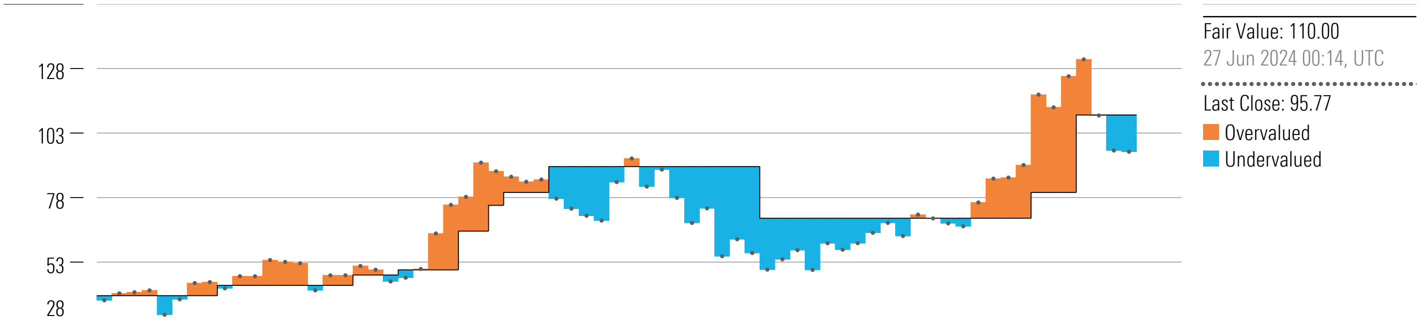
Morningstar Equity Analyst Report | Report as of 26 Sep 2024 00:33, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 1 of 21

Micron Technology Inc MU ★★★★ 25 Sep 2024 21:25, UTC

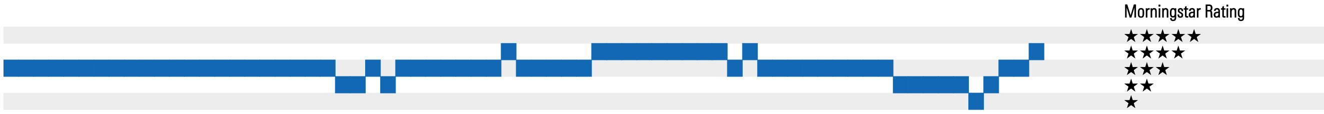
Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
95.77 USD 25 Sep 2024	110.00 USD 27 Jun 2024 00:14, UTC	0.87	106.19 USD Bil 25 Sep 2024	None	Large Value	High	Standard	4 Sep 2024 05:00, UTC

Price vs. Fair Value



	2019	2020	2021	2022	2023	YTD	
	1.22	1.50	1.04	0.71	1.22	0.87	Price/Fair Value
	69.49	39.79	24.17	-45.87	71.67	12.49	Total Return %

Morningstar Rating



Total Return % as of 25 Sep 2024. Last Close as of 25 Sep 2024. Fair Value as of 27 Jun 2024 00:14, UTC.

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The primary analyst covering this company does not own its stock.

[1]The ESG Risk Rating Assessment is a representation of Sustainalytics' ESG Risk Rating.

Micron Earnings: Great Guidance Appears to Reassure the Market, and Shares Now Look Fairly Valued

Analyst Note William Kerwin, CFA, Equity Analyst, 26 Sep 2024

We maintain our $110 fair value estimate for shares of no-moat Micron Technology as we hold our medium-term forecast steady even after tremendous August quarter results. Micron's quarterly results came in at or above the high end of its guidance ranges, and its November quarter guidance beat our model. The firm benefits from a broad and strong upcycle in memory chip demand, aided by AI-related demand. We believe this upswing should continue through calendar 2025. Still, we expect growth to decelerate through 2025 and forecast cyclicality for Micron in the long term, which informs our no-moat rating.

Micron's stock has been seeing downward pressure since its last earnings report three months ago, with a number of analyst downgrades citing concerns of oversupply in DRAM chips. We don't share these concerns in the short term and believe Micron's strong guide aligns with our view for tight supply to fuel another year of strong growth in fiscal 2025. The market responded positively to guidance, with shares up as much as 14% after-hours. The stock is now trading close to our fair value estimate.

August quarter revenue rose 93% year over year and 14% sequentially to $7.75 billion. DRAM continues to drive Micron's results, but DRAM and NAND showed more than 90% year-over-year growth as these markets recover from the steep cyclical downturn seen in fiscal 2023. We believe DRAM growth is broad-based but supplemented by robust demand for high-bandwidth memory chips that serve AI

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Sector	Industry
Technology	Semiconductors

Business Description

Micron is one of the largest semiconductor companies in the world, specializing in memory and storage chips. Its primary revenue stream comes from dynamic random access memory, or DRAM, and it also has minority exposure to not-and or NAND, flash chips. Micron serves a global customer base, selling chips into data centers, mobile phones, consumer electronics, and industrial and automotive applications. The firm is vertically integrated.

applications. HBM is still a small minority of total revenue today, but we forecast it to rise above 10% of Micron's revenue in the next two years.

November quarter guidance was impressive, implying 12% sequential revenue growth and 300 basis points of gross margin expansion at the midpoints. We believe growth will be driven by growth for shipments and pricing in fiscal 2025. Rising prices also contribute to our expectations for meaningful margin expansion in fiscal 2025.

Business Strategy & Outlook William Kerwin, CFA, Equity Analyst, 15 Aug 2024

We see Micron Technology as a strong supplier of memory chips, but we don't believe the firm holds an economic moat. Micron benefits from large scale, being the fifth-largest chipmaker in the world, but we don't see enough scale to generate consistent economic profits. Micron holds a third-place market share in dynamic random access memory, or DRAM, chips and a fifth-place market share in not-and, or NAND, flash chips. We view both the DRAM and NAND markets as highly cyclical, and we expect Micron to thrive in periods of strong demand and pricing, but to be vulnerable to downcycles that compress shipments, prices, and profits.

DRAM and NAND chips are vital components to data centers, consumer devices, cars, and industrial equipment. Nevertheless, we see these chips as commoditylike and suppliers like Micron producing mostly fungible chips. Thus, Micron and its peers are prone to market supply-and-demand dynamics. Periods of strong industry demand can be followed by periods of oversupply that crater pricing and firm profitability, as seen in Micron's fiscal 2023. As a vertically integrated chipmaker, Micron has a significant fixed cost base and thus periods of lower volume have a major impact on profitability.

While we foresee cyclicality to continue, we see long-term growth for both the DRAM and NAND markets over the course of cycles. We expect data centers, mobile phones, and cars to require greater amounts of memory content, driven by secular trends toward artificial intelligence, 5G, and autonomous vehicles. In our view, Micron should be able to benefit from this growth with its scale, despite cyclical effects in the short term. We also like Micron's shareholder distributions and view its balance sheet as good, for a cyclical memory chipmaker.

Finally, we caution investors about risk from China. The Chinese government effectively cut off Micron's sales into Chinese data centers in 2023, which will have a material impact on sales and growth. Micron earns nondata-center revenue out of China, but we expect this to remain unrestricted, as these chips are for consumer and lagging-edge markets that are less critical to national security.

Bulls Say William Kerwin, CFA, Equity Analyst, 15 Aug 2024

- When memory markets are in an upswing and demand is strong, Micron's sales growth and profitability can be impressive.

