

IS HBM HEADED TO NEW HEIGHTS OR IS THIS JUST HYPE?

Presenters:

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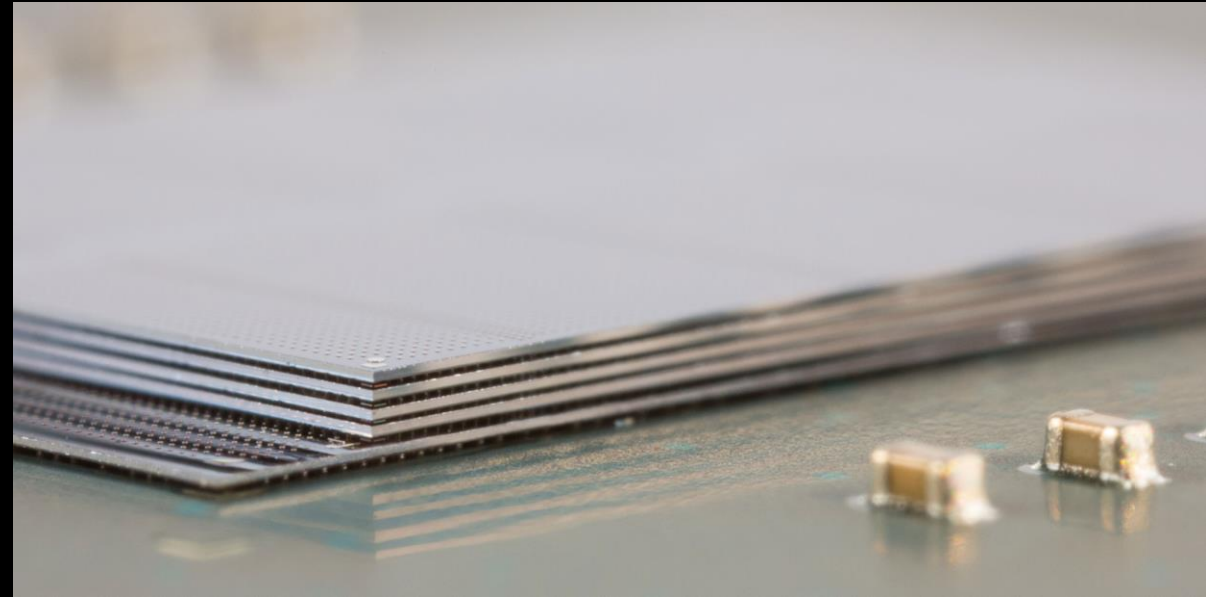


