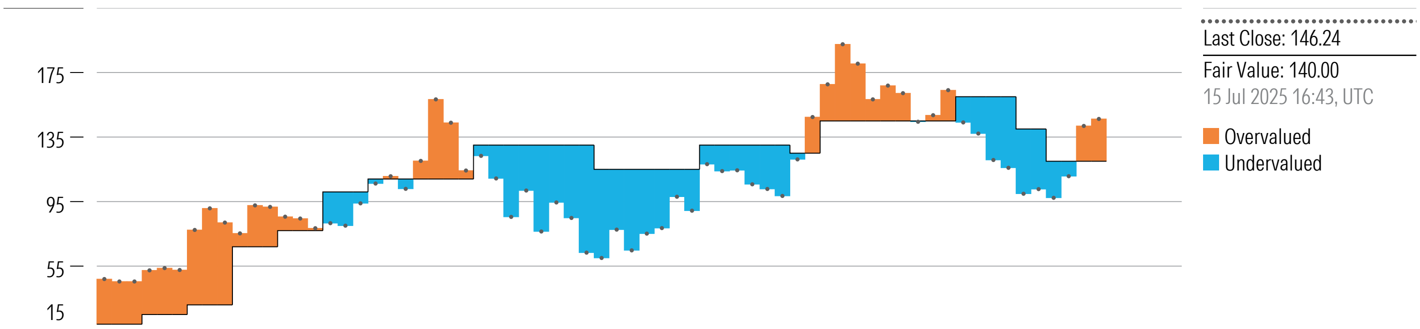
Morningstar Equity Analyst Report | Report as of 15 Jul 2025 16:52, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS

Advanced Micro Devices Inc AMD ★★★ 15 Jul 2025 16:47, UTC

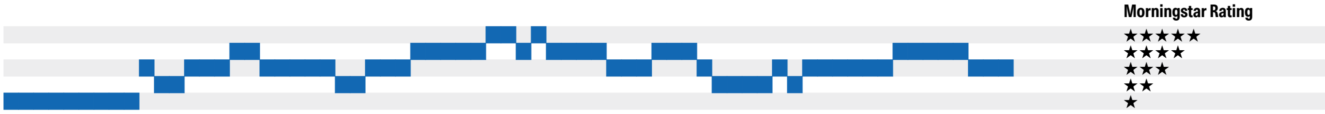
Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
146.24 USD 14 Jul 2025	140.00 USD 15 Jul 2025 16:43, UTC	1.04	252.55 USD Bil 15 Jul 2025	Narrow	Large Growth	Very High	Exemplary	4 Jun 2025 05:00, UTC

Price vs. Fair Value



	2020	2021	2022	2023	2024	YTD	
	1.37	1.32	0.56	1.18	0.75	1.04	Price/Fair Value
	99.98	56.91	-54.99	127.59	-18.06	21.07	Total Return %

Morningstar Rating



Total Return % as of 14 Jul 2025. Last Close as of 14 Jul 2025. Fair Value as of 15 Jul 2025 16:43, 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.

AMD: Raising Fair Value Estimate to $140 From $120 as Ban on AMD's Sales Into China Will Be Reversed

Analyst Note Brian Colello, CPA, Senior Equity Analyst, 15 Jul 2025

AMD has learned that the US will reverse course and approve the sale of its MI308X graphics processors, or GPUs, into China for artificial intelligence workloads. Sales of the MI308X were banned 90 days ago, causing AMD to incur an $800 million write-off.

Why it matters: We're pleasantly surprised by the US reversal, as both AMD and rival Nvidia are now allowed to support China's AI aspirations. The MI308X is not AMD's most advanced product, but it presents another potential customer base for AMD's budding AI aspirations versus Nvidia.

- We assume the reversal stays in place going forward, although we are cautiously, rather than wholly, optimistic about the latest restrictions. If retained, we still view Nvidia as the dominant AI supplier into China, but we're encouraged that AMD will have chances to compete.

