SUSTAINABLE ACTUARIAL SCIENCE AND CLIMATE RISKS

Financial partner(s) : Milliman Paris

Scientific director(s) : Stéphane LOISEL

Website : https://sites.google.com/view/stephaneloisel/recherche/projets/actuariat-durable-et-risques-climatiques?authuser=0

RESEARCH PROGRAM DESCRIPTION

The IDR Sustainable Actuarial Science and climate risks ("Milliman Paris - Actuariat durable, risques climatiques et stabilité du secteur de l'assurance à long terme") is to carry out research on cutting-edge actuarial topics related to insurance and linked with sustainable development and financial stability / solvency.

Regulation and pragmatism favor short term views of risk, involving proxies and simplifications of correlations and contagion risks. This IDR aims at studying the short-term and long-term risks that threaten the insurance, pension and reinsurance network with different time horizons.

The first research questions addressed by this IDR concern systemic risks, including those induced by climate change, the massive use of common methods to compute economic capital and by the market consistent valuation, as well as risks arising from competition and policyholder behavior.

The common point of these works is the potentially systemic aspect of the underlying risks and of their inappropriate modeling, in a framework that does not only matters to a single company, but also to the society as a whole.

Some research works concern Enterprise Risk Management and long term solvency of insurance companies, prevention, biodiversity, as well as asymmetry of information and its consequences in insurance and finance, longevity risk and the monitoring of actuarial assumptions.

RESEARCH TEAM

Researchers

- Stéphane LOISEL, Cnam
- Mercè CLARAMUNT, University of Barcelona
- Aurélien COULOUMY, Université Claude Bernard Lyon 1
- Kué Gilles GABA, Externativ

- Alexandre BOUMEZOUED, Milliman Paris
- Julien VEDANI, Milliman Paris

PUBLICATIONS OF THE YEAR DIRECTLY RELATED TO THE RESEARCH PROGRAM

Published

- Alimoradian, B., Jakubiak, J., Loisel, S., & Salhi, Y. (2023). Understanding Key Drivers of Participant Cash Flows for Individually Managed Stable Value Funds. Risks, 11(8), 148.
- Loisel, S., & Minier, C. (2023). On the Devylder–Goovaerts Conjecture in Ruin Theory. Mathematics, 11(6), 1501.
- Andrès, H., Boumezoued, A., & Jourdain, B. (2024). Signature-based validation of real-world economic scenarios. ASTIN Bulletin: The Journal of the IAA, 54(2), 410-440.
- Barigou, K., Goffard, P. O., Loisel, S., & Salhi, Y. (2023). Bayesian model averaging for mortality forecasting using leave-future-out validation. International Journal of Forecasting, 39(2), 674-690.
- Alimoradian, B., Jakubiak, J., Loisel, S., & Salhi, Y. Risk assessment for synthetic GICs: a quantitative framework for asset–liability management. Accepted, to appear in Decisions in Economics and Finance, 1-28.

- Chatelain, P. (2023). Tarification à l'adresse en assurance habitation individuelle (Doctoral dissertation, Université Claude Bernard-Lyon I). PhD thesis co-supervised with X. Milhaud, including works on subsidence risk (related to climate risks, in particular drought risk).
- Boj, E., Claramunt, M. M., & Varea, X. (2024). On which socioeconomic groups do reverse mortgages have the greatest impact? Evidence from Spain. Technological and Economic Development of Economy, 1-19. https://doi.org/10.3846/tede.2024.21138
- Atance D, Claramunt MM, Varea X, Aburto JM (2024) Convergence and divergence in mortality: A global study from 1990 to 2030. PLoS ONE 19(1): e0295842. https://doi.org/10.1371/journal.pone.0295842
- López Bausan, M. J.; Claramunt Bielsa, M. M.(2023). Estudio de los mecanismos de mitigación del riesgo de longevidad en seguros y pensiones, Anales del Instituto de Actuarios Españoles (ESP), 61- 94. https://doi.org/10.26360/2023_4
- Claramunt, M.M.; Mármol, M.; Varea, X. (2023). Facing a Risk: To Insure or Not to Insure ¿An Analysis with the Constant Relative Risk Aversion Utility Function, Mathematics , 11. https://doi.org/10.3390/math11051070
- Boj, E.; Claramunt, M.M.; Costa, T.; Galisteo, M.; González-Vila, L.; Mármol, M.; Roch, O.; Solanilla, S.; Varea, J.; Villavicencio, F. (2023). Informe estadístico de los planes de pensiones de empleo en España en la gran empresa. 2022. Librería Universitaria S.L. ISBN: 978-84-10101-10-4.
- Boj, E.; Claramunt, M.M.; Costa, T.; Galisteo, M.; González-Vila, L.; Mármol, M.; Roch, O.; Solanilla, S.; Varea, J.; Villavicencio, F. (2023). Instrumentos para el desarrollo del segundo pilar de la previsión social. Librería Universitaria S.L. ISBN: 978-84-10101-06-7

