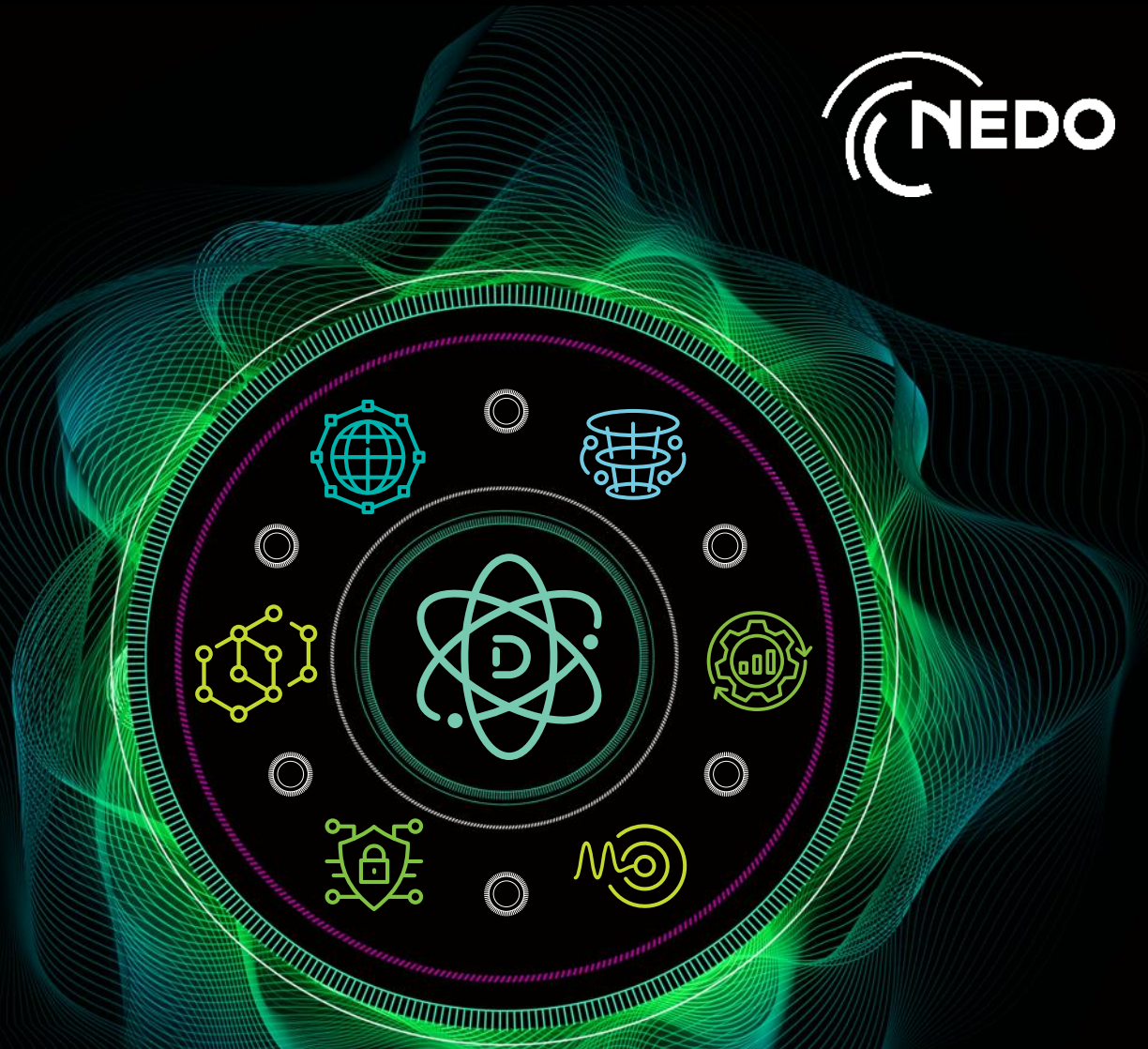
Quantum Computing Use Cases

High-Frequency Trading (HFT)



Combinatorial Optimization Problem

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New Energy and Industrial Technology Development Organization (NEDO)

【Hypothesis Formulation】High-Frequency Trading (HFT)



