Quantum Computing in the Financial Industry: Demonstrating Industrial Impact on Real NISQ Hardware

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Quantum computing is often discussed in the context of long-term disruption of the financial industry. In this talk, we demonstrate how variational quantum algorithms, and in particular the Variational Quantum Eigensolver (VQE), can already be applied to portfolio optimization problems that are directly relevant for industrial financial workflows. We show that these methods can be deployed on real, current NISQ devices to solve optimization problems whose natural formulations require more than 100 qubits, moving beyond purely illustrative examples.

Our work focuses on VQE techniques applied dynamic portfolio optimization. We analyze the full computational pipeline, including problem encoding, ansatz design, classical optimization strategies, and hardware-aware execution. We pay particular attention to the practical constraints imposed by noise, limited circuit depth, and device connectivity, and to the strategies required to obtain stable, high-quality solutions under these conditions.

Our results demonstrate that VQE-based approaches can achieve performance on par with established classical optimization methods for industrial relevant problem instances, while operating on real NISQ quantum hardware [1, 2]. Although the case studies are drawn from finance, the underlying methodology targets a broader class of combinatorial and continuous optimization problems, indicating a clear path toward generalization beyond portfolio optimization. Taken together, these results provide concrete evidence of emerging industrial impact of quantum optimization on NISQ hardware.

References

[1] I. De León, *et. al.*, arXiv:2512.22001 (2025).
[2] Á. Nodar, *et. al.*, arXiv:2412.19150 (2024).