From qubit to profit: cracking the code of quantum investing

- **Quantum computing uses qubits and the principles of quantum mechanics to perform complex computations far beyond the reach of classical computers.**
- **The field is still emerging, with significant investments and progress, and provides long-term investors with compelling early-stage opportunities.**
- **Investment opportunities range from high-risk pure-play quantum stocks to established tech companies and diversified exposure through funds.**
- **Key risks facing the sector include technological challenges, competition from classical computing, resource limitations, and cybersecurity concerns.**

Kishore Muktinutalapati
Head - Investment Strategy
Tel: +971 (0)2 812 6457
kishore.muktinutalapati@adcb.com

Prerana Seth, CFA
Fixed Income Strategist
Tel: +971 (0)2 812 6449
prerana.seth@adcb.com

Mohammed Al Hemeiri
Senior Analyst
Tel: +971 (0)2 812 6450
mohammed.alhemeiri@adcb.com

Visit Investment Strategy Webpage to read our other reports

Awarded Best Private Bank UAE & Middle East | Best for HNW Clients UAE & Middle East | Best for Investment Research UAE & Middle East – Euromoney 2025

What is quantum computing?

Quantum computing is a paradigm of computing that harnesses the principles of quantum mechanics to process information in ways that classical computers cannot. Instead of binary bits, quantum computers use quantum bits (qubits), which can exist in multiple states at once through superposition, and can be interlinked via entanglement. While a classical bit is either 0 or 1, a qubit can represent 0 and 1 simultaneously until measured. Multiple qubits can also be entangled, meaning their states become correlated no matter what the distance between them. These properties give quantum computers access to computational strategies unavailable to classical machines (exhibit 1).

Qubits can be 0, 1, or both at once in a superposed state. This superposition means a set of qubits represents an exponentially large combination of states simultaneously. In practical terms, n qubits can encode 2^n states at once – for instance, 4 qubits can represent 16 values concurrently – giving quantum machines massive parallelism within a single computation. This enables quantum computers to perform certain calculations (like factoring large numbers or simulating molecular interactions) exponentially faster than a classical computer. By leveraging 'superposition' and 'entanglement', a quantum processor can explore many workable solutions in parallel. This capability opens potential for breakthroughs in fields such as cryptography, drug discovery, materials science, optimization, and other complex domains that strain classical computing. Quantum computing uses "the weird and wonderful properties" of quantum physics to solve problems beyond the reach of today's most powerful supercomputers. Scientists anticipate that quantum computers will complement rather than replace classical systems, tackling certain problems that are impossible for conventional computers.

Exhibit 1: How is Quantum computing different from Classical computing

Feature	Quantum Computing	Classical Computing
Calculation basis	Qubits (can represent 0 and 1 simultaneously)	Transistors (represent either 0 or 1)
Power scaling	Power increases exponentially with each added qubit	Power scales linearly with each added transistor
Error rates & stability	High error rates; requires ultra-cold operating conditions	Low error rates; operates reliably at room temperature
Ideal use cases	Optimization problems, complex simulations, and data analysis	Everyday processing tasks, general-purpose computing

Source: ADCB Asset Management

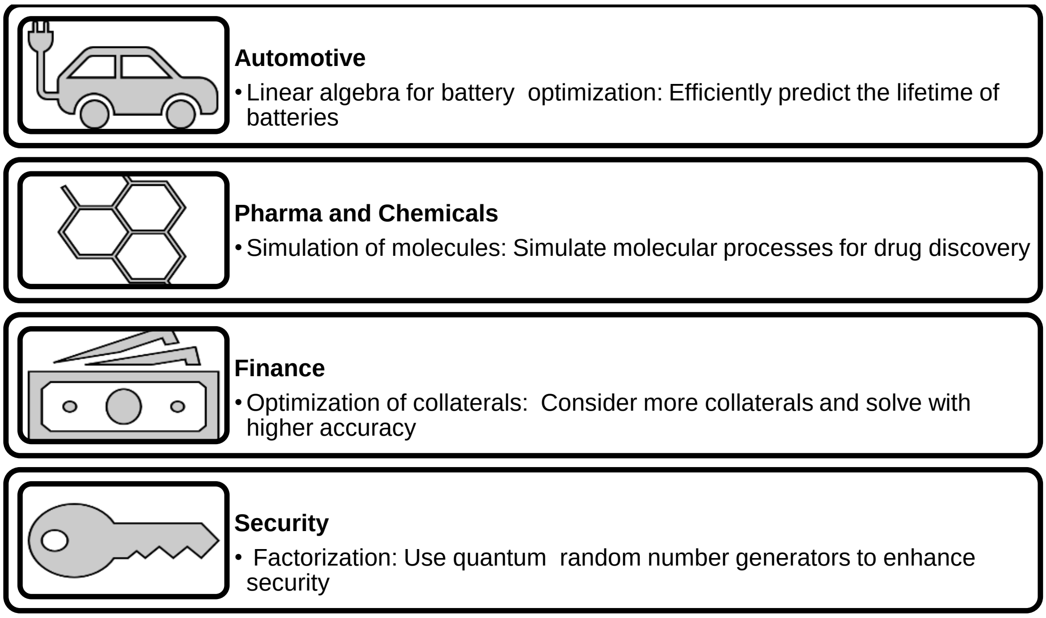
Long-term outlook for the quantum computing sector