The bottom line: We raise our fair value estimate for narrow-moat AMD to $140 from $120. This raise is the inverse of our cut in April to $120 from $140 when the ban was implemented. We maintain our Very High uncertainty rating for AMD.

- Shares appear modestly overvalued as we think its AI prospects might be a tad overestimated by the market. We view Nvidia as the bigger winner from the reversal, as Nvidia's H20 products are vital to China's AI buildouts, and China may rush to buy more H20s than ever before.
- We are re-inserting $1.2 billion of revenue in 2025 and $2.8 billion to our 2029 AI GPU estimates for

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Sector	Industry
Technology	Semiconductors

Business Description

Advanced Micro Devices designs a variety of digital semiconductors for markets such as PCs, gaming consoles, data centers, industrial, and automotive applications. AMD's traditional strength was in central processing units and graphics processing units used in PCs and data centers. Additionally, the firm supplies the chips found in prominent game consoles such as the Sony PlayStation and Microsoft Xbox. In 2022, the firm acquired field-programmable gate array leader Xilinx to diversify its business and augment its opportunities in key end markets such as data center and automotive.

AMD. We also boost our near-term gross margin estimates as we assume much of the prior write-off will be reversed.

Long view: The US reversal may signal a change in overall AI policy toward China.

- Rather than block U.S. AI accelerator sales into China, thus enabling Chinese AI firms to support other vendors like Huawei, these firms might remain dependent on the hardware, software, and networking provided by US firms—predominantly Nvidia, but perhaps AMD as well.

Business Strategy & Outlook Brian Colello, CPA, Senior Equity Analyst, 30 Oct 2024

Advanced Micro Devices has a wealth of digital semiconductor expertise and is well positioned to prosper from favorable trends in data centers and artificial intelligence. We consider AMD to be one of two notable firms in graphics processing units, which are especially well suited for AI. The company may play second fiddle to Nvidia in AI GPUs, but its GPU expertise should become increasingly valuable, and lucrative, in the years ahead.

AMD's primary products include processors and GPUs tailored to PCs, game consoles, and servers. In our view, AMD's PC and server success stems from the rare x86 architecture license that it possesses from Intel, which allows AMD and Intel to build x86 CPUs for Microsoft Windows PCs. We view it as a heavy lift for Windows to rewrite its x86 software to work with other processors, but Apple made this move in recent years to support its internal ARM-based processors. ARM will likely gain share in the PC market, but we still expect x86-based chips from AMD and Intel to retain leadership in the Windows PC market for quite some time.

AMD has benefited from its outsourced manufacturing model, as its tight relationship with industry leader Taiwan Semiconductor enabled AMD to grab a technological lead as its rival, Intel, stumbled with its internal manufacturing roadmap. We anticipate that AMD will continue to gain market share over the next few years as Intel strives to turn it around, but AMD's gains could be longer lasting if Intel were to stumble further.

We think AMD's data center business should boom over the next few years. Its server CPUs should be in high demand, as should its GPUs suited for AI workloads. AMD pegs the total addressable market for AI accelerators, such as GPUs, at $500 billion by 2028. While we foresee Nvidia capturing the bulk of this value over the next several years, we think that all AI vendors and customers will seek alternatives to keep Nvidia's dominance at bay, and AMD might be the best positioned to emerge as a second source in AI.

Bulls Say Brian Colello, CPA, Senior Equity Analyst, 15 Jul 2025

- AMD has gained market share in the PC CPU market as Intel's manufacturing prowess has hit several road bumps in recent years.