the Future of Memory and Storage

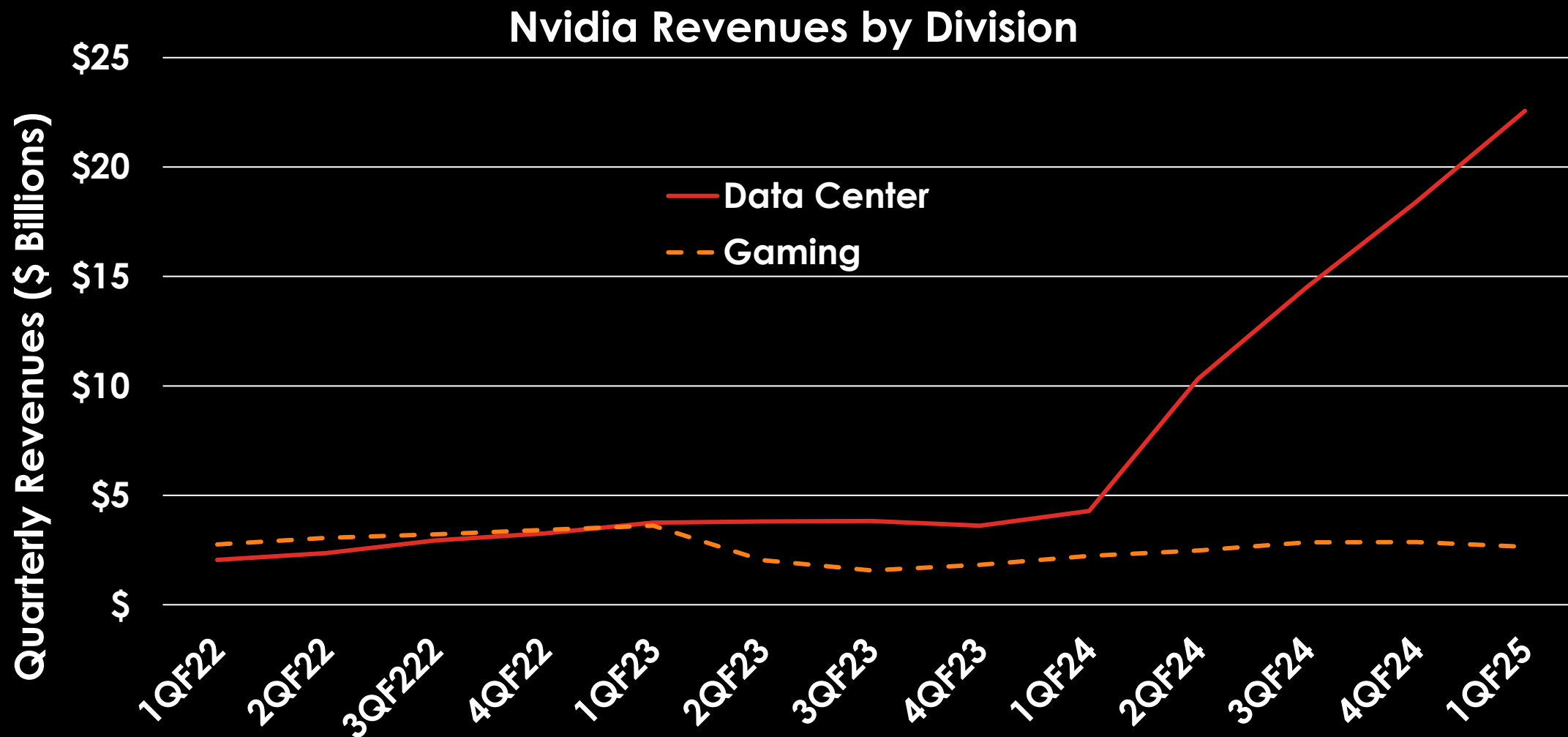
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WHAT IS HBM?

- 6X the price of DDR5
- Only used for AI
- A fast-growing market
- Sold Out into 2025