Though quantum computing is still in its initial stages, progress is accelerating, and expectations are high for the coming decades. As of mid-2025, quantum computers remain mostly experimental and have no broad tangible advantage over classical computing in real-world applications yet. Current devices, typically with tens to a few hundred qubits, belong to the "Noisy Intermediate-Scale Quantum" (NISQ) era – they can perform certain quantum operations but are limited by errors and cannot outcompute classical machines on practical problems consistently. Experts agree that achieving quantum advantage (solving a valuable problem faster or better than a classical supercomputer) will require hardware with thousands of high-quality, error-corrected qubits, which may still be a couple of years away. Indeed, building a fault-tolerant quantum computer capable of running billions of operations without errors is at least a few years away by some estimates.

Despite these challenges, the long-term forecast for quantum computing remains extremely optimistic. Qubit counts have been doubling every year or two, and researchers continue to hit milestones in scaling and error reduction (for example, Google's 2024 "Willow" chip demonstrated exponential error suppression via quantum error correction breakthroughs). Governments and industry are pouring resources into quantum R&D: global public funding for quantum tech has exceeded USD40bn cumulatively and venture capital investment in quantum start-ups topped USD1.2–1.9bn in 2024. This strong backing suggests the sector will have the runway needed to eventually surmount current technical barriers.

Market analysts project explosive growth for the quantum computing industry over the next 10–20 years as the technology matures. Analysis by The Quantum Insider forecasts that quantum computing could contribute over USD1trn in value to the global economy by 2035, with quantum hardware/software vendors capturing around USD50bn of direct revenue. Similarly, Boston Consulting Group estimates a potential USD450–850bn in economic value by 2040, supporting an annual market of USD90–170bn in quantum hardware and software sales. In terms of timeline, most experts envision the 2030s as the breakout period: the late 2020s will likely see the first instances of broad quantum advantage on specific high-value problems, and by the mid-2030s quantum computing could transition from laboratory curiosity to an indispensable enterprise tool in sectors like finance, pharmaceuticals, automotive, and logistics. In fact, within five years, quantum computers might become the go-to solution for certain specialized tasks – though others urge caution, noting truly transformative impact may still be farther away. We are believers of a fast-track adoption of quantum computing helped by rising use cases (exhibit 2) and quicker technological advancements.

Exhibit 2: Potential use cases of quantum computing



Source: ADCB Asset Management

Investing in quantum computing – a long-term perspective

For investors, the nascent quantum computing sector presents both exciting opportunities and considerable uncertainties. Quantum computing today is often likened to classical computing in the 1950s – the potential is transformative, but the technology is still maturing, and commercial payoffs are just beginning to materialize. As such, long-term investors should approach this sector with a balanced mind set: embrace the vision, but plan for volatility and a long horizon.

Pure-play companies: A handful of pure-play quantum companies are now publicly traded (IonQ, D-Wave, Rigetti, among others). These stocks have delivered eye-popping gains in anticipation of future success – for example, over the year leading into mid-2025, shares of these companies have surged 10x or more (multi-bagger returns) despite minimal current revenues (exhibit 3). However, such valuations (often 100x forward-sales or higher) reflect speculative optimism rather than fundamentals, posing a risk if technological progress or commercial adoption falls short. In fact, all three companies remain unprofitable and generate only a few million dollars in quarterly revenue while spending heavily on R&D. Investors need to be prepared for extreme volatility: these stocks can swing wildly on news of scientific breakthroughs (or setbacks), and any delay in achieving milestones could trigger sharp declines as "hype" expectations get reset. In short, pure-play quantum stocks are high-risk, high-reward bets that require patience and risk tolerance.