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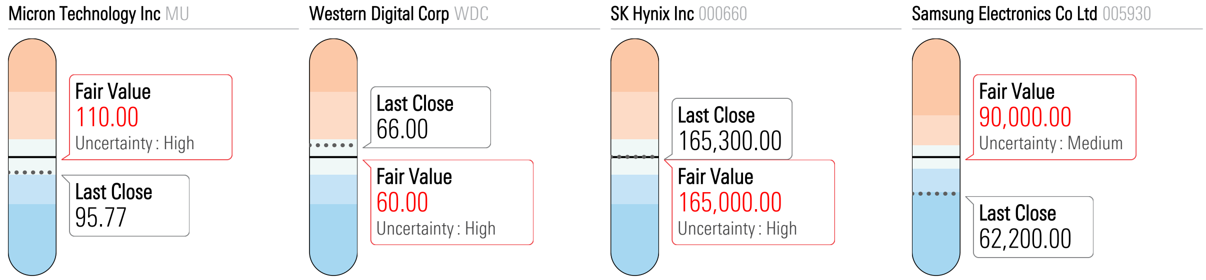
Competitors



	Micron Technology Inc MU	Western Digital Corp WDC	SK Hynix Inc 000660	Samsung Electronics Co Ltd 005930
Economic Moat	None	None	None	Narrow
Currency	USD	USD	KRW	KRW
Fair Value	110.00 27 Jun 2024 00:14, UTC	60.00 1 Aug 2024 02:20, UTC	165,000.00 8 May 2024 06:19, UTC	90,000.00 8 May 2024 06:21, UTC
1-Star Price	66.00	93.00	255,750.00	121,500.00
5-Star Price	170.50	36.00	99,000.00	63,000.00
Assessment	Undervalued 25 Sep 2024	Fairly Valued 25 Sep 2024	Fairly Valued 25 Sep 2024	Undervalued 25 Sep 2024
Morningstar Rating	★★★★25 Sep 2024 21:25, UTC	★★★25 Sep 2024 21:30, UTC	★★★25 Sep 2024 12:15, UTC	★★★★25 Sep 2024 12:14, UTC
Analyst	William Kerwin, Equity Analyst	William Kerwin, Equity Analyst	Kazunori Ito, Director	Kazunori Ito, Director
Capital Allocation	Standard	Standard	Standard	Standard
Price/Fair Value	0.87	1.10	1.00	0.69
Price/Sales	4.85	1.67	2.29	1.34
Price/Book	2.36	2.11	1.88	1.15
Price/Earning	—	—	26.43	15.44
Dividend Yield	0.49%	0.00%	0.73%	2.28%
Market Cap	106.19 Bil	22.67 Bil	113,828.50 Bil	422,504.03 Bil
52-Week Range	63.83—157.54	35.62—81.55	112,300.00—248,500.00	62,200.00—88,800.00
Investment Style	Large Value	Mid Value	Large Blend	Large Growth

- Micron is a major producer of DRAM and NAND chips with healthy market share positions, allowing it to benefit from secular trends toward AI, 5G, and connected cars.
- We like Micron's shareholder returns and view its balance sheet as strong for a cyclical firm.

Bears Say William Kerwin, CFA, Equity Analyst, 15 Aug 2024

- Micron has a high fixed cost base that leaves it vulnerable to underutilization charges and major profit compression when memory markets enter a downturn.
- We see DRAM and NAND as commoditylike products, and we foresee little ability for Micron to build durable differentiation against its competitors.
- Micron has meaningful China exposure and bears the risk of further restrictions out of that market hampering its sales.

Economic Moat William Kerwin, CFA, Equity Analyst, 15 Aug 2024

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We do not believe Micron possesses an economic moat. The firm operates in the highly capital-intensive industries of DRAM and NAND flash semiconductors, and it doesn't earn good enough profit margins through the course of a cycle to give us confidence in enduring economic profits.

We view DRAM and NAND as commoditylike products prone to market supply-and-demand dynamics and steady pricing erosion that reduces industry profitability. While we see better margins in DRAM, which has consolidated to three primary players (versus six in NAND) we still don't see good enough returns on invested capital over the course of a cycle to merit a moat. We do expect to see years of positive economic profits during periods of tight supply and strong demand that help support good pricing, but we see steep downcycles giving rise to poor profitability and eroding the economic profits built up in a market upswing.

The majority of Micron's sales comes from DRAM chip sales. DRAM chips provide volatile random access memory, which is used to store memory during a system's operation, and only while a system is turned on. DRAM is a critical component for data center servers, computers, smartphones, and industrial applications. We see DRAM chips as commodity products, primarily sold by three suppliers—Samsung, SK Hynix, and Micron—that occupy over 90% of the market. DRAM technology generations last years, and we see the leading oligopoly players moving in step to successive generations and participating in an industry standards-setting body. DDR5 is the latest technology transition for mainstream DRAM, and while a player like Micron will cite technological leadership or being first to market, we view these chips as fungible and time-to-market differences of a quarter or two as immaterial to competitive positioning.

As a vertically integrated producer, Micron has massive capital investment needs that weigh on its returns on invested capital. The DRAM industry typically exhibits high-single-digit annual pricing declines, with the dominant players focusing not only on product advancement, but also advances in cost efficiency to keep up with their peers. This rapid pricing erosion makes it difficult for industry players to earn strong profits, even with large market shares. Consolidation of the DRAM industry and rational acting by players have helped improve industry margins. Still, we don't see current margin levels providing durable economic profit levels over the course of a cycle. The memory chip market is prone to bouts of undersupply that raise prices and profits, followed by gluts of supply that crater pricing. Downcycles can be severe, sometimes leading to negative returns on invested capital and negative profit margins.

Micron also has a meaningful NAND flash chip business that makes up the minority of sales. NAND flash chips provide nonvolatile memory for storage purposes. Compared with DRAM, NAND is used for longer-term storage of data for data centers and consumer hardware. NAND advancements happen at a much faster pace than those in DRAM, with suppliers putting out higher-density chip generations every 18-24 months. Similar to DRAM, while suppliers will tout technological differences like layer counts and

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being first to market, we view NAND chips as fungible and commoditylike among the leading players.

We view very similar dynamics in NAND as we do in DRAM: commodity products, high capital intensity, and volatile market cycles. NAND, however, is less consolidated of a market with six primary players. In our view, the more fragmented nature of the NAND market creates more volatile supply-and-demand dynamics with worse pricing and profitability in market downturns caused by oversupply. NAND is also even more capital intensive than DRAM is, which we attribute to faster advancement and shorter product generations, and exhibits steeper annual pricing declines typically in the midteens. All of this leads to a lower margin profile for NAND compared with DRAM, as well as lower returns on invested capital.

Fair Value and Profit Drivers William Kerwin, CFA, Equity Analyst, 15 Aug 2024

Our fair value estimate for Micron is $110 per share. Our valuation implies a fiscal 2024 enterprise value/sales of 5 times. Against fiscal 2025 estimates, our valuation implies an adjusted price/earnings of 18 times and an enterprise value/sales of 4 times. The greatest drivers to our valuation are cyclical sales and cyclical profitability over a fixed cost base.

We forecast Micron's results to be highly cyclical, and note that fiscal 2023 represented one of the most severe downturns we've seen for the chipmaker, with gluts of chip supply for data centers, smartphones, and PCs following post-pandemic-era demand. Micron was also hampered in fiscal 2023 by the loss of revenue coming from memory sales into Chinese data center customers, thanks to retaliatory moves against other US government restrictions.

We believe Micron's key end markets bottomed in fiscal 2023, and we expect sequential recovery through fiscal 2024 and fiscal 2025. We project 60% revenue growth in fiscal 2024, and more than 40% growth in fiscal 2025. Thereafter, we model a tapering down to midcycle mid-single-digit growth. While the DRAM and NAND markets can be volatile, we view long-term trends exhibiting growth in bit shipments (which equates to volume) and declines in prices per bit. In DRAM, we expect mid-teens bit growth and roughly 10% annual pricing declines over the long term. In NAND, we expect bit growth in the mid-20% range and more than 10% annual pricing declines over the long term.

Practically all of Micron's costs of sales are fixed. Despite revenue cut in half in fiscal 2023, cost of sales was roughly flat, leading to a negative 8% non-GAAP gross margin. We expect Micron to continue investing in manufacturing for the long term, and gross margins to move in line with volumes. We see a recovery to positive gross margin in fiscal 2024 and a healthy level surpassing 40% in fiscal 2025. At a healthy midcycle, we think Micron can reach the low-40% range for non-GAAP gross margin.

Micron's operating expenses are more malleable than manufacturing. We forecast steady growth in research and development in the mid-single digits annually, and for other operating expenses to move with top-line volume. Still, Micron’s operating margins will be heavily dictated by its gross margins. We forecast positive non-GAAP operating margin for Micron in fiscal 2024, and a healthy level nearing 30% in fiscal 2025. At midcycle, we think Micron can earn close to 30% non-GAAP operating margins.

Risk and Uncertainty William Kerwin, CFA, Equity Analyst, 15 Aug 2024

We assign Micron a Morningstar Uncertainty Rating of High. Micron's largest risk comes from its high cyclicality, in our view. As a memory chipmaker, Micron is susceptible to fluctuations in market supply and demand for commoditylike chips, and periods of oversupply can slash prices. Micron is vertically integrated with a high fixed cost base, so weak pricing can have an outsize effect on profitability, as seen in fiscal 2023.

Micron also bears risk from its China exposure, which sits at roughly 25% of sales. The Chinese government issued restrictions on Micron’s sales into data centers in 2023, effectively cutting off roughly 10% of the firm’s revenue. The other 15% sells into consumer electronics and autos, which we think poses less of a national security risk. Still, escalating trade tensions could see a complete barring of US-produced memory chips, or alleviated restrictions could see Micron regain its cutoff revenue.