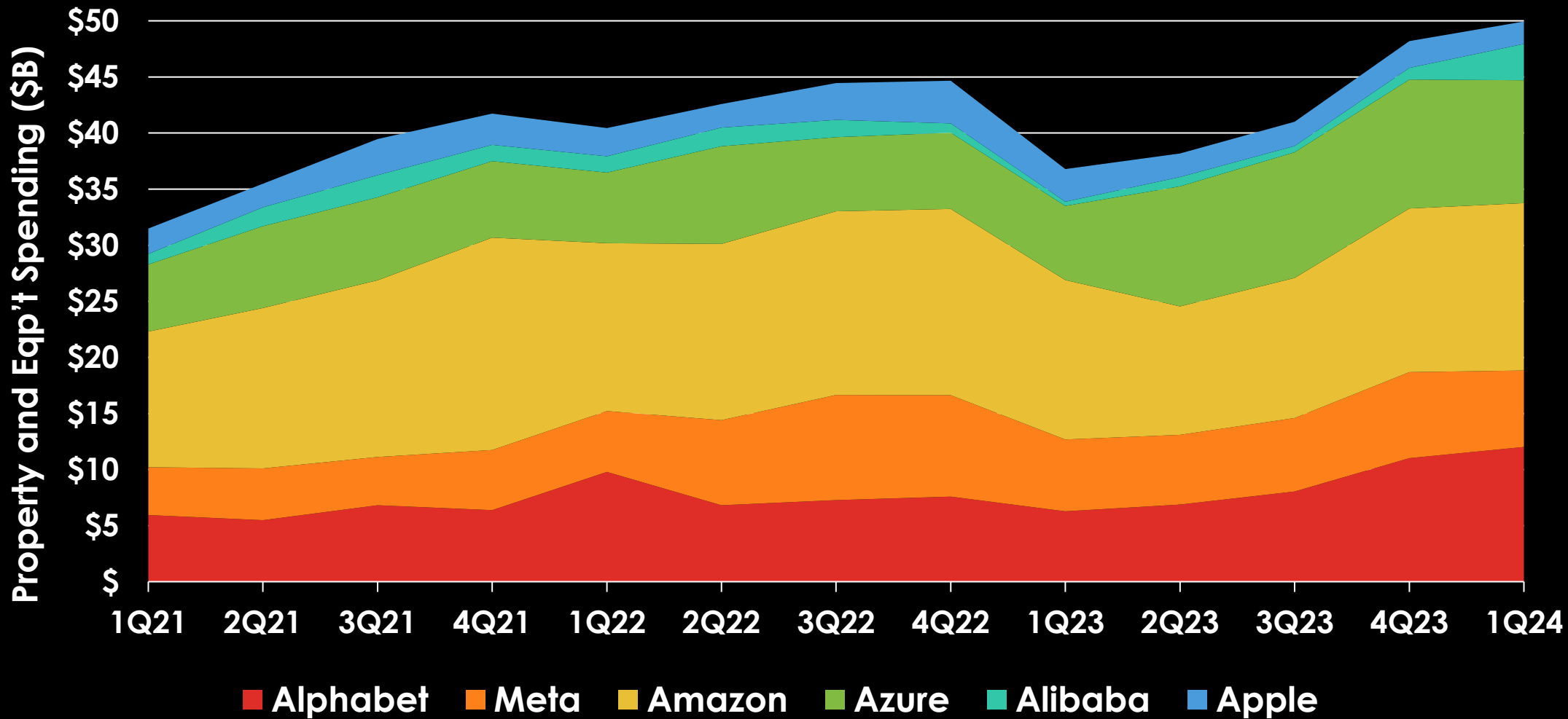


NVIDIA'S DATA CENTER REVENUES HAVE SKYROCKETED



HYPERSCALER CAPEX RETURNS TO GROWTH

Hyperscale Datacenter Capital Spending



MARK'S REASONS FOR HYPERGROWTH TODAY

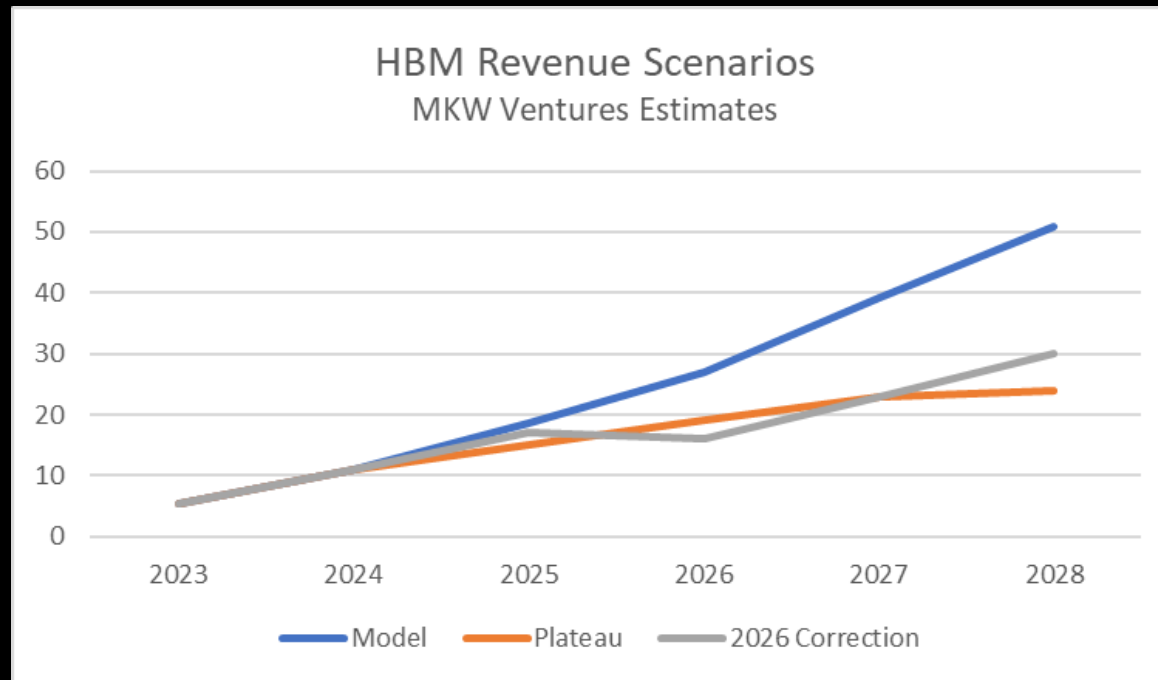
- HBM obviously is enabling technology for HPC AI Servers
- Nvidia is delivering new tech at amazing fast rate.
 - Products every year, 2x memory on new products
- Spending is in addition to traditional servers. They can afford it