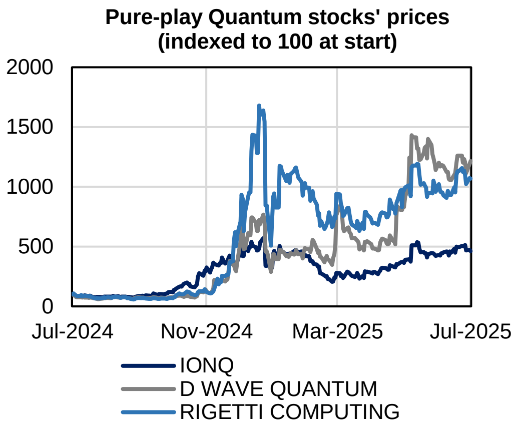
Established tech companies: A more conservative way to gain exposure is via large tech companies that are leading quantum development. Corporations like Alphabet (Google), IBM, Microsoft, Amazon, and others have integrated quantum research programs and will be at the forefront of commercialization. These giants have the advantage of deep resources and diversified businesses, so investors get quantum upside with far less downside risk. For instance, IBM and Google are making steady strides in quantum computing, but their valuations do not hinge on quantum delivering immediate revenue – their core businesses in cloud, AI, and enterprise tech generate healthy cash flows in the meantime. Investing in such companies (many of which are already in broad market indices) can be a prudent strategy to participate in the quantum revolution indirectly, without betting on any one speculative play.

Diversified funds: Another avenue is specialized technology funds or ETFs that target quantum computing and related industries. For example, one of the largest ETFs in this space holds a basket of 70+ companies involved in quantum technologies (from pure-plays to semiconductor firms and big tech), offering diversified exposure. As of 2025 this ETF had around USD800m in assets and outperformed the broader market over the prior year (exhibit 4), reflecting the surge of interest in quantum and quantum-adjacent stocks. As is the case with all funds, these vehicles can spread risk across the sector's various players and sub-fields, though investors should still be mindful that many component companies may be volatile.

Venture capital and Private equity: For those with access and higher risk appetite, investing in the private quantum start-up space is another consideration. Dozens of start-ups (hardware, software, quantum communication) have attracted venture funding, and early-stage investment has been booming – according to Stock Market Watch Q1'25 alone saw USD1.25bn invested in quantum tech start-ups, more than double the year prior. Specialized VC firms and corporate venture arms are actively funding promising quantum ventures. However, direct private investing requires domain expertise and the ability to lock up capital long-term; it may be out of scope for most individual investors.

Investment strategy: Importantly, long-term is the operative word for quantum investing. Meaningful commercial outcomes may take 5, 10, or more years to unfold. Investors should be prepared for a prolonged R&D phase with few immediately "killer apps" – unlike AI, which had a breakout moment with deep learning and chatbots, quantum computing's defining applications are still on the horizon. This makes timing the market difficult. A sensible approach for believers in quantum technology is a small allocation to this space (directly via pure-plays or indirectly via tech conglomerates or through ETFs), sized appropriately within a portfolio. We would monitor progress on scientific milestones (qubit counts, error rates, landmark demonstrations of quantum advantage) as indicators of the sector's health. As the industry matures – for instance, if a company achieves a useful, fault-tolerant quantum computer or a must-have quantum software application – one can increase exposure. Until then, treating quantum computing investments as a venture-style bet with a long runway can set proper expectations.