We see some risk from the relatively unconsolidated NAND market. We expect consolidation over the long term in NAND, and if Micron is left on the outside of consolidation, it could be left with a gap in scale relative to peers in NAND production, which could hurt its ability to reduce costs and maintain profitability.

Finally, we note some customer concentration for Micron, with roughly half of its sales coming from its top 10 customers. This concentration is mainly from distributors, and we don’t expect these customers to churn. Still, losing one or more of these material customers could have a negative impact on results.

On the environmental, social, and governance front, we foresee little risk to Micron. Its primary risks would arise from its environmental footprint as a manufacturer and its ability to retain human capital.

Capital Allocation William Kerwin, CFA, Equity Analyst, 15 Aug 2024

We assign Micron a Standard Morningstar Capital Allocation Rating, primarily driven by our view of fair investments. We believe Micron invests adequately to maintain its position in the DRAM and NAND markets, and we don’t believe greater investment would improve its position. Micron targets more than 30% of sales going to capital expenditure and roughly 10% of sales to go toward research and development, both of which roughly match peers. While Micron benefited from DRAM consolidation a decade ago, we see little opportunity for acquisitions now, and we believe that shareholder distributions as a second priority to organic investment is appropriate. We see Micron’s balance sheet as sound, and its distributions as appropriate. Micron is leveraged, but it holds long-dated debt and we believe its cash flow will be more than enough to cover its obligations over the long term. We also see

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Micron's quarterly dividend and opportunistic repurchases (in upcycle periods, typically) as a good return to investors with few other investment opportunities.

Analyst Notes Archive

Micron Earnings: We Raise Our DRAM Forecast and Valuation Behind Stronger Pricing Assumptions

William Kerwin, CFA, Equity Analyst, 27 Jun 2024

We raise our fair value estimate for no-moat Micron Technology to $110 per share, from $80, behind a higher medium-term growth and margin forecast. We now expect significant growth through fiscal 2026 for Micron, driven primarily by higher DRAM expectations. We believe high-bandwidth memory, or HBM, will augment growth, but we also expect standard DRAM to benefit from strong pricing over the next few years. AI investment is a meaningful contributor to our forecast across both HBM and standard DRAM, with data center GPUs requiring higher memory content, as well as higher content in AI-enabled PCs and smartphones. We see demand outpacing supply through calendar 2025, supporting high prices that should drive strong revenue for Micron. We also expect gross margins to benefit from strong pricing and a rising mix of HBM revenue, which is margin-accretive already.

Micron's fiscal third-quarter results aligned with our updated forecast, and the firm continues to rebound meaningfully from a cyclical trough in fiscal 2023. Shares dropped as much as 7% after hours upon results, which we attribute to the market wanting even better guidance from AI. We see shares as overvalued, even at our new valuation. Long term, we continue to see Micron as cyclical, and we expect softer results after our forecast for increasingly normal strength through fiscal 2026.

May quarter revenue rose 82% year over year and 17% sequentially to $6.8 billion, as Micron continues to recover revenue from a sharp cyclical downturn in fiscal 2023. Both DRAM and NAND revenue rose in line with firm revenue growth. We expect sequential growth to continue for both DRAM and NAND through fiscal 2025, and for Micron to reach record revenue in both fiscal 2025 and fiscal 2026. Micron's gross margin is improving in line with revenue, and we similarly expect margin expansion through fiscal 2026.

Micron Earnings: Valuation Up 14% to $80 Behind Strong Recovery and AI, but Shares Still Look Pricey

William Kerwin, CFA, Equity Analyst, 21 Mar 2024

We raise our fair value estimate for shares of no-moat Micron Technology to $80, from $70, as we raise our short-term forecasts after the firm reported strong February-quarter results and an outlook for the May quarter above our model. We believe Micron has more strength to come in the next two years as it benefits from rebounding prices in both DRAM and NAND memory chips after steep downturns in 2023. We expect Micron to also see upside to the underlying DRAM market rebound as it develops rising penetration in high-bandwidth memory, or HBM, which is an input into graphics processing units, or GPUs, from the likes of Nvidia that run artificial intelligence models. Still, we believe Micron will

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continue to be prone to memory market cyclicality (as seen in 2023) over the long term, and we forecast more tepid growth after fiscal 2025. We continue to see shares as overvalued and recommend investors seek a better entry point.

February-quarter sales rose 58% year over year and 23% sequentially to $5.8 billion, well ahead of company guidance. We credit Micron's DRAM sales for the beat, which are benefiting from improving market prices and the firm's adoption by Nvidia as a second source for HBM in its GPUs, like the new B200. All of Micron's end markets grew revenue meaningfully in the quarter, but we were most impressed by its sales into data centers, which include HBM spending for artificial intelligence. Positively, NAND flash sales also finally showed signs of a stronger recovery, rising 77% year over year.

Guidance for the May quarter beat both our expectations and those of consensus and, in our view, led to the after-hours stock price rising as much as 16%. At the midpoint, sales of $6.6 billion imply 75% year-over-year growth and 13% sequential growth. We believe strong growth will continue to be driven by improving DRAM and NAND pricing, as seen in the February quarter.

Micron Earnings: Market Rebounds, Bearing Fruit and Raising Results, but Shares Are Out of Reach

William Kerwin, CFA, Equity Analyst, 21 Dec 2023

We maintain our $70 fair value estimate for shares of no-moat Micron Technology after it reported good fiscal first-quarter results. The results bore no surprises, given Micron released results in late November. Still, we're pleased to see the rebounds across both DRAM and NAND progressing, with prices continuing to rise from deep troughs earlier in 2023. Micron's first-quarter results and second-quarter guidance are positively above our initial expectations, and we see this as market rebounds are happening earlier than we previously thought. Despite the pull-in of some sales into earlier quarters, we continue to hold expectations for Micron to return to roughly $30 billion in revenue in fiscal 2025 and 2026 and maintain our valuation. We see shares as overvalued.

November-quarter results were strong, with DRAM and NAND sales rising significantly both year over year and sequentially. Overall fiscal first-quarter revenue of $4.7 billion rose 16% year over year and 18% sequentially. We believe rising market pricing in commoditylike markets is the most important piece of rebounds for DRAM and NAND, and we foresee a continued upward trajectory for prices into fiscal 2025. In line with pricing, Micron's non-GAAP gross margin rose to 1% in the quarter, well above a trough below negative 30% earlier in 2023.

February-quarter guidance exceeded our model, with a sales midpoint of $5.3 billion, implying 12% sequential growth. Micron is also guiding to 1200 basis points of gross margin expansion. We continue to expect meaningful sequential improvement throughout fiscal 2024 and into fiscal 2025, across both DRAM and NAND. We share Micron's view that demand should exceed supply for the next two years, buoying pricing. While the next two fiscal years look good for Micron, we remind investors of the steep cyclicality it faces as a memory chipmaker that produces strong swings to both the upside and downside over the long run.

Micron: Positive Preliminary Earnings Announcement Aligns With Our Recovery Thesis William Kerwin, CFA, Equity Analyst, 28 Nov 2023

We maintain our $70 fair value estimate for no-moat Micron Technology after the company raised its fiscal 2024 first-quarter guidance. Micron has seen better pricing dynamics, primarily in DRAM chips, over the course of the quarter, which ends Nov. 30. We're pleased to see higher expectations for sales and profits in the first quarter, and we see our broader expectations for rebounding results in fiscal 2024 and fiscal 2025 playing out. The shares dipped nearly 3% in Nov. 28 midday trading, we think largely because of the rebound expectations already baked into the price. We believe the shares are fairly valued.

Micron raised every guidance metric, including sales, gross margin, and earnings per share. It now expects November-quarter sales of $4.7 billion (up from a midpoint of $4.4 billion), non-GAAP gross margin of negative 0.25% at the midpoint (up from negative 4%,) and non-GAAP EPS of negative $1.00 (up from a midpoint of negative $1.07). Management attributed the performance to improving DRAM pricing dynamics, which we'd already been anticipating.

Though near-term performance looks better than we expected, we continue to see this quarter as merely the start of a long recovery for Micron's results. After the top line was cut in half in fiscal 2023, we forecast two straight years of more than 30% growth through fiscal 2025. We think that DRAM dynamics are recovering already and that NAND will lag a bit but follow the DRAM recovery. We liked hearing that Micron anticipates positive gross margin in the February quarter, and we maintain our forecast for sizable jumps in gross margin through the fiscal year as demand drives utilization back up.

