

## Daniel Egger “Quantum computing and its applications to financial services”

### List of papers

#### Overview

- **Quantum Computing for Finance: State of the Art and Future Prospects** <https://arxiv.org/abs/2006.14510> A review paper discussing how financial machine learning, optimization and simulation can benefit from quantum computing.

#### Optimization

- **Warm-Starting Quantum Optimization** <https://arxiv.org/abs/2009.10095> Shows how the quantum approximate optimization algorithm for combinatorial optimization can be improved by warm-starting it with solutions of a relaxed problem obtained on a classical machine.
- **Quantum Algorithms for Mixed Binary Optimization applied to Transaction Settlement** <https://arxiv.org/abs/1910.05788> Shows how to tackle optimization problems with continuous and binary variables on a quantum computer and applies the ideas to the context of transaction settlement.
- **Improving Variational Quantum Optimization using CVaR** <https://arxiv.org/abs/1907.04769> Illustrates how to improve optimization and illustrates the ideas in the context of portfolio optimization.

#### Simulation

- **Quantum Risk Analysis** <https://arxiv.org/abs/1806.06893> Shows how to replace classical Monte Carlo with Quantum Amplitude Estimation to gain a quadratic speed-up. Applications that run Quantum Amplitude Estimation will require fault-tolerant quantum computers.
- **Option Pricing using Quantum Computers** <https://arxiv.org/abs/1905.02666> Applies the ideas from “Quantum Risk Analysis” to option pricing.
- **Credit Risk Analysis using Quantum Computers** <https://arxiv.org/abs/1907.03044> Shows how to use Quantum Amplitude Estimation to evaluate the VaR and Economic Capital requirement of a portfolio of loans.
- **A Threshold for Quantum Advantage in Derivative Pricing** <https://arxiv.org/abs/2012.03819> Explores what size of quantum computer is needed to gain a practical advantage when pricing derivatives.

#### IBM’s roadmap

- Can be found here: <https://research.ibm.com/blog/ibm-quantum-roadmap-2025>