Exhibit 3: Pure-play Quantum computing stocks have delivered exceptional returns over the past year



Source: LSEG Workspace, and ADCB Asset Management

Exhibit 4: Even a more diversified exposure to the quantum computing sector has outperformed

Source: LSEG Workspace, and ADCB Asset Management

Risks to the quantum computing sector

Like any emerging technology, quantum computing faces significant risks and challenges that could slow its progress or diminish its eventual impact. Key risk factors include:

- Technical challenges and timeline uncertainty: The foremost risk is that building a large-scale, error-corrected quantum computer may prove even harder or take longer than anticipated.
- Competition from classical and other technologies: Quantum computing does not advance in a vacuum – classical computing and alternative approaches are also improving.
- Human capital and resource constraints: The specialized nature of quantum technology means the sector could be constrained by a shortage of trained talent and critical materials.
- Cybersecurity and cryptography impact: One often-cited “risk” of quantum computing is its future ability to break current encryption schemes – this is a societal risk caused by quantum computers, but it could also backfire on the sector itself if not managed.
- Market and financial risks: The quantum sector is currently sustained by large investments based on optimistic outlooks. If technological progress stalls or economic downturns occur, funding could dry up, imperilling start-ups and even corporate programs.

Conclusion

As quantum computing accelerates toward its transformative potential, investors and innovators stand at the threshold of a new technological revolution. The promise is extraordinary – unlocking computational capabilities that will reshape industries from finance and pharmaceuticals to logistics and national security. With staggering projected market growth and increasing global investment, quantum technology is no longer a distant ambition but a rapidly approaching reality. Yet, this journey is not without significant risks. Technological hurdles, unpredictable timelines, and the spectre of quantum’s impact on cybersecurity may temper the exuberance. The sector’s volatility, talent shortages, and intense competition from both within and beyond the field remind us that progress is neither guaranteed nor linear. For those bold enough to participate, a measured approach is critical: balancing visionary enthusiasm with sharp-eyed risk management. As it is said, today’s speculative bets could become tomorrow’s industry giants, or cautionary tales. By staying informed and nimble, investors can play a part in shaping this quantum future, seizing opportunities while bracing for setbacks. In our view, the next decade will reward those who approach quantum computing with both optimism and realism, ready to adapt as the landscape evolves. The quantum leap is coming – be prepared to embrace it, eyes wide open to both its dazzling promise and its complex challenges.

.

Disclaimer

ADCB Asset Management Limited (“AAML”), is a member of ADCB Group, licensed by Financial Services Regulatory Authority in Abu Dhabi Global Markets under financial services permission number 170036.

This publication is intended for general information purposes only. It should not be construed as an offer, recommendation or solicitation to purchase or dispose of any securities or to enter in any transaction or adopt any hedging, trading or investment strategy. Neither this publication nor anything contained herein shall form the basis of any contract or commitment whatsoever. Distribution of this publication does not oblige ADCB Group to enter into any transaction.

The content of this publication should not be considered as legal, regulatory, credit, tax or accounting advice. Anyone proposing to rely on or use the information contained in the publication should independently verify and check the accuracy, completeness, reliability and suitability of the information and should obtain independent and specific advice from appropriate professionals or experts regarding information contained in this publication. Investment products are not available to US persons.

Information and opinions contained herein is are based on various sources, including but not limited to public information, annual reports and statistical data that AAML considers accurate and reliable. However, AAML makes no representation or warranty as to the accuracy or completeness of any statement made in or in connection with this publication and accepts no responsibility whatsoever for any loss or damage caused by any act or omission taken as a result of the information contained in this publication. This publication is intended for customers who are either retail or professional investors.

Charts, graphs and related data or information provided in this publication are intended to serve for illustrative purposes only. The information contained in this publication is prepared as of a particular date and time and will not reflect subsequent changes in the market or changes in any other factors relevant to their determination. All statements as to future matters are not guaranteed to be accurate. AAML expressly disclaims any obligation to update or revise any forward looking statement to reflect new information, events or circumstances after the date of this publication or to reflect the occurrence of unanticipated events.

ADCB Group does and may at any time solicit or provide commercial banking, investment banking, credit, advisory or other services to the companies covered in its publications. As a result, recipients of this publication should be aware that any or all of foregoing services may at time give rise to a conflict of interest that could affect the objectivity of this publication. Opinions expressed herein may differ from opinions expressed by other businesses or affiliates of ADCB Group.

Past performance does not guarantee future results. Investment products are not bank deposits and are not guaranteed by ADCB Group. They are subject to investment risk, including possible of loss of principal amount invested. This publication may not be reproduced or circulated without ADCB Group written authority. The manner of circulation and distribution may be restricted by law or regulation in certain jurisdictions. Persons who come into possession of this document are required to inform themselves of, and to observe such restrictions. Any unauthorized use, duplication, or disclosure of this document is prohibited by law and may result in prosecution.