Micron Earnings: Management Guides for a Cyclical Recovery and We Maintain Our Forecast

William Kerwin, CFA, Equity Analyst, 28 Sep 2023

We maintain our $70 fair value estimate for shares of no-moat Micron Technology after the firm's fiscal fourth-quarter results and fiscal first-quarter guidance exceeded our expectations. We maintain our model for fiscal 2024 and longer term but now see an earlier and less back-end-weighted recovery through fiscal 2024. Micron management believes recoveries for the DRAM and NAND markets are underway. While we've seen bit shipments for both technologies improve from February-quarter bottoms, management believes pricing has bottomed in the August quarter and is set to rebound. In our view, a cyclical recovery for memory chips should be bolstered by the emerging high spending toward artificial intelligence-focused data centers, which offer a content uplift to suppliers like Micron. We see shares as fairly valued and view a modest selloff afterhours as myopic considering a fiscal first-quarter outlook that while weak, represents a meaningful improvement.

Fiscal fourth-quarter sales rose 7% sequentially with DRAM and NAND sales growing. Year-over-year comparisons continue to be dismal for sales as fiscal 2023 experienced a significant cyclical downturn, but we view sequential recovery as positive. In terms of volume, both DRAM and NAND businesses recorded all-time record shipments for Micron, which is good and is helping to offset weak pricing. Management believes pricing in both markets bottomed in the quarter and is set to improve through fiscal 2024.

Margins in the quarter were poor, but we focused on the improvement sequentially. Non-GAAP gross margin of negative 9% was up 700 basis points sequentially as volumes improved. Management guided to another negative gross margin quarter in November, but we expect it to be the last one as pricing increases in NAND and DRAM drive Micron back to profitability.

Micron's fiscal first-quarter outlook exceeded our prior model with a midpoint of sales at $4.4 billion implying 8% year-over-year growth and 10% sequential growth.

Micron: We Anticipate a Strong Rebound in Coming Years, but We See It Fully Baked Into Share Price William Kerwin, CFA, Equity Analyst, 15 Aug 2023

We maintained our $70 fair value estimate for shares of no-moat Micron after revisiting our moat and valuation assumptions. We've raised our fiscal 2024 and fiscal 2025 revenue forecasts to reflect an aggressive rebound from the precipitous memory downturn in fiscal 2023, and we model revenue growth tapering to a midcycle level in the midsingle digits thereafter. We've also raised our midcycle margin expectations, with midcycle non-GAAP gross margin modestly above 40% and non-GAAP operating margins reaching 30%. We still see shares as fairly valued.

We see Micron Technology as a strong supplier of memory chips, but don't believe the firm holds an economic moat. Micron benefits from large scale, being the fifth-largest chipmaker in the world, but we don't see enough scale to generate consistent economic profits. Micron holds a third place market share in dynamic random access memory, or DRAM, chips and a fifth-place market share in not-and, or NAND, flash chips. We view both the DRAM and NAND markets as highly cyclical, and expect Micron to thrive in periods of strong demand and pricing, but to be vulnerable to downcycles that compress shipments, prices, and profits.

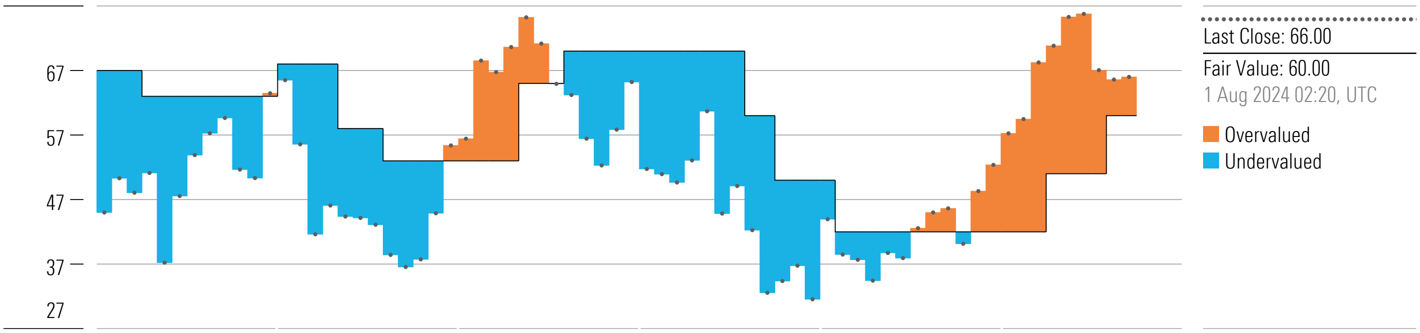
While we foresee cyclicality to continue, we see long-term growth for both the DRAM and NAND markets over the course of cycles. We expect data centers, mobile phones, and cars to require greater amounts of memory content, driven by secular trends towards artificial intelligence, 5G, and autonomous vehicles. In our view, Micron should be able to benefit from this growth with its scale, despite cyclical effects in the short-term. We also like Micron's shareholder distributions and view its balance sheet as good for a cyclical memory chipmaker.

Morningstar Equity Analyst Report | Report as of 26 Sep 2024 00:33, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 11 of 21

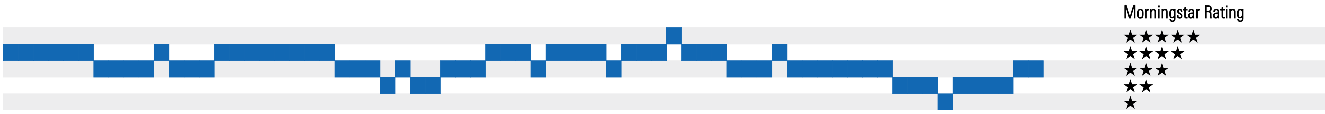
Micron Technology Inc MU ★★★★ 25 Sep 2024 21:25, UTC

Competitors Price vs. Fair Value

Western Digital Corp WDC

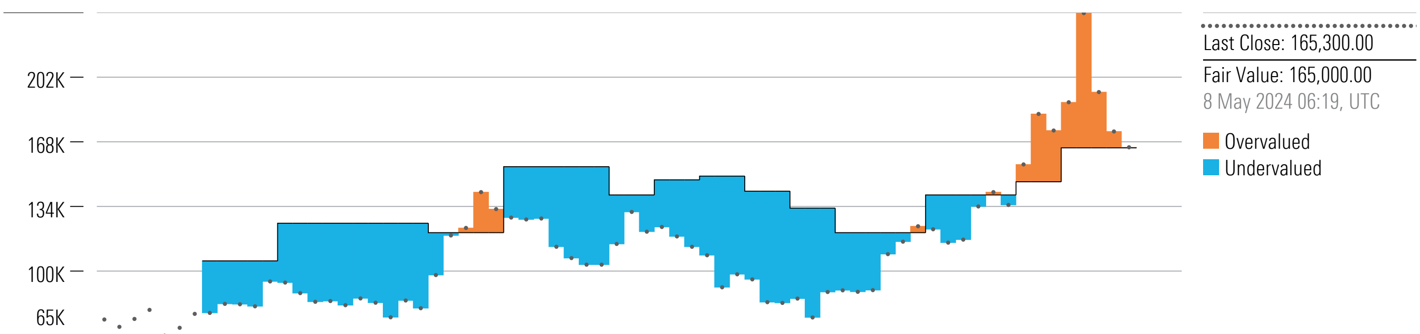


	2019	2020	2021	2022	2023	YTD	
	1.01	1.05	0.93	0.63	1.25	1.10	Price/Fair Value
	75.74	-11.15	17.73	-51.62	65.99	26.03	Total Return %

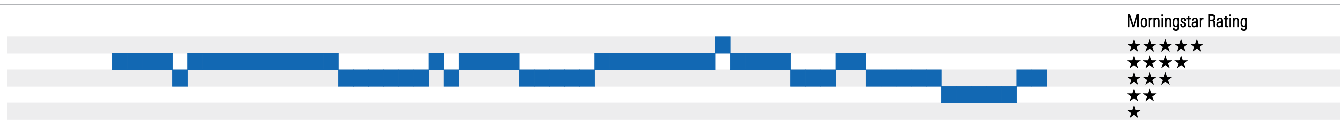


Total Return % as of 25 Sep 2024. Last Close as of 25 Sep 2024. Fair Value as of 1 Aug 2024 02:20, UTC.

