

# BNP Paribas – Quantitative Research

## Internship offers

This team is dedicated to questions related to financing and resources which have become a significant driver of P&L for a wide range of products.

The mandate of the team includes:

- The computation of resources induced costs on all assets of Global Market and the allocation of implied costs at trade level
- The optimization of security financing transactions and collateral (OTC, listed products, repos and Prime Brokerage activities)
- The valuation of the financing components of products (including the valuation of repo transaction in mark-to-market)

The team is involved in major initiatives, notably the creation of a cross-asset platform for resource computation, the creation of a real-time inventory management system and the review of the operating model for collateral management.

### Internship 1: Transaction costs in Collateral Optimization

As collateral constitutes a major source and usage of funding resources, the stronger regulatory highlighted the need to optimize the related costs and to value accurately substitution option.

The purpose of the internship is to improve the algorithm used by PAL collateral engine. This collateral engine computes an optimal allocation of collateral. Each collateral shell has a set of eligibility rules and concentration limits. Given an inventory of securities, the purpose of the algorithm is to provide the best allocation of securities that satisfies these constraints. This is a high-dimension optimization problem (dimension = 50 000 securities X 200 shells).

The purpose of the internship is to take into account transaction costs in the optimization platform. The challenge comes from the nature of these costs that turns the equations to a non-linear problem. The application will be developed in C#. This project is a unique opportunity to work on an active area of R&D and to contribute on key topics closely followed by Trading. The successful candidate will get familiar with financial aspects of collateral and work on a large scale Quant library. He will be in touch with experts of various areas and will be stimulated by the challenging environment and the short plan-to-delivery cycle. If results are positive, the intern would get the satisfaction to see his work used in production.

Prior knowledge of an object-oriented language and a strong mathematical background are prerequisite for the application.

## **Internship 2: Segregation Engine**

The Segregation Engine is a solution required by Prime Brokerage to indicate the securities which can be rehypothecated, the final objective being to maximize the platform's P&L.

A functional optimization process following waterfall logic is already in production, the purpose of the internship being to help develop a global optimization solution. Linear and integer programming solvers will be used for the optimization. One of the difficulties we need to deal with is the great amount of data to be treated.

The main tasks are:

- Study the performance of different solvers. There are already several LP/IP solvers in place. Other solvers will also be branched and the study will be made on both linear and integer problems.
- Integrate non-linear factors into the optimization, such as flat operational costs. Introducing integer variables into a linear problem increases significantly its solving time.
- Helping with other developments and problems within the Segregation Engine project.

The application will be developed in C#. This project is a unique opportunity to work on an active area of R&D and to contribute on key topics closely followed by Trading. The successful candidate will get familiar with financial aspects of collateral and work on a large scale Quant library. He will be in touch with experts of various areas and will be stimulated by the challenging environment and the short plan-to-delivery cycle. If results are positive, the intern would get the satisfaction to see his work used in production.

Prior knowledge of an object-oriented language, a strong mathematical background and a rigorous working method are prerequisite for the application.