Application of quantum computing in securities transactions settlement framework

A securities transaction is an exchange of securities versus payment in currency between two financial actors. The transaction is settled, if, inter alia, there are sufficient amounts of resources on the corresponding cash and securities accounts. Each night more than four hundred thousand transactions over a billion euro are settled in batches. Banque de France is in charge of Mathematical Optimization Module (MOM), which is a component of a large European transactions settlement platform named T2S.

Given a batch and the limited time, MOM looks for a subset of transactions to settle whose size is as large as possible respecting all business constraints and taking advantage of some financial features reducing the number of failed transactions. It is composed of preparatory, construction and improvement solution phases. Since the batch size is too large, no algorithm can find neither optimal nor approximate solution for the entire batch on a conventional computer. Thus, MOM's preparatory phase splits a batch of transactions into the subsets to address smaller problems. The current splitting procedure has long runtime and its quality affects the final number of settled transactions. In this work, we present an approach that would improve the splitting results and the MOM's outcome. It is based on a Quadratic Unconstrained Binary Optimization solved by a Quantum Approximate Optimization Algorithm and implemented on the available quantum devices via Qiskit platform.