

Quantum Decacorns – the Good and the Bad

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Quantinuum's announcement last week that it had raised \$600M on a \$10B valuation left me reeling. It joins the ranks of IonQ as a quantum decacorn (trading at \$13B as of 10 September). I write here why the new decacorn regime makes me feel uncomfortable.

The Good

Let's start with the good. As an investor in quantum, this is a great story for the potential return of these technologies. Quantinuum's valuation is on the extreme end of where quantum computing company valuations have been heading over the past 18 months. PsiQuantum raised \$1B this week valuing the company at \$7B, just a few days after the Quantinuum announcement. IQM announced a \$320M raise, making it a unicorn just last week. Earlier this year Oxford Ionics was acquired for \$1B (mostly in volatile IonQ shares). Inflection is going public via SPAC (yikes). This should give investors confidence that investing in quantum computing can deliver the fund-returning exits that venture capital needs. It also shows the positive sentiment of private markets in the promise of quantum computing. In my opinion, this is good for all players in the sector who should be able to capitalise on the (perceived) lower liquidity risk to secure more cheques from a greater set of investors.

Credit where credit's due - the decacorns have achieved some good initial results. Quantinuum has 20 fully-connected qubits, a single-qubit fidelity of 99.998%, a two-qubit gate fidelity of greater than 99.9%, and is selling systems to customers. IonQ also has two-qubit fidelities of greater than 99.9% and sells access to systems with 25 qubits. HOWEVER...

The Bad

In my view, \$10B is totally out of whack. This is intuitive for most but becomes clear when looking at comps and the implications for investors' expectations.

As mentioned, the many quantum companies with >\$1B valuations already make me feel queasy – these are all essentially pre-revenue companies and any revenues they do have are usually not reflective of long-term, sustainable unit economics (more on why early revenue is not a useful metric here). The decacorn's 10x this (and 10x my queasiness). Listed IonQ's value seems to fluctuate depending on what NVIDIA CEO Jensen Huang says about quantum on stage. Not exactly a rigorous valuation methodology, in my opinion, and no matter how you cut it, investors must have understood that this is a venture bet.

For one, there is still significant technology risk for anyone building quantum computers, including Quantinuum, IonQ, and PsiQuantum. I mentioned their impressive results before - but they are a long way off what is required for commercially relevant quantum computing, according to their own roadmaps. For example, the point where Quantinuum expects fault tolerance, the widely accepted benchmark for commercially relevant systems, is in 2030. This means that Quantinuum needs to execute on a technology roadmap for at least another 5 years before it begins to sell commercially relevant systems or time on systems. Achievement of the roadmap will require scientific, engineering, and manufacturing breakthroughs. The decacorns have lots of the building blocks to get there, but questions on scaling, clock speed, and commercial viability are yet to be answered. I'm a believer – I think commercially useful, fault-tolerant quantum computing is going to happen and I think it's going to happen within the next 8 years - but it ain't going to be easy.

There's also market risk – no one really has a good idea of what the market will look like for quantum computing applications or how much someone would pay for them. DARPA says: “It has been credibly hypothesised – but not proven – that quantum computers would have a transformational impact on many industries.” Even then, market estimates for quantum computing hardware and software in 2040 range from \$45B to \$131B (McKinsey).

Finally, there's competition risk. There are many different ways to make a quantum computer and many players vying for each flavour of qubit. I think that many of these competitors, including the likes of Google, Amazon, and Microsoft, as well as a large list of startups, have plausible roadmaps to get to the scale required.

Understanding all of these risks, investors may have considered that the reward is worth taking on these risks. At \$10B valuations, investors are implicitly betting on a potential \$100B+ outcome (>10x returns in 10 years needed for venture) – an outcome reserved for today's tech giants. That feels...optimistic to me. For

comparison, the startup Thinking Machines recently raised \$10B - but in this case, it's already clear the technology is possible (Anthropic, OpenAI already doing it), they're playing for an AI market expected to hit \$4.8T by 2033 where there is already strong traction.

Even if you believe that Quantinuum or IonQ's work with customers and impressive technological achievements so far somewhat derisks this journey, in my view, it isn't a slam dunk.

So What?

The obvious thing to me: this can't last. I won't go as far as to say that quantum computing is a bubble – because Quantinuum and IonQ (and almost PsiQuantum) are in a league of their own valuation-wise - but it's hard for me to see how they deliver on the expectations baked into a \$10B price tag. Flush with cash, they've bought themselves years before reality catches up.

I believe these large raises at high valuations are good for today's optimism, but dangerous if tomorrow's reality can't keep pace. In my opinion, quantum needs time and careful capital – not burgeoning valuations which don't stack up.

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