

Quantum Computing

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Senior industry executives gathered to discuss the promise of quantum computing and how financial institutions should approach it. Firms cannot afford to ignore the potential of quantum to perform complex simulations in areas such as risk assessment, asset valuation, and portfolio adjustment much faster and better than conventional computers. While practical applications are still a few years away, companies can gain exposure and knowledge at a relatively low cost today as the field is still in its formative stage. This note provides a brief summary of the key themes from the discussion, respecting that the conversation was conducted under the Chatham House rule and comments are unattributed.

Quantum computing is real, and firms should seek to gain exposure. An industry that depends heavily on technology cannot afford to ignore quantum computers. By using the movement of sub-atomic particles to store information in multiple states rather than just strings of ones and zeros like conventional computers, quantum machines have the potential to simulate much more complex scenarios, potentially helping design everything from new pharmaceutical molecules to better risk-management and trade optimization strategies. Scientists and developers need to demonstrate they can scale the technology and make machines capable of correcting the errors they are prone to, but the pace of progress and amount of investment pouring into the field suggests quantum computers may start producing significant breakthroughs in as little as two years.

What makes it so powerful. Unlike conventional computers, quantum bits, or qubits, can exist as zero or one or a combination of both. That enables quantum machines to do many things in parallel rather than process computations sequentially, like conventional computers. The result is a dramatic increase in speed that, if harnessed correctly, could allow quantum computers to address problems of vast complexity better than any of today's supercomputers.

What makes it so complicated. The fundamental differences of quantum require a whole new supporting infrastructure, including software to run on the machines and methods for optimizing data for that software. At the same time, conventional computers continue to get faster and more powerful every year, enabling banks to perform much more robust capital stress testing than five years ago. These factors may incline many financial firms to focus on developing quantum as a tool for cracking currently unsolvable problems rather than trying to speed up existing operations.

How to get involved. There are enough uncertainties surrounding quantum to deter many from investing heavily, but the promise of quantum, and the potential ramifications of not being involved, means that most enterprises – especially in finance – should be working promptly to gain knowledge and inform strategy on quantum. Firms can join existing consortiums to get exposure to quantum research and intellectual property. There are also a number of startups looking for partners to help them scale up or provide data to sharpen their analytical capabilities. Placing small bets now can put firms in a good position to ride the quantum curve from experimental to groundbreaking.

Other issues to bear in mind. Quantum computing's potential power gives it geopolitical significance. China's latest five-year plan identifies quantum as one of the seven frontier technologies the country is prioritizing, while the US Commerce Department recently imposed export controls on eight Chinese quantum computing companies. With this competition likely to intensify, companies need to consider the risk of increased regulation and technology controls in deciding their strategy. Quantum computers also could render today's data encryption tools obsolete by enabling code-breakers to quickly factor the long strings of digits used to keep digital messages and financial information secure today. The United States National Institute of Standards and Technology is working with industry to develop new algorithms that can resist attacks using quantum computers. That's yet one more reason why firms should be getting involved now.