MARK'S REASON FOR A CORRECTION COMING

- When a new technology hits the peak of the Gartner hype cycle, the growth predictions are ALWAYS exaggerated
- When Hypergrowth slows, the effect on supply market is >3x
 - Less growth, no backup orders, no inventory build, excess inventory burn. 10% down becomes 30% down (See FMS 2023 presentation)

ACTUAL LIKELY SCENARIOS

- New Markets have adjustments. Two likely Scenarios
 - Plateau effect. There is a reasonable mature market end state
 - Correction in 2026. Digestion phase plus competition kicking in



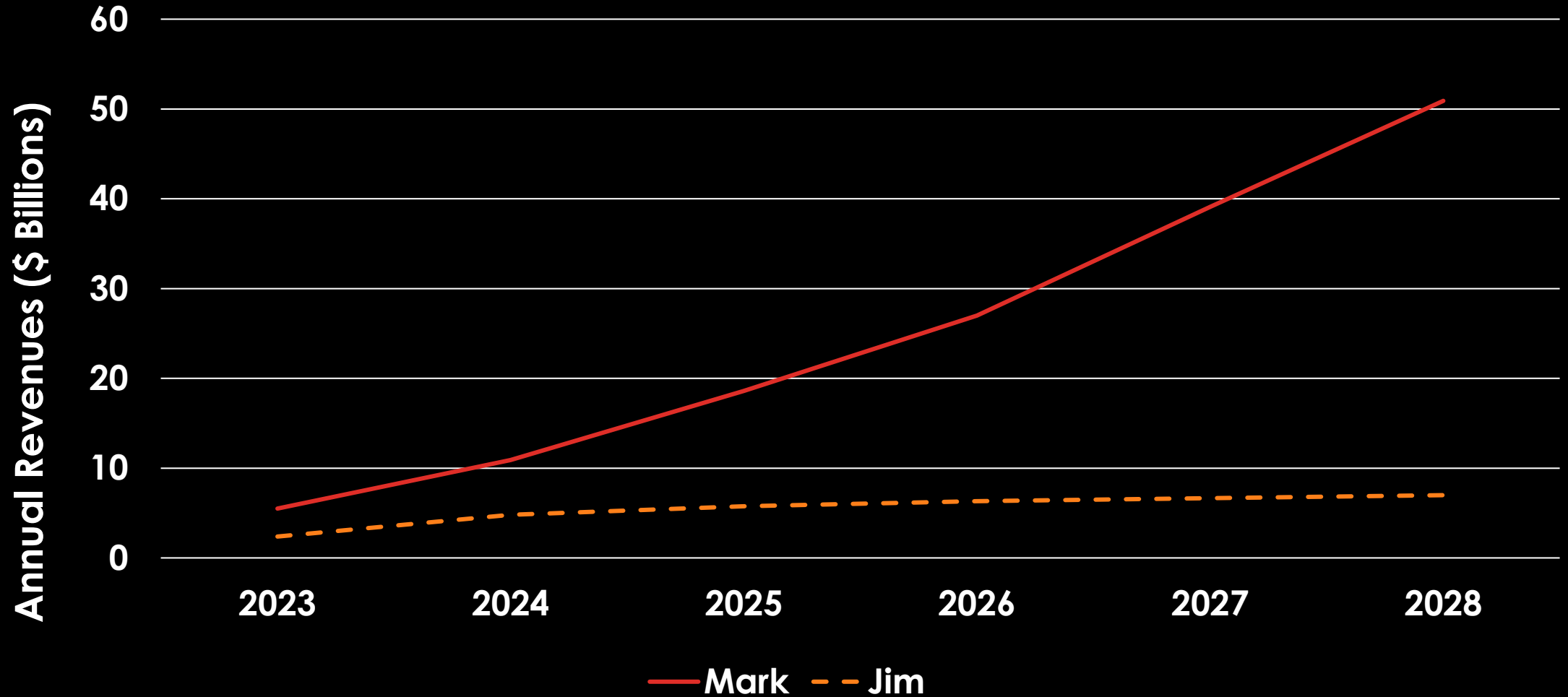
DRAM MARKET REALITIES

- DRAM is a commodity
- HBM's 6X price adder caused by sole-sourcing and shortages
- Oversupplies are inevitable
- Everyone competes on price
- Hyperscaler demand gyrates wildly

