GUROBI OPTIMIZATION

Identify the Right Portfolio for Each Customer, While Addressing Compliance

With Gurobi, swissQuant achieved 1% higher returns compared to another commercial solver.

swissQuant

swissQuant Group develops and delivers intelligent technology products and provides complementary or stand-alone services and consultancy surrounding these Quant-based technologies. Our focus on the core and long-term needs of our clients, makes us the partner of choice for local and international financial and industrial clients, including a number of global Fortune 500 companies.

Industry: Financial Services
Location: Europe
Use Cases: Portfolio Management
Website: www.swissquant.com/en

Results

- 1% higher return for customers
- Found optimal solutions for 90% of test problems

When it comes to meeting the needs of private banking customers, recommending the right portolfio of investments for each customer is of critical importance. Not only must the customer's objectives, risk profile and available assets be taken into account, but the bank itself must adhere to both bank and regulatory policies when creating the possible portfolios to choose from. Making this more complex is that the recommendations must be generated within a reasonable amount of time and the customer must feel like they are an involved and important part of the process.

The Decision

Given the above requirements and the in-person interaction, an acceptable amount of time for the customer to wait for the solution is not half a day or half an hour, but only a few seconds. Not only is the custom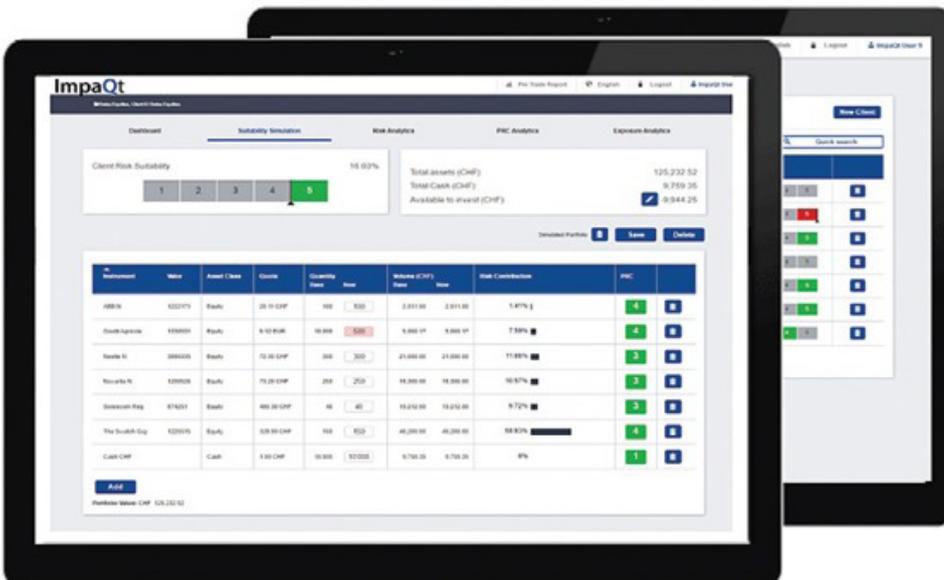er's time valuable, but the proposed portfolio must also be robust enough that it does not significantly change even if the customer inputs are slightly modified. Powerful and efficient algorithms must be used when calculating the optimal portfolios to ensure timely results that both the customer and bank can have confidence in. This difficult task was carried out at swissQuant with Gurobi.

Why Gurobi?

"A key deciding factor for us was definitely the solver performance," states Matthias Wyss, Head of ImpaQt Consulting at swissQuant. "When the project first began, another commercial solver was used at first, but it quickly reached its limits. We finally decided on Gurobi, which scored points for its speed, scalability and robustness. Gurobi's quality sets it apart," explains Matthias Wyss.

The Process

Gurobi is embedded in a complex application, where the first step is to create a customer profile. In this profile,

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opportunities and risks are presented interactively, and stress tests are run in order to understand the bank risks. From there, additional restrictions from the customer are added in, as well as general rules and conditions from the bank.

At this point, Gurobi solves the consequent mathematical optimization model, in which the portfolio will be optimized to maximize the rate of return subject to risk limits. Once the model is solved, health checks and pre-trade checks are ran to see how the decision might differ based on various factors. Finally, the optimized portfolio showing several investment strategies is presented to the customer, along with their risks and prospective benefits.

Gurobi in Use

There are many ways to structure a portfolio. You can formulate this solution space as a mathematical optimization problem and optimize it with respect to target function. Portfolio optimization is characterised by a quadratic objective function with 1,000 to 10,000 variables and almost as many additional linear conditions. Also, some of the variables must only be represented as integer values, which results in a mixed-integer quadratic problem (MIQP). Gurobi solves the MIQPs in a few seconds, which is essential in a situation where the bank representative interacts with a customer face-to-face, and they both expect to see quality, reliable solutions right away.

Compared to a Competitor

The swissQuant Group has carried out various tests and arrived at the following results: Gurobi finds a solution for 98% of the feasible problems within 20 seconds. The competitor could only achieve solution times of less than 20 seconds for 38% of the models. A feasible problem in this case is a portfolio optimization for which there is at least one solution and which fulfils all restrictions.

In 7% of feasible problems, Gurobi was able to find a solution that would bring the customer a 1% higher return on their portfolio compared to the competitor solution. In total, Gurobi found the optimum solution for 90% of the test problems, whereas the competitor could only do this for 55% of problems.

The Switch

"It was not a difficult decision to switch over to Gurobi after seeing these impressive numbers. The Gurobi interfaces set themselves apart in that they are simple and intuitive to use, and the application works well with large models. The Gurobi technical support team is available to help answer all of our questions, which is an extra time-saving benefit, in addition to the solver's performance and the quick implementation process," explains Matthias Wyss.

swissQuant Group

The swissQuant Group was established in 2005. It was originally founded as a spin-off of ETH Zürich. It tasks close to 100 employees with Risk Modelling & Analytics, Trading & Risk Management and Hedging & Procurement.

Its customers include clearing houses and both Swiss and international banks.

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