- Boj, E.; Claramunt, M.M.; Costa, T.; Galisteo, M.; González-Vila, L.; Mármol, M.; Roch, O.; Solanilla, S.; Varea, J.; Villavicencio, F. (2023). Informe estadístico de los planes de pensiones de empleo en España en las pymes. 2022. Librería Universitaria S.L. ISBN: 978-84-10101-12-8.
- Boj, E.; Claramunt, M.M.; Costa, T.; Galisteo, M.; González-Vila, L.; Mármol, M.; Roch, O.; Solanilla, S.; Varea, J.; Villavicencio, F. (2023). Informe estadístico de los planes de pensiones de empleo en España. Comparativa entre pymes y grandes empresas. 2022. Librería Universitaria S.L. ISBN: 978-84-10101-10-4.
- Boj, E.; Claramunt, M.M.; Costa, T.; Giménez, J.;González-Vila, L.; Mármol, M.; Roch, O.; Varea, J. (2023). Llibre blanc de la previsió social complementària a Catalunya. Librería Universitaria S.L. ISBN: 978-84-19282-93-4.
- Boj, E.; Claramunt, M.M.; Costa, T.; Giménez, J.;González-Vila, L.; Mármol, M.; Roch, O.; Varea, J. (2023). Desenvolupament dels instruments de previsió social complementària del sistema d'ocupació. Quina percepció en tenen els directors de recursos humans de Catalunya?. Librería Universitaria S.L. ISBN: 978-84-19282-61-3.
- Boj, E.; Claramunt, M.M.; Costa, T.; Giménez, J.;González-Vila, L.; Mármol, M.; Roch, O.; Varea, J. (2023). Anàlisi DAFO dels instruments de previsió social complementària. Librería Universitaria S.L. ISBN: 978-84-19282-82-8.
- Boj, E.; Claramunt, M.M.; Costa, T.; González-Vila, L.; Mármol, M.; Roch, O.; Varea, J. (2023). Informe estadístico de los planes de pensiones de empleo en España en las pymes. 2021. Librería Universitaria S.L. ISBN: 978-84-19282-77-4.
- Boj, E.; Claramunt, M.M.; Costa, T.; Giménez, J.;González-Vila, L.; Mármol, M.; Roch, O.; Varea, J. (2023). DESENVOLUPAMENT DELS INSTRUMENTS DE PREVISIÓ SOCIAL COMPLEMENTÀRIA DEL SISTEMA D'OCUPACIÓ. Quina percepció en tenen els TREBALLADORS de Catalunya? Librería Universitaria S.L. ISBN: 978-84-19282-62-0.
- Boj, E.; Claramunt, M.M.; Costa, T.; Giménez, J.;González-Vila, L.; Mármol, M.; Roch, O.; Varea, J. (2023). Llibre blanc de la previsió social complementària a Catalaunya. Anàlisi prospectiu (mètode delphi). Librería Universitaria S.L. ISBN: 978-84-19282-63-7.
- Boj, E.; Claramunt, M.M.; Costa, T.; Giménez, J.;González-Vila, L.; Mármol, M.; Roch, O.; Varea, J. (2023). Desenvolupament dels instruments de previsió social complementària del sistema d'ocupació. Quina percepció en tenen els empresaris de Catalunya?. Librería Universitaria S.L. ISBN: 978-84-19282-60-6.
- Boj, E.; Claramunt, M.M.; Costa, T.; González-Vila, L.; Mármol, M.; Roch, O.; Varea, J. (2023). Informe estadístico de los planes de pensiones de empleo en España en la gran empresa. 2021. Librería Universitaria S.L. ISBN: 978-84-19282-78-1.
- Boj, E.; Claramunt, M.M.; Costa, T.; González-Vila, L.; Mármol, M.; Roch, O.; Varea, J. (2023). Informe anual del Observatorio de los Sistemas Europeos de Previsión Social Complementaria. 2022. Librería Universitaria, S.L. ISBN: 978-84-19282-54-5.
- Boj, E.; Claramunt, M.M.; Costa, T.; González-Vila, L.; Mármol, M.; Roch, O.; Varea, J. (2023). Informe estadístico de los planes de pensiones de empleo en España. Comparativa entre pymes y grandes empresas. 2021 Librería Universitaria S.L. ISBN: 978-84-19282-79-8.

- V. Du Preez, A. Couloumy et al. , From Bias to Black Boxes: Understanding and managing the risks of AI, accepted, to appear in Cambridge Core.

Under review

- Le Bastard, L., Loisel, S., & Shao, A. W. (2023). Combining experience data of several Long-Term Care Insurance products with different disability definitions.
- Boumezoued, A., Cherkaoui, Y., & Hillairet, C. (2023). Cyber risk modeling using a two-phase Hawkes process with external excitation. arXiv preprint arXiv:2311.15701.
- Andrès, H., Boumezoued, A., & Jourdain, B. (2023). Implied volatility (also) is path-dependent. arXiv preprint arXiv:2312.15950.