Use Case Overview	Mean-Reverting Portfolio Construction via QUBO Formulation and Annealing Optimization
Issues to be addressed and their effects	Millisecond-to-Second Real-Time Portfolio Computation
Contributions of quantum technology	• Recommend optimal portfolios from a large universe of assets through large-scale optimization • Generate diverse solution patterns by leveraging quantum randomness

Expected realization period	(Year)2030
Industry classification	Financial
Related QRAMI layers	Business layer
Related quantum technologies	Quantum-Inspired

Novelty	Some new elements
Difficulty of achievement	Difficult
Social contribution level	Contributions to society as a whole
Market size	Over 10T¥

Detail

High-Frequency Trading (HFT)

Key Challenges

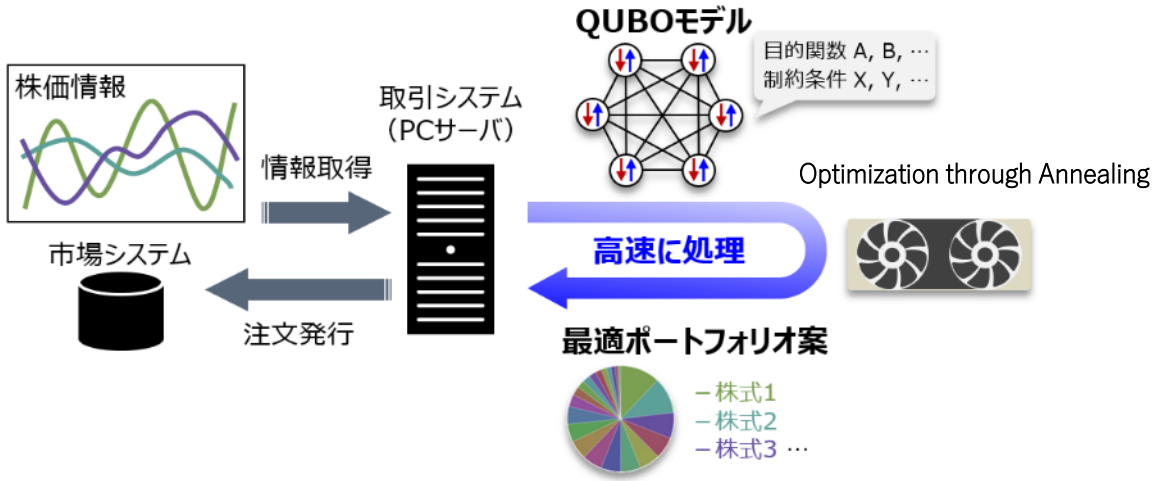
Real-Time Financial Portfolio Computation (Sub-Millisecond to Second Timescales)

Overview of the Use Case

- Formulate the construction of a mean-reverting financial asset portfolio as a QUBO-based combinatorial optimization problem and solve it using annealing.
- Detect mispricing by solving combinatorial optimization problems with annealing, enabling statistical arbitrage trading and optimal portfolio construction.

Implementation Image

Target Realization Date: 2030



Expected Benefits

- Enhanced Financial
- Market EfficiencyImproved
- Financial Market LiquidityRevitalization of Financial Markets

Action Plan

QRAMI	Action
Business	Reduced Deployment and Optimization Effort through SaaS
Function	Financial Strategy UpdatesSelect Preferred Strategies from Multiple Options
Information	Accumulation and Updating of Stock Price Data
Integration	Integration with Market Trading Systems
Asset	Expansion of Quantum Computing (Matching) and Quantum-Inspired Computing

More use cases are available on our website. We invite you to explore them.
https://www.quantum-computing-use-cases.nedo.go.jp/english/

More Use Cases

New Energy and Industrial Technology Development Organization (NEDO)
AI and Robotics Department (e-mail: quantum_ai@ml.nedo.go.jp)

This collection of use cases was obtained as a result of the work commissioned by the New Energy and Industrial Technology Development Organization (NEDO) "Cyber-Physical Development Business of Quantum/Classical Hybrid Technology/Study of Use Case of Quantum Technology" and the “Post-5G Information and Communications System Infrastructure Reinforcement R & D Project (Quantum Industrialization)/Comprehensive Study for Promoting the Industrialization of Quantum Computers ”.