SK Hynix Inc 000660



	2019	2020	2021	2022	2023	YTD	
	0.90	0.99	0.94	0.56	1.01	1.00	Price/Fair Value
	57.19	27.00	11.65	-41.87	90.27	17.24	Total Return %



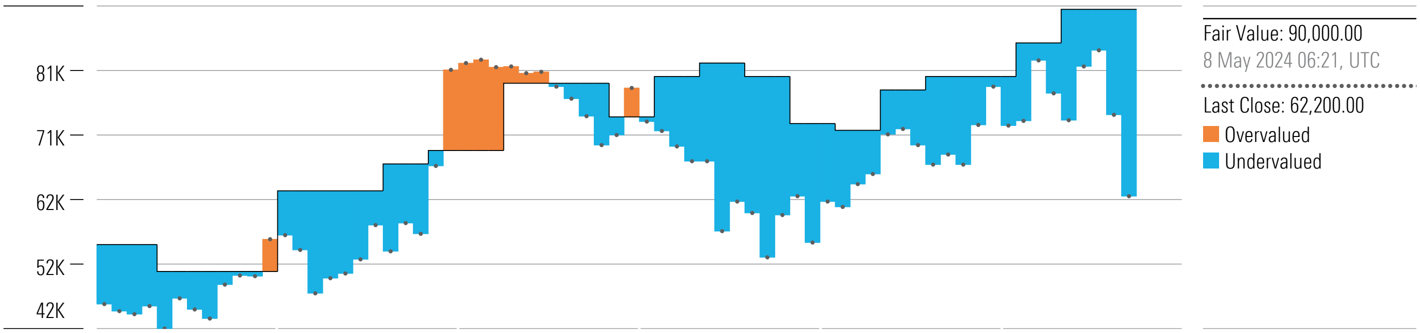
Total Return % as of 25 Sep 2024. Last Close as of 25 Sep 2024. Fair Value as of 8 May 2024 06:19, UTC.

Morningstar Equity Analyst Report | Report as of 26 Sep 2024 00:33, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS

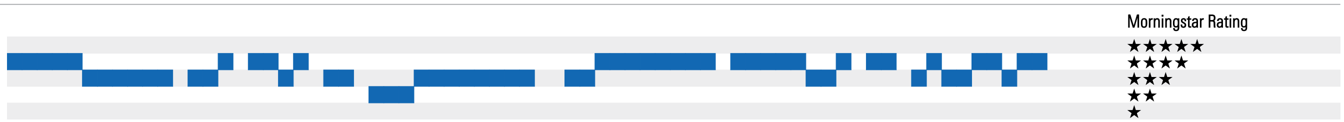
Micron Technology Inc MU ★★★★ 25 Sep 2024 21:25, UTC

Competitors Price vs. Fair Value

Samsung Electronics Co Ltd 005930



	2019	2020	2021	2022	2023	YTD
Price/Fair Value	1.09	1.17	1.06	0.76	0.98	0.69
Total Return %	47.84	50.04	-1.75	-27.60	44.56	-19.84



Total Return % as of 25 Sep 2024. Last Close as of 25 Sep 2024. Fair Value as of 8 May 2024 06:21, UTC.

Morningstar Equity Analyst Report | Report as of 26 Sep 2024 00:33, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 13 of 21

Micron Technology Inc MU ★★★★ 25 Sep 2024 21:25, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
95.77 USD 25 Sep 2024	110.00 USD 27 Jun 2024 00:14, UTC	0.87	106.19 USD Bil 25 Sep 2024	None	Large Value	High	Standard	4 Sep 2024 05:00, UTC

Morningstar Historical Summary

Financials as of 31 May 2024

Fiscal Year, ends 31 Aug	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	YTD	TTM
Revenue (USD Bil)	16	16	12	20	30	23	21	28	31	16	17	21
Revenue Growth %	80.3	-1.0	-23.4	63.9	49.6	-23.0	-8.4	29.3	11.0	-49.5	50.6	17.6
EBITDA (USD Bil)	5.19	5.65	3.14	9.66	19.41	12.60	8.83	12.62	16.88	2.49	5.95	6.56
EBITDA Margin %	31.7	34.9	25.3	47.5	63.9	53.8	41.2	45.5	54.9	16.0	34.3	30.7
Operating Income (USD Bil)	3.37	2.98	0.23	5.86	14.93	7.39	3.06	6.75	9.71	-5.46	-0.28	-1.66
Operating Margin %	20.6	18.4	1.9	28.9	49.1	31.6	14.3	24.3	31.6	-35.1	-1.6	-7.8
Net Income (USD Bil)	3.05	2.90	-0.28	5.09	14.14	6.31	2.69	5.86	8.69	-5.83	-0.11	-1.54
Net Margin %	18.6	17.9	-2.2	25.0	46.5	27.0	12.5	21.2	28.2	-37.5	-0.6	-7.2
Diluted Shares Outstanding (Mil)	1,198	1,170	1,036	1,154	1,229	1,143	1,131	1,141	1,122	1,093	1,104	1,102
Diluted Earnings Per Share (USD)	2.54	2.47	-0.27	4.41	11.51	5.51	2.37	5.14	7.75	-5.34	-0.10	-1.41
Dividends Per Share (USD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.46	0.35	0.46

Valuation as of 30 Aug 2024

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Recent Qtr	TTM
Price/Sales	2.6	1.1	1.7	2.1	1.2	2.9	4.0	3.6	2.0	5.8	6.8	5.0
Price/Earnings	13.8	7.8	-73.0	6.4	2.6	17.2	31.7	14.4	9.0	-13.6	-93.5	-68.0
Price/Cash Flow	7.4	3.4	7.1	4.6	2.1	5.9	10.2	7.4	4.6	46.3	27.1	19.8
Dividend Yield %	—	—	—	—	—	—	—	0.21	0.89	0.54	0.35	0.48
Price/Book	3.5	1.2	2.0	2.1	1.1	1.6	2.2	2.3	1.1	2.2	3.3	2.4
EV/EBITDA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Operating Performance / Profitability as of 31 May 2024

Fiscal Year, ends 31 Aug	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	YTD	TTM
ROA %	14.7	12.5	-1.1	16.2	35.9	13.7	5.2	10.4	13.9	-8.9	—	-2.3
ROE %	30.6	25.1	-2.3	33.2	55.5	18.5	7.2	14.1	18.5	-12.4	—	-3.4
ROIC %	20.7	17.4	0.4	21.8	43.0	15.9	6.3	12.3	16.2	-10.2	—	-2.6
Asset Turnover	0.8	0.7	0.5	0.6	0.8	0.5	0.4	0.5	0.5	0.2	—	0.3

Financial Leverage

Fiscal Year, ends 31 Aug	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Recent Qtr	TTM
Debt/Capital %	31.6	33.9	43.1	34.7	10.5	11.2	15.0	14.0	12.9	23.6	23.4	—
Equity/Assets %	48.0	51.0	43.9	52.7	74.4	73.4	72.6	74.7	75.3	68.7	66.8	—
Total Debt/EBITDA	1.3	1.3	3.2	1.2	0.2	0.5	0.8	0.6	0.4	5.6	2.3	—
EBITDA/Interest Expense	14.7	15.2	7.2	16.1	56.7	98.4	45.5	68.9	89.3	6.4	13.9	11.8

Morningstar Analyst Historical/Forecast Summary as of 01 Jul 2024

Financials

			Estimates		
Fiscal Year, ends 31 Oct 2023	2022	2023	2024	2025	2026
Revenue (USD Mil)	30,758	15,540	25,075	37,092	41,951
Revenue Growth %	11.0	-49.5	61.4	47.9	13.1
EBITDA (USD Mil)	17,397	2,937	9,776	19,628	24,838
EBITDA Margin %	56.6	18.9	39.0	52.9	59.2
Operating Income (USD Mil)	9,716	-5,450	876	10,122	13,257
Operating Margin %	31.6	-35.1	3.5	27.3	31.6
Net Income (USD Mil)	9,369	-4,864	1,296	9,393	12,223
Net Margin %	30.5	-31.3	5.2	25.3	29.1
Diluted Shares Outstanding (Mil)	1,122	1,093	1,095	1,091	1,083
Diluted Earnings Per Share(USD)	8.35	-4.45	1.18	8.61	11.29
Dividends Per Share(USD)	0.42	0.46	0.46	0.48	0.49

Forward Valuation

			Estimates		
	2022	2023	2024	2025	2026
Price/Sales	2.0	4.9	4.2	2.9	2.5
Price/Earnings	6.5	-15.0	81.2	11.1	8.5
Price/Cash Flow	—	—	—	—	—
Dividend Yield %	0.8	0.7	0.5	0.5	0.5
Price/Book	1.2	1.7	2.4	2.0	1.7
EV/EBITDA	3.4	27.3	11.4	5.7	4.5

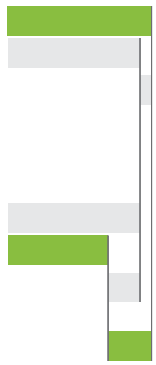
Morningstar Equity Analyst Report | Report as of 26 Sep 2024 00:33, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 14 of 21

