BANQUE DE FRANCE

OPTIMIZING AUTOMATED SETTLEMENT OF FINANCIAL TRANSACTIONS

Aims:

To design and implement a mathematical automated settlement optimization module for a maximum number of overnight transactions through the Target2Securities platform (T2S)

Solution:

- a bespoke model
- implementation of several algorithms, including integer linear programming, Lagrangian relaxation and heuristics

Results:

Almost 90% of overnight transactions settled automatically within 45 minutes

"The dual development and optimization skills of the EURODECISION experts and their ease in grasping our needs enabled us to work together on devising the preferred resolution methods. They joined the Banque de France team and got involved in all the delivery-versus-payment settlement engine development stages. Their professionalism measured up to the level of commitment to excellence that the bank seeks for its projects." *Dan GUGENHEIM, T2/T2S Management Department, BANQUE DE FRANCE*

Banque de France, which is tasked with implementing monetary policy in France, also works with the European Central Bank (ECB) on rolling out European projects. One of these projects is the Target2Securities (T2S) platform whose purpose is to unify delivery-versus-payment settlement, i.e. the exchange of securities[1] on the European market, by simplifying and fluidifying transactions between financial players.

Banque de France was responsible for designing the TS2 payment engine – which is the main component of the platform – for this project carried out in conjunction with the central banks of Germany, Spain and Italy. Its role is to determine whether or not a transaction will be settled and is assigned to an optimization engine for overnight transactions and a real-time module for day-time transactions.

T2S transaction settlement poses a number of difficulties. Over and above adhering to the constraints stemming from exchanging securities and the platform's features such as auto-collateralization[2] or partial settlement, a very high volume of interdependent transactions – running into hundreds of thousands – must be settled in a very short time. The sums involved can differ by a euro cent to a billion euros.

The Banque de France Target 2 and Target2Securities Management Department which is responsible for specifying and testing these settlement engines in TS2, decided to implement a powerful mathematical optimization module for the overnight engine to automate settlement of the maximum number of transactions. It sought expert guidance and enlisted support from EURODECISION, the business analytics specialist.

When the project kicked off in 2012, the team had no real data or transaction mapping because of the specific nature of T2S. Developments in platform usage were also unchartered waters. There was no state of the art on a mathematical subject of this type. The EURODECISION algorithm experts had to put forward proposals to determine the most suitable resolution method. Accordingly, the overnight delivery-versus-payment issue was modeled by a mixed variables mathematics program, then several conventional optimization methods were prototyped and tested. Direct resolution by a solver was ruled out because of the operating constraints (time, volume and numerical precision). The EURODECISION experts turned to integer linear programming to resolve the root of the problem, and various algorithmic techniques to prepare for and simplify the front-end problem and correct the back-end solution. Repairs are required to factor in all the constraints and make the solution workable.

The T2S platform was launched in June 2015, and the various European financial markets joined in waves through to September 2017. Nowadays the platform performs 400–500 000 transactions every day and the mathematical optimization module is used several times a night. The night settlement engine's performance level of almost 90% of transactions automatically settled within 45 minutes, meets Banque de France's expectations.

Since T2S was launched, EURODECISION has continued analyzing and following-up the developed module. Banque de France still calls on mathematical optimization experts to devise developments that could enhance the solution further and monitor changes in the financial players' behavior since they entered the T2S system.

[1] *securities: shares and bonds*

[2] *auto-collateralization: automatic pledging of securities to provide liquidity*