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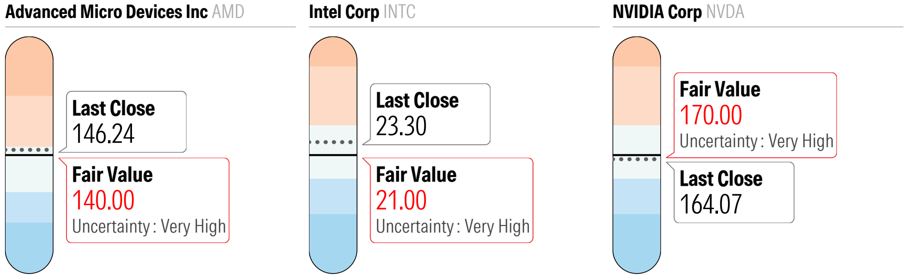
Competitors



	Advanced Micro Devices Inc AMD	Intel Corp INTC	NVIDIA Corp NVDA
Economic Moat	Narrow	None	Wide
Currency	USD	USD	USD
Fair Value	140.00 15 Jul 2025 16:43, UTC	21.00 2 Aug 2024 03:48, UTC	170.00 15 Jul 2025 16:07, UTC
1-Star Price	245.00	36.75	297.50
5-Star Price	70.00	10.50	85.00
Assessment	Fairly Valued 14 Jul 2025	Fairly Valued 14 Jul 2025	Fairly Valued 15 Jul 2025
Morningstar Rating	★★★15 Jul 2025 16:47, UTC	★★★14 Jul 2025 21:22, UTC	★★★15 Jul 2025 16:09, UTC
Analyst	Brian Colello, Senior Equity Analyst	Brian Colello, Senior Equity Analyst	Brian Colello, Senior Equity Analyst
Capital Allocation	Exemplary	Standard	Exemplary
Price/Fair Value	1.04	1.11	1.01
Price/Sales	8.61	1.89	27.32
Price/Book	4.10	1.02	47.72
Price/Earning	100.11	—	52.93
Dividend Yield	0.00%	0.54%	—
Market Cap	237.11 Bil	101.63 Bil	4,001.27 Bil
52-Week Range	76.48—185.50	17.67—37.16	86.62—167.89
Investment Style	Large Growth	Large Blend	Large Growth

- AMD's partnership with chip manufacturing leader TSMC, plus its adoption of a chiplet manufacturing strategy, has allowed the company to come to market with more formidable products and greater flexibility to bring new products to market quickly.
- AI offers a massive opportunity to GPU makers, and while AMD lags industry leader Nvidia, we see plenty of room in the AI market for GPU alternatives such as AMD's products.

Bears Say Brian Colello, CPA, Senior Equity Analyst, 15 Jul 2025

- Despite AMD's recent share gains, Intel remains the industry leader in PC CPUs and might recapture the vast majority of the market if it can deliver industry-leading manufacturing capabilities once again.
- AMD will need to improve its software capabilities to make a dent in Nvidia's AI dominance, as Nvidia is strong in not only GPUs but associated AI software tools.
- AMD's gaming semicustom chip business is beholden to the design cycles and launches of new gaming consoles, and it might be a couple of more years until next-generation consoles arrive.

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Economic Moat Brian Colello, CPA, Senior Equity Analyst, 30 Oct 2024

We assign AMD a narrow economic moat based on intangible assets around a variety of chip designs (including those from Xilinx, which we rated as having a narrow moat before it was acquired in 2022). We think it is more likely than not that AMD will generate excess returns on capital over the next 10 years, and perhaps even longer.

AMD is perhaps best known for its CPUs for PC desktops and notebooks within its client business segment. We think that AMD has a moat in this business, not only because of chip design expertise honed over decades, but also because AMD is one of two prominent firms to hold an x86 instruction set architecture license.

Intel initially developed x86 in the 1970s and licensed the architecture to AMD to satisfy conditions from IBM that required a second source of chips. Intel and AMD are the primary licensees of x86 and owners of x86 intellectual property, as they have a cross-licensing agreement that covers the x86 patent portfolio and would be terminated if either firm were acquired or had a change of control. The exclusivity of the x86 license serves as a significant barrier to entry for other chipmakers (such as Qualcomm and Apple) that cannot make an x86 processor without a license.