Micron Technology Inc MU ★★★★ 25 Sep 2024 21:25, UTC

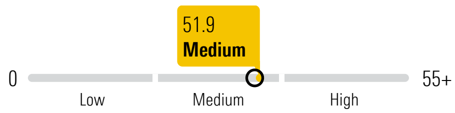
Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
95.77 USD 25 Sep 2024	110.00 USD 27 Jun 2024 00:14, UTC	0.87	106.19 USD Bil 25 Sep 2024	None	Large Value	High	Standard	4 Sep 2024 05:00, UTC

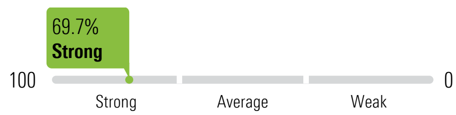
ESG Risk Rating Breakdown

Exposure	
Company Exposure[1]	51.9
– Manageable Risk	47.7
Unmanageable Risk[2]	**4.2**
Management	
Manageable Risk	47.7
– Managed Risk[3]	33.2
Management Gap[4]	**14.5**
Overall Unmanaged Risk	**18.6**



● Subject ○ Subindustry (51.0)





- Exposure represents a company's vulnerability to ESG risks driven by their business model
- Exposure is assessed at the Subindustry level and then specified at the company level
- Scoring ranges from 0-55+ with categories of low, medium, and high-risk exposure

- Management measures a company's ability to manage ESG risks through its commitments and actions
- Management assesses a company's efficiency on ESG programs, practices, and policies
- Management score ranges from 0-100% showing how much manageable risk a company is managing

ESG Risk Rating

ESG Risk Ratings measure the degree to which a company's value is impacted by environmental, social, and governance risks, by evaluating the company's ability to manage the ESG risks it faces.

1. A company's Exposure to material ESG issues 2. Unmanageable Risk refers to risks that are inherent to a particular business model that cannot be managed by programs or initiatives 3. Managed Risk = Manageable Risk multiplied by a Management score of 69.7% 4. Management Gap assesses risks that are not managed, but are considered manageable 5. ESG Risk Rating Assessment = Overall Unmanaged Risk = Management Gap plus Unmanageable Risk

ESG Risk Rating Assessment[5]

ESG Risk Rating is of Sep 04, 2024. Highest Controversy Level is as of Sep 08, 2024. Sustainalytics Subindustry: Semiconductor Design and Manufacturing. Sustainalytics provides Morningstar with company ESG ratings and metrics on a monthly basis and as such, the ratings in Morningstar may not necessarily reflect current Sustainalytics' scores for the company. For the most up to date rating and more information, please visit: sustainalytics.com/esg-ratings/.

Peer Analysis 04 Sep 2024

Peers are selected from the company's Sustainalytics-defined Subindustry and are displayed based on the closest market cap values

Company Name	Exposure			Management			ESG Risk Rating		
Micron Technology Inc	51.9 | Medium	0	55+	69.7 | Strong	100	0	18.6 | Low	0	40+
Western Digital Corp	29.2 | Low	0	55+	69.8 | Strong	100	0	9.5 | Negligible	0	40+
Samsung Electronics Co Ltd	32.1 | Low	0	55+	62.1 | Strong	100	0	13.3 | Low	0	40+
SK Hynix Inc	51.2 | Medium	0	55+	71.9 | Strong	100	0	17.0 | Low	0	40+
—	— | —	0	55+	— | —	100	0	— | —	0	40+

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Appendix
Historical Morningstar Rating

Micron Technology Inc MU 25 Sep 2024 21:25, UTC

Dec 2024	Nov 2024	Oct 2024	Sep 2024	Aug 2024	Jul 2024	Jun 2024	May 2024	Apr 2024	Mar 2024	Feb 2024	Jan 2024
—	—	—	★★★★	★★★	★★★	★★	★	★★	★★	★★	★★
Dec 2023	Nov 2023	Oct 2023	Sep 2023	Aug 2023	Jul 2023	Jun 2023	May 2023	Apr 2023	Mar 2023	Feb 2023	Jan 2023
★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★★	★★★
Dec 2022	Nov 2022	Oct 2022	Sep 2022	Aug 2022	Jul 2022	Jun 2022	May 2022	Apr 2022	Mar 2022	Feb 2022	Jan 2022
★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★	★★★	★★★
Dec 2021	Nov 2021	Oct 2021	Sep 2021	Aug 2021	Jul 2021	Jun 2021	May 2021	Apr 2021	Mar 2021	Feb 2021	Jan 2021
★★★	★★★	★★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★	★★★
Dec 2020	Nov 2020	Oct 2020	Sep 2020	Aug 2020	Jul 2020	Jun 2020	May 2020	Apr 2020	Mar 2020	Feb 2020	Jan 2020
★★	★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★
Dec 2019	Nov 2019	Oct 2019	Sep 2019	Aug 2019	Jul 2019	Jun 2019	May 2019	Apr 2019	Mar 2019	Feb 2019	Jan 2019
★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★

Western Digital Corp WDC 25 Sep 2024 21:30, UTC

Dec 2024	Nov 2024	Oct 2024	Sep 2024	Aug 2024	Jul 2024	Jun 2024	May 2024	Apr 2024	Mar 2024	Feb 2024	Jan 2024
—	—	—	★★★	★★★	★★	★★	★★	★★	★	★★	★★
Dec 2023	Nov 2023	Oct 2023	Sep 2023	Aug 2023	Jul 2023	Jun 2023	May 2023	Apr 2023	Mar 2023	Feb 2023	Jan 2023
★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★★	★★★	★★★	★★★
Dec 2022	Nov 2022	Oct 2022	Sep 2022	Aug 2022	Jul 2022	Jun 2022	May 2022	Apr 2022	Mar 2022	Feb 2022	Jan 2022
★★★★	★★★★	★★★★	★★★★★	★★★★	★★★★	★★★★	★★★	★★★★	★★★★	★★★★	★★★★
Dec 2021	Nov 2021	Oct 2021	Sep 2021	Aug 2021	Jul 2021	Jun 2021	May 2021	Apr 2021	Mar 2021	Feb 2021	Jan 2021
★★★	★★★★	★★★★	★★★★	★★★	★★★	★★★	★★	★★	★★★	★★	★★★
Dec 2020	Nov 2020	Oct 2020	Sep 2020	Aug 2020	Jul 2020	Jun 2020	May 2020	Apr 2020	Mar 2020	Feb 2020	Jan 2020
★★★	★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★	★★★
Dec 2019	Nov 2019	Oct 2019	Sep 2019	Aug 2019	Jul 2019	Jun 2019	May 2019	Apr 2019	Mar 2019	Feb 2019	Jan 2019
★★★	★★★★	★★★	★★★	★★★	★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★

SK Hynix Inc 000660 25 Sep 2024 12:15, UTC

Dec 2024	Nov 2024	Oct 2024	Sep 2024	Aug 2024	Jul 2024	Jun 2024	May 2024	Apr 2024	Mar 2024	Feb 2024	Jan 2024
—	—	—	★★★	★★★	★★	★★	★★	★★	★★	★★★	★★★
Dec 2023	Nov 2023	Oct 2023	Sep 2023	Aug 2023	Jul 2023	Jun 2023	May 2023	Apr 2023	Mar 2023	Feb 2023	Jan 2023
★★★	★★★	★★★	★★★★	★★★★	★★★	★★★	★★★	★★★★	★★★★	★★★★	★★★★
Dec 2022	Nov 2022	Oct 2022	Sep 2022	Aug 2022	Jul 2022	Jun 2022	May 2022	Apr 2022	Mar 2022	Feb 2022	Jan 2022
★★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★	★★★	★★★
Dec 2021	Nov 2021	Oct 2021	Sep 2021	Aug 2021	Jul 2021	Jun 2021	May 2021	Apr 2021	Mar 2021	Feb 2021	Jan 2021
★★★	★★★	★★★★	★★★★	★★★★	★★★★	★★★	★★★★	★★★	★★★	★★★	★★★
Dec 2020	Nov 2020	Oct 2020	Sep 2020	Aug 2020	Jul 2020	Jun 2020	May 2020	Apr 2020	Mar 2020	Feb 2020	Jan 2020
★★★	★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★
Dec 2019	Nov 2019	Oct 2019	Sep 2019	Aug 2019	Jul 2019	Jun 2019	May 2019	Apr 2019	Mar 2019	Feb 2019	Jan 2019
★★★	★★★★	★★★★	★★★★	★★★★	—	—	—	—	—	—	—

Morningstar Equity Analyst Report | Report as of 26 Sep 2024 00:33, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 16 of 21

