Joint press release

Quantum computing: Two real-world experiments conducted by Crédit Agricole CIB, in partnership with Pasqal and Multiverse Computing, produce conclusive results in finance

Paris, 26 January 2023 – Crédit Agricole CIB and European technology leaders in quantum computing, Pasqal and Multiverse Computing, announce conclusive results on two Proofs of Concept using quantum computing in the field of finance.

These two experiments, initiated in June 2021 by Crédit Agricole CIB, aimed to evaluate the contribution of an algorithmic approach inspired by quantum computing, and the potential of quantum computers for finance, in two areas: the valuation of financial products, and the assessment of credit risks.

The bank partnered with French company Pasqal, a leader in the manufacture of quantum computers in Europe, and the Spanish company Multiverse Computing, which specializes in quantum and quantum-inspired algorithms, which can run on conventional computer systems.

Experiment on the valuation of derivatives in capital markets with Multiverse

The goal of this experiment was to assess the performance gain offered by quantum computing in the valuation of derivatives. Recent research has shown the benefit of neural networks for this type of calculation. Yet, in several cases, the neural networks are difficult to use because they are too resource intensive in terms of memory and suffer from lengthy processing times. However, algorithmic techniques inspired by quantum computing can be used to optimise the speed and memory required for this training phase, leading to faster valuations and more accurate risk assessments.

Experiment on the anticipated downgrade of counterparties' financial rating with Pasqal and Multiverse

The goal of this experiment was twofold: first, to measure a quantum computer's ability to solve a concrete problem, given the current state of technology. Second, to assess the change in performance depending on the number of qubits[1] used. The bank chose a production use case, providing a real point of comparison: the anticipation of a counterparty credit rating downgrade over a 6 to 15-month period. Through conventional computer technology and heuristics, good

[1] The qubit, or quantum bit, is the basic unit of quantum computing.

results can be achieved. However, these methods do not work for all problems, and there is no guarantee that the results obtained will be close to the ideal solution. Using quantum parallelism, in theory, makes it possible to find optimum solutions more efficiently.

Both experiments successful

The two experiments took place over a year and a half and were very successful. A marked improvement in computing time requiring a smaller memory footprint was measured using quantum computing techniques, paving the way for their use in real-world applications in the valuation of derivatives. For the quantum computer, the chosen problem was tackled under real-world conditions. With a quantum processor of only 50 qubits, the results obtained are as accurate as the results in production. The projections indicate that this performance could be bettered at 300 qubits, a power that should be available industrially in 2024.[2]

Ali El Hamidi, the project's sponsor at Crédit Agricole CIB, says: "These two Proofs of Concept demonstrated the potential and reality of quantum computing for finance, despite these technologies still being in their infancy. We took advantage of this initiative to start developing the internal skills to prepare for a technological breakthrough which, if it happens, will have a direct and decisive impact on competitiveness in our sector."

Georges-Olivier Reymond, President of Pasqal, says: "This is the most instructive experiment carried out in the industry so far, offering concrete comparisons for the first time, launching a new era for quantum computing. One of the results is that the tipping point is not that far away, probably less than two years, and that it is therefore urgent for users to quickly adopt these new methods, as Crédit Agricole CIB has done. We thank our partners, Crédit Agricole CIB and Multiverse for this great success."

Enrique Lizaso, CEO of Multiverse Computing, says: "With our leading Singularity SaaS solution, we are helping organizations solve problems with the quantum computers available to us today. This collaboration with Credit Agricole CIB, and with Pasqal for the quantum part, has clearly demonstrated that economic advantages are possible today through quantum-inspired and quantum solutions."

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[2] Link towards a research paper on credit risk managements : [2212.03223] Financial Risk Management on a Neutral Atom Quantum Processor (arxiv.org)
Link towards a research paper on the capital markets: [2208.02235] Quantum-Inspired Tensor Neural Networks for Partial Differential Equations (arxiv.org) and [2212.14076] Quantum-Inspired Tensor Neural Networks for Option Pricing (arxiv.org)

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About Crédit Agricole Corporate and Investment Bank (Crédit Agricole CIB)
Crédit Agricole CIB is the corporate and investment banking arm of Credit Agricole Group, the 10th largest banking group worldwide in terms of balance sheet size (The Banker, July 2022). More than 8,900 employees across Europe, the Americas, Asia-Pacific, the Middle East and Africa support the Bank's clients, meeting their financial needs throughout the world. Crédit Agricole CIB offers its large corporate and institutional clients a range of products and services in capital markets activities, investment banking, structured finance, commercial banking and international trade. The Bank is a pioneer in the area of climate finance, and is currently a market leader in this segment with a complete offer for all its clients.
For more information, please visit www.ca-cib.com

About Pasqal
PASQAL builds quantum computers from ordered neutral atoms in 2D and 3D arrays to bring a practical quantum advantage to its customers and address real-world problems. PASQAL was founded in 2019, from the Institut d'Optique, by Georges-Olivier Reymond, Christophe Jurczak, Professor Dr. Alain Aspect, Nobel Prize Laureate Physics in 2022, Dr. Antoine Browaeys and Dr. Thierry Lahaye. PASQAL has secured more than €140 million in financing, combining equity and non-dilutive financing.
The company recently sold two quantum computers to Genci in France and JFZ in Germany for on-site installation at HPC centers in both countries. Named Cool Vendor by Gartner in 2022, PASQAL also recently announced a scientific collaboration with the University of Chicago.
For more information, please visit www.pasqal.com
Twitter: @pasqalio
LinkedIn: www.linkedin.com/company/pasqal/

About Multiverse Computing
Multiverse Computing is a leading quantum software company that applies quantum and quantum-inspired solutions to tackle complex problems, notably in finance, to deliver value today and enable a more resilient and prosperous economy. The company's expertise in quantum algorithms and quantum-inspired algorithms means it can secure maximum results from current quantum devices as well as classical high performance computers. Its flagship SaaS platform, Singularity, allows professionals across all industries to leverage quantum computing with common software tools. The company also serves companies in the mobility, energy, life sciences and industry 4.0 sectors.
For more information, please visit www.multiversecomputing.com
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