Working papers

- GABA K.G., Loisel S., Parent A. (2023), Cliometrics and Actuarial Science: New Avenues for Enriching Prospective Mortality Table Construction Models, Working paper.

Reports, books, press articles, etc.

- Boumezoued, A. (2023). The role of mathematics in computational efficiency. The European Actuary, 36, December 2023.

MAJOR COMMUNICATIONS RELATED TO THE RESEARCH PROGRAM

Major academic conferences, invited speaker, etc.

Stéphane Loisel: invited speaker at

PARTY Conference, Valencia, Jan. 2023
Charles University Seminar (Prague), April 2023
AAE conference, Bratislava, April 2023
Europen pension workshop, Barcelona, June 2023
Oberwolfach 2023 conference on maths of quantitative risk management, Oct. 2023
Taiwan Risk and Insurance Association, Taiwan, Dec. 2023.

Invited session talk at ICIAM conference, Tokyo, August 2023

Talk at ICA 2023 (Sydney), June 2023
Talk at IME conference, Edinburgh, July 2023
Talk at AFRIC conference, Victoria Falls, July 2023
Talk at UOM, Mauritius, August 2023

- Boj, E.; Claramunt, M.M.; Varea, X. (2023). On which socioeconomic groups do reverse mortgages have the greatest impact?. European Seminar on Private Pensions, 5-7 june 2023.

- Boj, E.; Claramunt, M.M.; Varea, X. (2023). On which Socioeconomic Groups do Reverse Mortgages have the Greatest Impact? Evidence from Spain. 31st Colloquium on Pensions and Retirement Research, 5-7 december 2023.
- Boj, E.; Claramunt, M.M.; Varea, X. (2023). Hipotecas inversas y sostenibilidad financera. Seminario Académico 2023 sobre Sistemas de pensiones y mecanismos de solidaridad intergeneracional, 20 de junio de 2023.
- Claramunt Bielsa, M.M.; Gonzalez-Vila Puchades, L.; Hijazi, M.M. (2023). Herding Behavior in times of crisis: An analysis of the major global stock exchanges during the 2008 and Covid-19 Crises. 08 Workshop on Pensions and Insurance, November, 13-14 2023.
- Boj, E.; Claramunt, M.M.; Costa, T.; González-Vila, L.; Huertas, M.; Mármol, M.; Roch, O.; Varea, X. (2023). Análisis de los planes de pensiones de empleo en España en las pymes en el periodo 2016-2022. 08 Workshop on Pensions and Insurance, November, 13-14 2023.
- Boj, E.; Claramunt, M.M.; Costa, T.; González-Vila, L.; Huertas, M.; Mármol, M.; Roch, O.; Varea, X. (2023). Análisis de los planes de pensiones de empleo en España en el periodo 2016-2022: Comparativa entre pymes y gran empresa. 08 Workshop on Pensions and Insurance, November, 13-14 2023.
- Boj, E.; Claramunt, M.M.; Costa, T.; González-Vila, L.; Huertas, M.; Mármol, M.; Roch, O.; Varea, X. (2023). Análisis de los planes de pensiones de empleo en España en las grandes empresas en el periodo 2016-2022. 08 Workshop on Pensions and Insurance, November, 13-14 2023.

Aurélien Couloumy's conference talks:

LLMs in insurance: from the main concepts to the deployment of solutions for industrial risks - 100% Data Science Seminar - French Institute of Actuaries - Paris (2023)
Fraud detection using mixt machine learning techniques - 100% Data Science Seminar - French Institute of Actuaries - Paris (2023)
Neural generative techniques for synthetic data creation and domain validity using uncertainty measures – Insurance Data Science Conference – London (2023)

Kué Gilles Gaba's talks:

Invited speaker at the inaugurale conference of the actuarial research chair at ENSEA Abidjan, March 2023
Invited lecture at webinar of Institut des Actuaires, May 2023.

Events organized by the program

- 08 Workshop on Pensions and Insurance, November, 13-14 2023. Barcelona.
- European Seminar on Private Pensions, 5-7 june 2023.
- Matinée de l'IDR ADRC, Paris, 2023

OTHER HIGHLIGHTS

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

Alexandre Boumezoued: Louis Bachelier Professional Fellow (2023)

Best Risk Management Paper Award at International Congress of Actuaries (Sydney, 2023) for the paper
Andrès, H., Boumezoued, A., & Jourdain, B. (2024). Signature-based validation of real-world economic scenarios. ASTIN Bulletin: The Journal of the IAA, 54(2), 410-440.

Visiting researchers: Hansjoerg Albrecher (UNIL), Naushad Mamode Khan (UOM), Claude Lefèvre (ULB), José Garrido (Concordia), Julien Trufin (ULB), Mogens Steffensen (Copenhagen), Gihane Mansour (USJ), ...