Samsung Electronics Co Ltd 005930 25 Sep 2024 12:14, UTC

Dec 2024	Nov 2024	Oct 2024	Sep 2024	Aug 2024	Jul 2024	Jun 2024	May 2024	Apr 2024	Mar 2024	Feb 2024	Jan 2024
—	—	—	★★★★	★★★★	★★★	★★★★	★★★★	★★★	★★★	★★★★	★★★
Dec 2023	Nov 2023	Oct 2023	Sep 2023	Aug 2023	Jul 2023	Jun 2023	May 2023	Apr 2023	Mar 2023	Feb 2023	Jan 2023
—	★★★★	★★★★	—	★★★★	★★★	★★★	★★★★	★★★★	★★★★	★★★★	★★★★
Dec 2022	Nov 2022	Oct 2022	Sep 2022	Aug 2022	Jul 2022	Jun 2022	May 2022	Apr 2022	Mar 2022	Feb 2022	Jan 2022
—	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★	★★★	—
Dec 2021	Nov 2021	Oct 2021	Sep 2021	Aug 2021	Jul 2021	Jun 2021	May 2021	Apr 2021	Mar 2021	Feb 2021	Jan 2021
—	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★★	★★	★★	★★
Dec 2020	Nov 2020	Oct 2020	Sep 2020	Aug 2020	Jul 2020	Jun 2020	May 2020	Apr 2020	Mar 2020	Feb 2020	Jan 2020
—	★★★	★★★	—	★★★★	★★★	★★★★	★★★★	—	★★★★	★★★	★★★
Dec 2019	Nov 2019	Oct 2019	Sep 2019	Aug 2019	Jul 2019	Jun 2019	May 2019	Apr 2019	Mar 2019	Feb 2019	Jan 2019
—	★★★	★★★	★★★	★★★	★★★	★★★	★★★★	★★★★	★★★★	★★★★	★★★★

Research Methodology for Valuing Companies

Overview

At the heart of our valuation system is a detailed projection of a company's future cash flows, resulting from our analysts' research. Analysts create custom industry and company assumptions to feed income statement, balance sheet, and capital investment assumptions into our globally standardized, proprietary discounted cash flow, or DCF, modeling templates. We use scenario analysis, indepth competitive advantage analysis, and a variety of other analytical tools to augment this process. Moreover, we think analyzing valuation through discounted cash flows presents a better lens for viewing cyclical companies, high-growth firms, businesses with finite lives (e.g., mines), or companies expected to generate negative earnings over the next few years. That said, we don't dismiss multiples altogether but rather use them as supporting cross-checks for our DCF-based fair value estimates. We also acknowledge that DCF models offer their own challenges (including a potential proliferation of estimated inputs and the possibility that the method may miss shortterm market-price movements), but we believe these negatives are mitigated by deep analysis and our longterm approach.

Morningstar's equity research group ("we," "our") believes that a company's intrinsic worth results from the future cash flows it can generate. The Morningstar Rating for stocks identifies stocks trading at a discount or premium to their intrinsic worth—or fair value estimate, in Morningstar terminology. Five-star stocks sell for the biggest risk adjusted discount to their fair values, whereas 1-star stocks trade at premiums to their intrinsic worth.

Four key components drive the Morningstar rating: (1) our assessment of the firm's economic moat, (2) our estimate of the stock's fair value, (3) our uncertainty around that fair value estimate and (4) the current market price. This process ultimately culminates in our singlepoint star rating.

1. Economic Moat

The concept of an economic moat plays a vital role not only in our qualitative assessment of a firm's long-term investment potential, but also in the actual calculation of our fair value estimates. An economic moat is a structural feature that allows a firm to sustain excess profits over a long period of time. We define economic profits as returns on invested capital (or ROIC) over and above our estimate of a firm's cost of capital, or weighted average cost of capital (or WACC). Without a moat, profits are more susceptible to competition. We have identified five sources of economic moats: intangible assets, switching costs, network effect, cost advantage, and efficient scale.

Companies with a narrow moat are those we believe are more likely than not to achieve normalized excess returns for at least the next 10 years. Wide-moat companies are those in which we have very high confidence that excess returns will remain for 10 years, with excess returns more likely than not to remain for at least 20 years. The longer a firm generates economic profits, the higher its intrinsic value. We believe low-quality, no-moat companies will see their normalized returns gravitate toward the firm's cost of capital more quickly than companies with moats.

When considering a company's moat, we also assess whether there is a substantial threat of value destruction, stemming from risks related to ESG, industry disruption, financial health, or other idiosyncratic issues. In this context, a risk is considered potentially value destructive if its occurrence would eliminate a firm's economic profit on a cumulative or midcycle basis. If we deem the probability of occurrence sufficiently high, we would not characterize the company as possessing an economic moat.

2. Estimated Fair Value

Combining our analysts' financial forecasts with the firm's economic moat helps us assess how long returns on invested capital are likely to exceed the firm's cost of capital. Returns of firms with a wide economic moat rating are assumed to fade to the perpetuity period over a longer period of time than the returns of narrow-moat firms, and both will fade slower than no-moat firms, increasing our estimate of their intrinsic value.

Our model is divided into three distinct stages:

Stage I: Explicit Forecast

In this stage, which can last five to 10 years, analysts make full financial statement forecasts, including items such as revenue, profit margins, tax rates, changes in workingcapital accounts, and capital spending. Based on these projections, we calculate earnings before interest, after taxes (EBI) and the net new investment (NNI) to derive our annual free cash flow forecast.

Stage II: Fade

The second stage of our model is the period it will take the company's return on new invested capital—the return on capital of the next dollar invested ("RONIC")—to decline (or rise) to its cost of capital. During the Stage II period, we use a formula to approximate cash flows in lieu of explicitly modeling the income statement, balance sheet, and cash flow statement as we do in Stage I. The length of the second stage depends on the strength of the company's economic moat. We forecast this period to last anywhere from one year (for companies with no economic moat) to 10–15 years or more (for wide-moat companies). During this period, cash flows are forecast using four assumptions: an average growth rate for EBI over the period, a normalized investment rate, average return on new invested capital (RONIC), and the number of years until perpetuity, when excess returns cease. The investment rate and return on new invested capital decline until a perpetuity value is calculated. In the case of firms that do not earn their cost of capital, we assume marginal ROICs rise to the firm's cost of capital (usually attributable to less reinvestment), and we may truncate the second stage.

Stage III: Perpetuity

Once a company's marginal ROIC hits its cost of capital, we calculate a continuing value, using a standard perpetuity formula. At perpetuity, we assume that any growth or decline or investment in the business neither creates nor destroys value and that any new investment provides a return in line with estimated WACC.

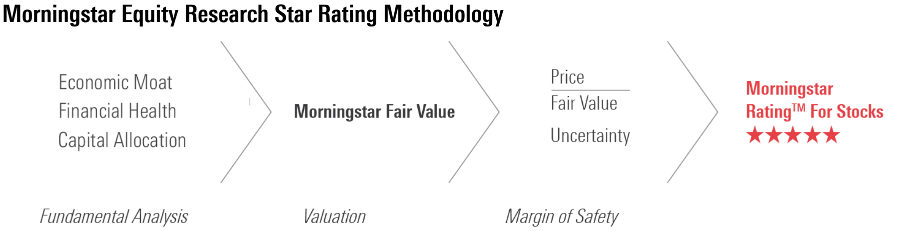
Because a dollar earned today is worth more than a dollar earned tomorrow, we discount our projections of cash flows in stages I, II, and III to arrive at a total present value of expected future cash flows. Because we are modeling free cash flow to the firm—representing cash available to provide a return to all capital providers—we discount future cash flows using the WACC, which is a weighted average of the costs of equity, debt, and preferred stock (and any other funding sources), using expected future proportionate long-term, market-value weights.

3. Uncertainty Around That Fair Value Estimate

Morningstar's Uncertainty Rating is designed to capture the range of potential outcomes for a company's intrinsic value. This rating is used to assign the margin of safety required before investing, which in turn explicitly drives our stock star rating system. The Uncertainty Rating is aimed at identifying the confidence we should have in assigning a fair value estimate for a given stock.

Our Uncertainty Rating is meant to take into account anything that can increase the potential dispersion of future outcomes for the intrinsic value of a company, and any-

Morningstar Equity Research Star Rating Methodology



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thing that can affect our ability to accurately predict these outcomes. The rating begins with a suggested rating produced by a quantitative process based on the trailing 12-month standard deviation of daily stock returns. An analyst overlay is then applied, with analysts using the suggested rating, historical rating data, and their own knowledge of the company to inform them as they make the final Uncertainty Rating decision. Ultimately, the rating decision rests with the analyst. Analysts take into account many characteristics when making their final decision, including cyclical factors, operational and financial factors such as leverage, company-specific events, ESG risks, and anything else that might increase the potential dispersion of future outcomes and our ability to estimate those outcomes.

