, mais aussi potentiellement sur le risque de morbidité. Au-delà de l'étude de données d'assureurs qui demeurent encore à ce jour indisponibles concernant des calculs sophistiqués sur ce risque, des données nationales permettent de détecter certains des facteurs clefs influençant la mortalité. Des extensions de modèles bien connus des actuaires tel que le modèle de Lee-Carter permettront notamment d'illustrer ces impacts.

OTHER HIGHLIGHTS

Awards, scientific recognition, organization of calls for projects, involvement in master's courses, PhD program visiting researchers, etc...

All researchers are involved in teaching tasks and administrative tasks in their respective institutions.

Katrien Antonio received in 2022 the Best Actuarial Paper Award from SOA.

The research team organized in 2022 the conference MLISTRAL at CIRM (Centre Internationale de Recherche en Mathématiques)