For many years, effectively all PC software (including Microsoft's Windows, Apple's Mac operating systems, and any desktop software applications running on both operating systems) was designed for the x86 architecture. Software makers could not easily deviate from building x86-optimized applications, while Microsoft and Apple would have a heavy lift to convert their operating systems to alternate instruction sets (such as those by ARM, which is the dominant instruction set for mobile devices, used in processors from Qualcomm, Samsung, Apple's iPhone and others). In turn, Apple (for the Mac) and PC vendors (for Windows machines) had little choice than to buy x86 processors from (mostly) Intel or (on occasion) AMD to run their PCs.

Today, however, Apple has already done the heavy lifting of converting its Mac software to ARM and has now built excellent in-house processors for its Mac lineup. Further, an increasing portion of software is hosted in the cloud and can run on multiple operating systems and isn't tied to only x86 devices. Microsoft has dabbled in ARM-based versions of Windows and may increase these investments over time. We still think it would be a heavy lift for any on-device software makers to port their software to be compatible with ARM-based PCs, but we think the writing is on the wall here to move such software to the cloud or on to ARM-based devices like the Mac. Thus, we don't think the x86 architecture is as moaty as it once was, although we still foresee x86-based processors from Intel and AMD as making up a significant portion of the PC market for the next several years.

In years past, Intel dominated the PC market, not only because of its x86 know-how, but also its internal manufacturing advantage over virtually any other chipmaker, which allowed Intel to come out with best-of-breed products that made it nearly impossible for AMD to gain meaningful market share. These dynamics have flipped in recent years, however, as Intel has stumbled in internal manufacturing. Meanwhile, AMD has partnered closely with Taiwan Semiconductor, the world's largest outsourced chip manufacturer. TSMC now has a market lead in making cutting-edge chips, and AMD is bringing more competitive products to the PC market. Further, AMD has focused on a chiplet strategy with TSMC that is improving yields and flexibility, boosting AMD's portfolio even further.

In turn, AMD has gained market share from Intel in PCs in recent years. Intel is investing heavily in new process nodes to strive for manufacturing parity, if not leadership, with TSMC. If Intel is successful, it could regain some lost x86 PC market share. However, we no longer view AMD as an also-ran in PC CPUs, and even if Intel were to improve, we still think AMD could retain enough customers to maintain a healthy PC business.

In server CPUs within AMD's data center segment, we see similar dynamics where most of the software (particularly in the enterprise) is based on x86, and we think AMD has a moat in this segment too. Again, Intel's manufacturing stumbles and AMD's partnership with TSMC have enabled AMD to gain market share and profitability, and we don't think Intel will easily recapture such share even if its internal manufacturing were to improve.

We also think that any cloud-based software vendors face high switching costs to move their software from x86 servers and on to ARM-based servers, although the switching costs are likely far lower between hosting software on an Intel x86 server versus an AMD one. Still, like the PC market, we see ARM-based processors as a threat, as Amazon, Nvidia, and others are developing ARM-based processors to run traditional server workloads, as well as AI applications. Optimizing data center architectures and workloads for ARM-based servers, rather than x86 ones, is again a heavy lift, from what we can gather. Still, we recognize that mega-cap tech firms and cloud leaders (Microsoft, Apple, Amazon) may have the incentive to do so if they can use ARM-based processors to elevate their data centers and devices. Ultimately, we don't foresee a mass exodus away from x86 architectures in the data center for the next several years.

Looking ahead, we think AMD's graphics processing unit expertise is becoming increasingly valuable in AI applications. GPUs perform parallel processing, in contrast to the serial processing performed by CPUs, to run the software and applications on PCs. In the past decade, the parallel processing of GPUs was found to more efficiently run the matrix multiplication algorithms needed to power artificial intelligence models. AMD is working diligently to deliver AI-centric GPUs to market.

However, Nvidia has a clear lead in GPU hardware and has captured the vast majority of AI training workloads today. It has spent a decade or more developing its CUDA software platform, creating and hosting a variety of libraries, compilers, frameworks, and development tools that allowed AI professionals to build their models. CUDA is proprietary to Nvidia and only runs on Nvidia GPUs, so we think it will take some effort for AI customers to port any AI models based on CUDA over to AMD's hardware.

