Migration of a cash flow projection model into R

Life Insurance

Level of Intervention

- Development
- Consulting
- Expertise
- Project management

Tools & programming

- R
- GitLab
- Roxygen
- Rmarkdown
- Rshiny

Context & issues

A reinsurer expressed the need to migrate its cash flow projection model, initially implemented in RAFM, to an R package. This migration aimed to improve the model's performance and ensure compliance with regulatory requirements.

Detail of the intervention & realisations

- Analysis of the current process, identification of improvement opportunities, and collection of operational feedback.
- Designing the model architecture in R to incorporate a model-point parallelization constraint essential for regulatory compliance.
- Code Optimization:
  - Removing unnecessary calculations by distinguishing between deterministic and stochastic calculations.
  - Profiling the code with the microbenchmark package to optimize performance on a single core.
  - Using vectorized functions and compiled C/C++ code to improve efficiency.
  - Parallelizing calculations with the future package in R.
- Version Control, Collaboration & Governance:
  - Using GitLab to structure developments and manage versions.
  - Recording run metadata to ensure auditability.
  - Implementing unit tests automatically executed upon push to GitLab to detect regressions.
- Documentation and User Interface:
  - Writing functions documentation with the Roxygen package and compiling dedicated mathematical model documentation with Rmarkdown.
  - Building an interface with Rshiny to list available and validated versions of the package (model) and do a run.

Deliverables

- An R package containing the projection engine and intuitive user interface for version management and run execution.
- Complete, versioned documentation of the model and functions.

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