

# Challenge July 2024

## Smart Investment

A solution with OPL CPLEX by Alex Fleischer  
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2 comments:

- 1) With these values, a human can find the optimal solution quickly. LMM is the best stock so let's have as much as we can in LMM, 5000. 1000 for the 2 worst stocks XYZ and TTT and the 3000 remaining in the second best share, ABC.
- 2) 40+ banks rely on IBM CPLEX to optimize portfolios as I wrote in



**Business challenge**  
To make transfers related to the buying and selling of securities under T2S (TARGET2-Securities), Banque de France needed a mathematical optimization solution capable of handling settlements quickly, to support more than a million transactions processed every night.

**Transformation**  
Prior to the implementation of T2S, the large number of counterparties involved in securities exchanges drove up settlement costs and liquidity requirements. With a unique secondary market platform, built on IBM® ILOG® CPLEX® Optimization Studio, Banque de France reduces costs while maintaining transaction security.



Dan Gugenheim  
Operations Research  
Team Leader  
Banque de France

**Business benefits:**  
**250,000**  
securities transactions  
carried out every night  
**1.5-2 hours**  
to process transactions  
**3-10x**  
lower cost for processing  
end-to-end transactions

**Banque de France  
Optimizes settlement  
and delivery of securities  
in Europe**

Banque de France is one of the four national central banks in the Eurozone responsible for the development and operational management of the TARGET2-Securities (T2S) platform. T2S was launched by the European Central Bank to optimize and harmonize securities settlement and delivery in the Eurozone and beyond. In this system, the Banque de France is responsible for optimizing the settlement of securities and cash. The sheer number and monetary value of transactions, the complexity of the aftermarket and the need

*"We leverage CPLEX's high performance optimization technology on z/OS. This solution satisfies the requirements of the T2S system and offers the mathematical guarantee that we absolutely need when dealing with very large settlement volumes."*

Dan Gugenheim  
Operations Research Team Leader  
Banque de France

## AI, optimization and Finance : Doing more with less - banks and insurances



Alex Fleischer  
Data and AI Technical Sales



Anyway, let me share how to solve this puzzle with OPL  
CPLEX available in IBM watsonx AI

```
tuple stock
{
    key string name;
    float currentPrice;
    float futurePrice;
}

{stock} stocks=
{
    <"ABC",25,35>,
    <"XYZ",50,60>,
    <"TTT",100,125>,
    <"LMN",25,40>;
}

// how many stocks ?
dvar int+ investments[stocks];

dvar float+ gain;

maximize gain;

subject to
{
    //A client of an investment firm has $10000 available for investment.
    sum(s in stocks) investments[s]*s.currentPrice<=10000;

    // no more than $5000 is invested in any one stock
    // but at least $1000 be invested in each stock.
    forall(s in stocks) 1000<=investments[s]*s.currentPrice<=5000;

    gain==sum(s in stocks) investments[s]*(s.futurePrice-s.currentPrice);
}

execute display_solution
{
    writeln("gain = ",gain);
    writeln("with");
    for(var s in stocks)
        writeln(investments[s]," * ",
            s.name, " which is USD ",investments[s]*s.currentPrice);
}
```

Which gives

```
gain = 4650
with
120 * ABC which is USD 3000
20 * XYZ which is USD 1000
10 * TTT which is USD 1000
200 * LMN which is USD 5000
```