

Computational Finance and Quantum Computing

Quantum computation and information are among the most innovative developments in science and technology over the last 15 years. Quantum computer hardware is now reaching the stage where potential *applications* of serious interest may become feasible in the next few years. Such fields ranging from cryptography, protein folding, video compression, and general optimization methods may see exponential computational speed-ups through quantum computers that vastly outstrip the capabilities of current non-quantum computers.

Computational finance problems may also offer important opportunities for the application of quantum computing techniques, especially in the realms of risk management such as Basel III, OTC derivative exposures, and counterparty credit risk. The financial markets have developed to a large degree of complexity, with extraordinarily high volumes of data – hundreds or thousands of times higher than just a decade or two ago – which suggest that quantum computational speed improvements may offer real promise.

This project entails finding which computational finance problems are best suited for different types of quantum computer designs such as quantum circuit models, adiabatic computing, or topological quantum computing. An undergraduate degree in Physics or Math is required for this project.