That said, since Nvidia and CUDA are clearly dominant in AI GPUs today, we think leading cloud vendors will continue to seek second sources for AI and have the necessary incentives to port AI models from Nvidia to other vendors, at least enough to keep Nvidia honest as a vendor. In-house chip development by the hyperscalers will continue, but partnerships with AMD may emerge as well, assuming AMD can improve upon its software chops to allow new customers to use AMD's GPUs for AI training.

We view AMD's embedded business as moaty, as this business is mostly inorganic from the acquisition of Xilinx. We long believed that Xilinx warranted a narrow moat, based on its expertise in the field-programmable gate array niche of the broader chip industry (with Intel-Altera being the other major FPGA supplier). Although FPGAs are standard components that can be sold to many different users for a multitude of applications, converting a complex algorithm to an efficient custom hardware architecture can be an arduous task. Customers are generally reluctant to switch FPGA vendors, which would require their engineers to learn new software and design tools. Some of Xilinx's FPGAs are used extensively in communication equipment that may have operational lifetimes of at least a decade if not longer. Thus, it can not only be difficult for new entrants to gain market share but also less likely that existing customers defect from Altera (owned by Intel) to Xilinx or vice versa.

We generally do not view AMD's discrete GPU business for gaming nor its semicustom chip business for gaming consoles as moaty, although we acknowledge that the chip design expertise for both likely aided AMD in its ability to deliver profitable GPUs to the data center in the future. In gaming, we think AMD has intangible assets related to GPU patents and chip design expertise. However, it did not lead to excess returns on capital for AMD when its CPU business was lagging, and we believe AMD's GPU operating margins lag its CPU business.

Fair Value and Profit Drivers Brian Colello, CPA, Senior Equity Analyst, 15 Jul 2025

Our fair value estimate is $140 per share, which implies a 2025 adjusted price/earnings ratio of 27.5 times and a 3% free cash flow yield.

We expect AMD to achieve a top-line compound annual growth rate of 17% from 2025 to 2029. We model 33% growth in 2025, up from our prior estimate of 12%, as the U.S. will reverse AI GPU restrictions against chips sold into China. We model an average annual growth rate of 13% from 2026 to 2029, as AMD's data center GPU business gains momentum in AI applications.

We are most bullish on the data center segment, in which AMD forecasts a total available market of more than $500 billion for AI accelerators, such as GPUs, by 2028. We're cautious about the market reaching these lofty levels, but we think that firms like AMD, Nvidia, and others will get close to this figure over time. Regardless, AI accelerators represent a massive opportunity for many companies, including AMD.

For AMD's data center segment, which includes both x86 server CPUs and AI GPUs, we model a 20% revenue CAGR over the next five years. Within this segment, we think AMD can carve out a decent portion of the AI accelerator market over time, although our expectations at the start of 2025 are less bullish than what we modeled when AMD's GPUs were introduced in 2024. We model AMD's AI GPU revenue reaching $8.2 billion in 2025 versus $5.0 billion earned in 2024 and nearly zero revenue earned in 2023 and prior.

We model AMD reaching $17.9 billion in AI GPU revenue in 2029. In turn, AMD's GPU revenue should grow at a 29% CAGR over the next five years. While these estimates pale in comparison to the $115 billion in revenue that Nvidia earned in calendar 2024, AI GPUs should still represent an impressive windfall for AMD in the years ahead.

In client revenue (PC CPUs), we model a 16% CAGR over the next five years as AMD gains market share from Intel, although tariffs may stunt sales of PCs in general. In gaming, AMD faced a brutal downturn in 2024 due to aging gaming consoles. We model a 20% CAGR in the next five years, but off of this trough in business conditions. We anticipate that AMD will retain its semi-custom processor business within upcoming gaming consoles released by Microsoft and Sony in the future. We model a 5% CAGR for AMD's embedded business.