Our recommended margin of safety—the discount to fair value demanded before we'd recommend buying or selling the stock—widens as our uncertainty of the estimated value of the equity increases. The more uncertain we are about the potential dispersion of outcomes, the greater the discount we require relative to our estimate of the value of the firm before we would recommend the purchase of the shares. In addition, the Uncertainty Rating provides guidance in portfolio construction based on risk tolerance.

Our Uncertainty Ratings are: Low, Medium, High, Very High, and Extreme.

	Margin of Safety	
Qualitative Analysis Uncertainty Ratings	★★★★★Rating	★Rating
Low	20% Discount	25% Premium
Medium	30% Discount	35% Premium
High	40% Discount	55% Premium
Very High	50% Discount	75% Premium
Extreme	75% Discount	300% Premium

Our uncertainty rating is based on the interquartile range, or the middle 50% of potential outcomes, covering the 25th percentile–75th percentile. This means that when a stock hits 5 stars, we expect there is a 75% chance that the intrinsic value of that stock lies above the current market price. Similarly, when a stock hits 1 star, we expect there is a 75% chance that the intrinsic value of that stock lies below the current market price.

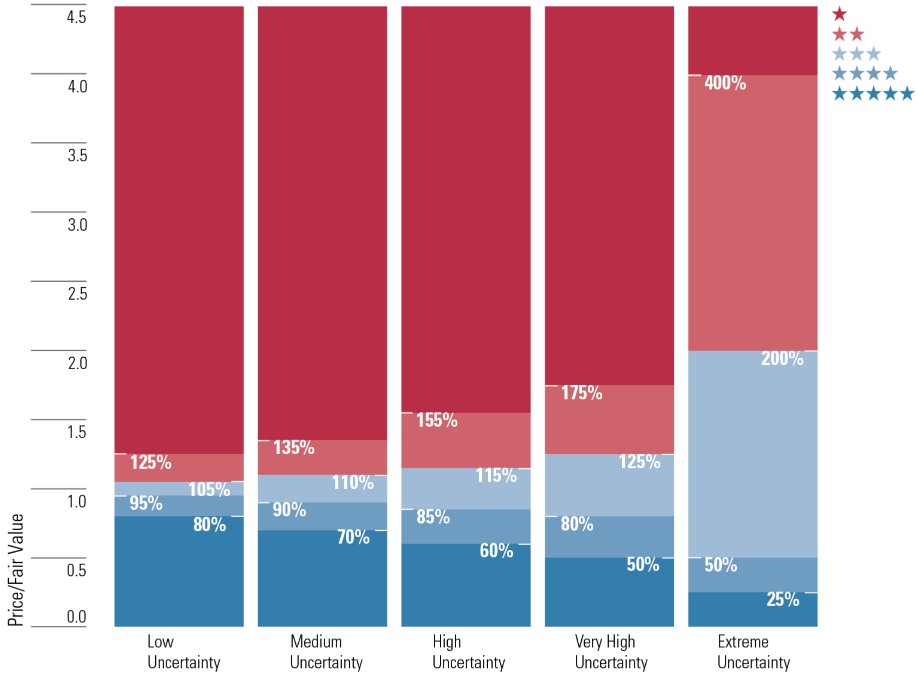
4. Market Price

The market prices used in this analysis and noted in the report come from exchange on which the stock is listed which we believe is a reliable source.

For more details about our methodology, please go to https://shareholders.morningstar.com

Morningstar Star Rating for Stocks

Morningstar Equity Research Star Rating Methodology



Once we determine the fair value estimate of a stock, we compare it with the stock's current market price on a daily basis, and the star rating is automatically re-calculated at the market close on every day the market on which the stock is listed is open. Our analysts keep close tabs on the companies they follow, and, based on thorough and ongoing analysis, raise or lower their fair value estimates as warranted.

Please note, there is no predefined distribution of stars. That is, the percentage of stocks that earn 5 stars can fluctuate daily, so the star ratings, in the aggregate, can serve as a gauge of the broader market's valuation. When there are many 5-star stocks, the stock market as a whole is more undervalued, in our opinion, than when very few companies garner our highest rating.

We expect that if our base-case assumptions are true the market price will converge on our fair value estimate over time generally within three years (although it is impossible to predict the exact time frame in which market prices may adjust).

Our star ratings are guideposts to a broad audience and individuals must consider their own specific investment goals, risk tolerance, tax situation, time horizon, income needs, and complete investment portfolio, among other factors.

The Morningstar Star Ratings for stocks are defined below:

★★★★★ We believe appreciation beyond a fair risk adjusted return is highly likely over a multiyear time frame. Scenario analysis developed by our analysts indicates that the current market price represents an excessively pessimistic outlook, limiting downside risk and maximizing upside potential.

★★★★ We believe appreciation beyond a fair risk-adjusted return is likely.

★★★ Indicates our belief that investors are likely to receive a fair risk-adjusted return (approximately cost of equity).

★★ We believe investors are likely to receive a less than fair risk-adjusted return.

★ Indicates a high probability of undesirable risk-adjusted returns from the current market price over a multiyear time frame, based on our analysis. Scenario analysis by our analysts indicates that the market is pricing in an excessively optimistic outlook, limiting upside potential and leaving the investor exposed to Capital loss.

Other Definitions

Last Price: Price of the stock as of the close of the market of the last trading day before date of the report.

Capital Allocation Rating: Our Capital Allocation (or Stewardship) Rating represents our assessment of the quality of management's capital allocation, with particular emphasis on the firm's balance sheet, investments, and shareholder distributions. Analysts consider compan-

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ies' investment strategy and valuation, balance sheet management, and dividend and share buyback policies. Corporate governance factors are only considered if they are likely to materially impact shareholder value, though either the balance sheet, investment, or shareholder distributions. Analysts assign one of three ratings: "Exemplary", "Standard", or "Poor". Analysts judge Capital Allocation from an equity holder's perspective. Ratings are determined on a forward looking and absolute basis. The Standard rating is most common as most managers will exhibit neither exceptionally strong nor poor capital allocation.

Capital Allocation (or Stewardship) analysis published prior to Dec. 9, 2020, was determined using a different process. Beyond investment strategy, financial leverage, and dividend and share buyback policies, analysts also considered execution, compensation, related party transactions, and accounting practices in the rating.

Capital Allocation Rating: Our Capital Allocation (or Stewardship) Rating represents our assessment of the quality of management's capital allocation, with particular emphasis on the firm's balance sheet, investments, and shareholder distributions. Analysts consider companies' investment strategy and valuation, balance sheet management, and dividend and share buyback policies. Corporate governance factors are only considered if they are likely to materially impact shareholder value, though either the balance sheet, investment, or shareholder distributions. Analysts assign one of three ratings: "Exemplary", "Standard", or "Poor". Analysts judge Capital Allocation from an equity holder's perspective. Ratings are determined on a forward looking and absolute basis. The Standard rating is most common as most managers will exhibit neither exceptionally strong nor poor capital allocation.

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Sustainalytics ESG Risk Rating Assessment: The ESG Risk Rating Assessment is provided by Sustainalytics; a Morningstar company.

Sustainalytics' ESG Risk Ratings measure the degree to which company's economic value at risk is driven by environment, social and governance (ESG) factors.

Sustainalytics analyzes over 1,300 data points to assess a company's exposure to and management of ESG risks. In other words, ESG Risk Ratings measures a company's unmanaged ESG Risks represented as a quantitative score. Unmanaged Risk is measured on an open-ended scale starting at zero (no risk) with lower scores representing less unmanaged risk and, for 95% of cases, the unmanaged ESG Risk score is below 50.

Based on their quantitative scores, companies are grouped into one of five Risk Categories (negligible, low, medium, high, severe). These risk categories are absolute, meaning that a 'high risk' assessment reflects a comparable degree of unmanaged ESG risk across all subindustries covered.

The ESG Risk Rating Assessment is a visual representation of Sustainalytics ESG Risk Categories on a 1 to 5 scale. Companies with Negligible Risk = 5 Globes, Low Risk = 4, Medium Risk = 3 Globes, High Risk = 2 Globes, Severe Risk = 1 Globe. For more information, please visit sustainalytics.com/esg-ratings/

Ratings should not be used as the sole basis in evaluating a company or security. Ratings involve unknown risks and uncertainties which may cause our expectations not to occur or to differ significantly from what was expected and should not be considered an offer or solicitation to buy or sell a security.

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