The New York Academy of Sciences

PCRI

Quantum Computing in Business and Private Equity

A virtual roundtable presented by The New York Academy of Sciences and the Private Capital Research Institute; sponsored by Ropes & Gray and HMC Capital.

Panelists

Matthew Kinsella
CEO
Infleqtion

Reed Sturtevant
General Partner
The Engine Ventures

Bill McMahon, PhD
Co-Founder and Managing Partner
Minnow Venture Partners

Shahin Farshchi, PhD
Partner
Lux Capital

Moderator

Josh Lerner, PhD
The Jacob H. Schiff Professor
Harvard Business School
Director, Private Capital Research Institute

Executive Summary

By exploiting the special physics of phenomena that occur at the scale of individual atoms, quantum computing promises to solve computational problems at speeds far beyond anything possible with current microprocessors. It would transform the digital economy, if researchers could get it to work.

Many physicists remain sceptical that practical quantum computing is even possible. Much of the current effort focuses on trying to scale up the number of qubits, the fundamental units of a quantum processor, that a computer can harness simultaneously. A system with 100 logical qubits may be able to perform useful calculations; current cutting-edge systems have only one-tenth that number.

While a firm's specific technological approach is important, panelists all agreed that the people driving quantum computing companies are the true engines of progress. In particular, successful teams will need a rare combination of talents in physics, investor relations, people management, and tenacity. The field has yet to establish clear benchmarks to measure progress, but doing so would help investors calculate risks. If quantum computing succeeds, it will likely set off a technological arms race between nations using it for decryption and defence. From a business perspective, quantum processors will probably be complementary to conventional computing, rather than replacing it.

Key Highlights

- Current quantum computers remain primarily research platforms, but with recent progress, such as advances in logical qubits, many physicists increasingly view their practical usefulness as a matter of "when," not "if."
- Quantum computing remains in an early stage, yet the United States, China, and other nations are investing heavily—not only out of concern that a fully mature quantum computer could break today's encryption, but also because they increasingly expect the technology to succeed and want to lead its development. The U.S. designation of quantum as one of its top technology priorities reflects both a desire to mitigate potential risks and a conviction that quantum capabilities will become strategically and economically significant.
- Quantum computing companies are long-term, high-risk investments.
- Clear milestones for the technology could help investors quantify risks, but such milestones have yet to be developed.
- Investors should focus more on the talents of companies' founders than on the specific technological approaches they're pursuing.
- If successful, quantum computers could revolutionize many aspects of the digital economy, without fully replacing conventional computing systems.

Panel Summary

On November 17, 2025, The New York Academy of Sciences and the Private Capital Research Institute convened the second of a series of panel discussions on Private Capital and Discovery: Strategic Investing in Scientific Innovation. This time, the focus was on quantum computing. The meeting sought to cut through the hype around this technology and define possible strategies for investors and corporate leaders eager to explore its potential.

The lure of the technology is that if it can be made to work, a quantum computer could solve computing problems orders of magnitude faster than any current microprocessor. Such a system could revolutionize numerous fields, including cybersecurity, computational biology, finance, and artificial intelligence.

Quantum computing relies on quantum mechanics, the collection of physical phenomena that occur at the minuscule scale of individual atoms. A crucial question is whether it's physically possible to entangle the states of enough quantum computing units, or qubits, to perform useful calculations. Systems built to date have all been demonstration projects, with at least an order of magnitude fewer qubits than any practical device would require. All quantum computing projects are struggling with the same challenge of entangling more qubits, but they are pursuing different architectures and approaches to accomplish it. It remains unclear which, if any, of the current designs will succeed.

While numerous companies are trying to build practical quantum computers, others are concentrating on more predictable markets peripheral to the field. For example, they may focus on manufacturing components that quantum computing companies need or on writing software to help make companies "quantum ready" if the new technology proves feasible. These supporting companies are more likely to turn profits in the short term, though they may become less relevant as the field develops.

Because useful quantum computers are likely several years away, it is impossible to predict what their ultimate markets will look like. The long timeframe also means that startup companies must be prepared to outlast their competition. Panelists argued that investors should pay special attention to a company's leadership team. Regardless of how promising their technology seems, those without the unique combination of skills to survive a prolonged development process will probably fail.

The closest analogy to the investment landscape of quantum computing is biotechnology, where companies often pursue long-term, high-risk projects. That industry, however, has the benefit of clear milestones as a product moves from preclinical through multiple phases of clinical trials, which allows investors to calculate risks at each stage. While panelists agreed that a similar set of milestones for progress in quantum computing would help the field attract more investors, no one has yet determined what those milestones should be.

In the meantime, public-private partnerships are helping quantum computing advance, with governments around the world investing heavily in the technology because of its potential national security importance. If quantum computing does become practical, it could lead to "Q-day," when a quantum computer becomes capable of breaking all current digital encryption algorithms. China and the US are the leading contenders in this race, and quantum computing companies in both countries face stringent export controls on their technologies, even at the research stage.

Investors looking for signs of the field's maturation should pay close attention to cryptography, artificial intelligence (AI), and where the biggest companies are investing. If any quantum computing system has a clear path to breaking current encryption systems, it could herald a major breakthrough.

In artificial intelligence, indications that current AI models are exhausting available training data could point to another potential application for quantum computers, which may be able to generate vast amounts of synthetic training data to resolve that bottleneck. Finally, when big technology companies start boosting their investments in quantum computing, it could signal a major shift in the field.

If quantum computing succeeds, panelists agreed that it will most likely operate as a complement to conventional computer components instead of replacing them. Just as a graphics processing unit (GPU) now works alongside the central processing unit (CPU) in a computer, a quantum processing unit, or QPU, might join them.

About The New York Academy of Sciences and the Private Capital Research Institute

The New York Academy of Sciences stands as a pivotal platform for advancing scientific knowledge and fostering innovation. Established in 1817, the Academy has long been at the forefront of bridging scientific research with practical application.

Based at Harvard Business School, the Private Capital Research Institute's mission is to encourage research about private capital's potential to be a constructive force to power economic development, innovation, and business transformation.

While the Academy excels in fostering scientific discovery and interdisciplinary collaboration, PCRI focuses on enhancing the understanding and impact of private capital investments. This collaboration allows for a unique intersection where cutting-edge scientific research meets strategic investment insights.

Both non-profit organizations seek to present substantive, fact-based research in a form that maximizes broad accessibility of these ideas and their applicability to the concerns of investors, business leaders, and policymakers, investors, as well as influential intermediaries.