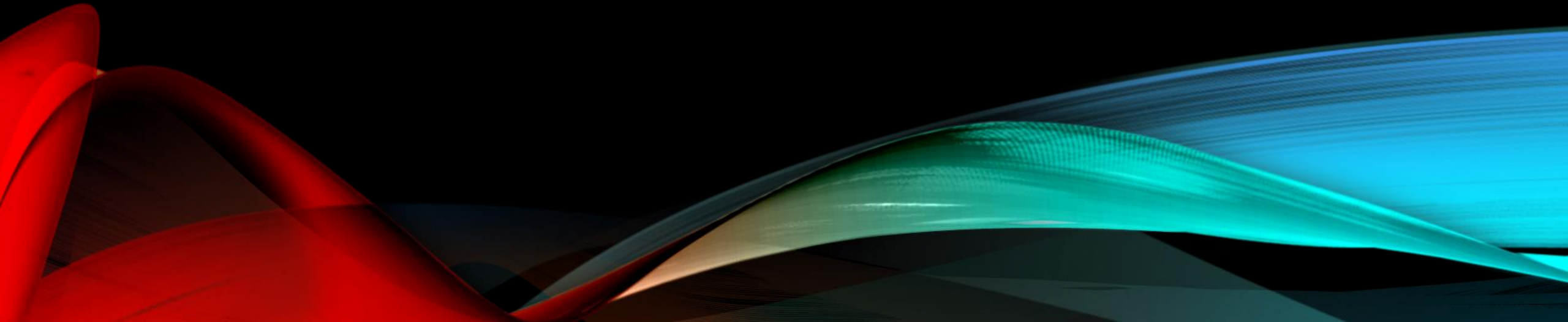
WHERE IS HBM HEADED?

- Great growth until the bottom blows out
- Oversupply will drive price collapse
- Cost about 2-3X DDR5's

TWO VERY DIFFERENT HBM FORECASTS



BACK-UP MATERIALS





Will HBM Rescue the DRAM Market?

- **New report from Objective Analysis**
- Covers all perspectives
 - What is HBM and why it's so costly
 - Supply Chain – who buys it and why
 - Price dynamics: HBM vs. DRAM
 - Forecast (Revenues, units, ASP)
- Available for immediate download:

[Objective-Analysis.com/reports](https://www.Objective-Analysis.com/reports)

MKW VENTURES

- We have detailed modeled numbers for all aspects of HBM Market
- HBM bit cost over time including packaging and yield effects
- HBM technology timeline. UF, Hybrid Bonding, stacking, Die size
- Strengths and weaknesses of each company

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ACTUAL VS PREDICTED GROWTH FOR NEW TECHNOLOGIES

- When a new technology hits the peak of the Gartner hype curve, the growth predictions are ALWAYS exaggerated
 - SSD/Phone/Tablet example, Cost/spending limits, Competition, digestion
- When Hypergrowth slows, the effect on supply market is >3x
 - Less growth, no backup orders, no inventory build, excess inventory burn. 10% down becomes 30% down (FMS 2023 presentation)
- This will happen. Look at supply chain inventory, end market sales for signal
 - When the cycle begins, the impact will depend on how supply reacts
 - With the long lead time HBM, the length of cycle is longer
- This can be controlled and managed IF suppliers choose.
 - Run continuously constrained, monitor customers inventory.
 - Modeled bit price is 6x DDR. But Cost is well over 3x DDR. Remember this
 - Do not overbuild ("if you build it, they will come" is bad in memory)
- HBM Planned demand Growth of 80% per year will end up at 20% CAGR for some time and supplier negative revenue growth for some period.
 - Everyone will be surprised. They will blame economy, politicians, global conflicts.