Adjusted gross margin expanded from 45% in 2020 to 53% in 2024. As AMD grows in client and data center revenue, adjusted gross margin should expand to the high 50% range and should reach management's long-term target of 57% as soon as 2027. Similarly, adjusted operating margin was 24% in 2024, but data center growth should lead to operating margin expansion to 35% in 2029, in line with management's long-term target of 35%.

Risk and Uncertainty Brian Colello, CPA, Senior Equity Analyst, 7 May 2025

We raise our Morningstar Uncertainty Rating for AMD to Very High from High, mostly due to potential tariffs and restrictions on AI sales into China. AMD sees a massive opportunity to gain share in GPUs targeting AI applications, but we view Nvidia as a clear leader here with a wide economic moat in not only hardware design but also associated software tools. Even if AMD's GPU designs are up to par (or better), we view the associated software tools as a hurdle where AMD is behind today and will need to catch up to Nvidia. Further, we expect leading hyperscale cloud computing customers to continue to invest in AI processors. Google's Tensor processing units and Amazon's Trainium and Inferentia chips were designed with AI workloads in mind, while Microsoft and Meta have announced semiconductor design plans.

In PCs, AMD continues to square off against Intel, the formerly dominant market leader that has lost its manufacturing edge in recent years. If Intel can regain its manufacturing lead, which it hopes to do by the end of 2025, AMD will face a more formidable x86 foe. Additionally, if Microsoft were to continue to push its Windows PC ecosystem toward PCs with ARM-based processors, new entrants could pose credible threats to both AMD and Intel. All the while, the PC market remains cyclical, and AMD will have to navigate the cycles accordingly.

In other segments, AMD's gaming business often faces boom-or-bust cycles. AMD also has customer concentration in its semicustom business—it supplies processors into Sony's PlayStation and Microsoft's Xbox today, and it would be a blow to the firm if it were to miss out on either of these sockets in the next console cycle.

On the environmental, social, and governance front, we do not foresee any material issues on the horizon. Perhaps the greatest risk is the potential scarcity of experienced chip design talent. We think the firm has done a solid job developing chip designers internally.

Capital Allocation Brian Colello, CPA, Senior Equity Analyst, 7 May 2025

We assign AMD an Exemplary Morningstar Capital Allocation Rating. The rating reflects our assessments of a sound balance sheet, exceptional investments associated with the firm's strategy and execution, and attractive and appropriate shareholder distribution policies.

Lisa Su took over as CEO in 2014; she was previously COO. She was named chair of the board as well in 2022. In 2023, Jean Hu took over as CFO from Devinder Kumar, having served as Marvell's CFO previously. Since Su took charge, we think management has done a solid job in driving a more focused long-term plan across both PC and server end markets. The firm has adopted a chiplet strategy (which disaggregates parts of chips and utilizes the most practical manufacturing process) and tapped TSMC to manufacturing its leading-edge processors. As a result of this strategy, AMD has been capturing market share at Intel's expense as the latter has struggled with its advanced manufacturing processes.

We think AMD has made nice strategic moves in recent years to expand beyond the PC CPU market. In February 2022, AMD closed the purchase of FPGA leader Xilinx in an all-stock deal worth about $50 billion. Xilinx represents a margin-accretive business for AMD and gives AMD entry into industrial, automotive, and communications infrastructure end markets, all while helping AMD offer more robust products in the data center. AMD has also made nice bolt-on acquisitions, such as Pensando Systems, Silo AI, and the pending deal for ZT Systems, to improve its presence in AI and data centers. Organically, we like AMD's focus on the data center end market, as the company is well positioned to carve out a piece of the AI pie with its GPU expertise.

We view AMD as having a solid balance sheet. As of March 2025, AMD had $7.3 billion in cash and cash equivalents against total debt of $4.2 billion. AMD does not pay a dividend but has bought back shares in recent years. We'd expect any capital distributions in the years ahead to be done via additional buybacks as part of this program.

Analyst Notes Archive

AMD Earnings: We're Pleased to See Strong PC Processor Revenue; Maintaining $120 Fair Value

Brian Colello, CPA,Senior Equity Analyst,7 May 2025

AMD's first-quarter revenue grew 36% year over year and was above the high end of guidance. AMD's second-quarter forecast is for 27% growth year over year, and is above FactSet consensus estimates. Adjusted EPS will dip due to a previously stated $800 million writeoff of AI chips built for China. Why it matters: AMD's results reinforce our thesis that the firm is poised for processor (CPU) share gains from Intel in PCs and servers. AMD's AI GPU remains in focus but is a mixed bag with decent first-quarter results but a bigger headwind than we anticipated from the US restrictions on MI308 chip sales into China. AMD's rival, Intel, saw a rise in low-price CPU sales amid tariff and macro concerns in the first quarter. Encouragingly, AMD saw the opposite with 68% year-over-year revenue growth in its client segment, boosted by sales of higher priced CPUs in both desktops and notebooks. AMD's data center segment grew 57% year over year. Server CPU sales were solid on a year-over-year basis, while artificial intelligence GPU revenue was in line with management's expectations. The bottom line: We maintain our $120 fair value estimate for narrow-moat AMD but raise our Uncertainty Rating to Very High from High because of tariff and geopolitical concerns. Shares appear undervalued, as AMD's potential share gains in CPUs appears to be underestimated. We see no signs of AMD's CPU share gains over Intel slowing down. In AI GPUs, restrictions on shipments into China will be a headwind, but AMD's non-China opportunities appear promising. Its large upcoming AI cluster with Oracle may serve as a model for future AMD AI adoption. Coming up: AMD expects June revenue to be $7.4 billion. Client (PC) and gaming revenue should rise about 10% sequentially, but data center should be down. Within data center, server CPU sales should be decent, but AI GPUs will face a $700 million shortfall from the China restrictions.

AMD: Lowering Our Fair Value Estimate to $120 From $140 Due to China Restrictions and PC Concerns

Brian Colello, CPA,Senior Equity Analyst,16 Apr 2025

AMD expects to incur up to $800 million of writeoffs associated with its MI308 artificial intelligence products, as the US has restricted their export to China. These chips were crafted to allow AMD to circumvent prior US restrictions. AI rival Nvidia is facing similar restrictions. Why it matters: The US has placed another round of restrictions against selling AI chips into China. Nvidia is the clear AI chip leader today, but a path for AMD to gain ground on its rival within China has been cut off. AI is by far the strongest catalyst for AMD's growth. AMD reports that China made up 24% of revenue in 2024

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based upon the billing location of its customer. This percentage likely includes non-AI products, such as PC CPUs and embedded FPGAs, and the mix of AMD's emerging AI business into China isn't clear to us. AMD's projected AI gains aren't as strong as what we would have anticipated last year, and China adds another layer of doubt. Meanwhile, tariff uncertainties (at best) and controls (at worst) will likely weigh on PC unit sales and might mute the PC share gains we expect AMD to gain over Intel. The bottom line: We lower our fair value estimate for narrow-moat AMD to $120 from $140 as we cut our AI GPU revenue estimates to exclude China, as well as our global PC revenue expectations. Shares appear undervalued, as AMD's potential PC share gains still appear underappreciated despite tariffs. We lower our AMD AI GPU revenue estimates in 2025 to $6.5 billion from $7.7 billion. We also lower our client (PC) revenue in 2025 to $7.6 billion from $10.1 billion. Still, we anticipate that AMD will carve out a piece of the AI pie in the years ahead, and we expect the company to remain a winner in the PC CPU space. Long view: We expect these issues to mute long-term revenue growth, as well. We now reduce our 2029 AI GPU and PC CPU revenue estimates to $15.1 billion and $12.0 billion, down from $17.9 billion and $13.3 billion, respectively.

AMD Earnings: Cutting Our Fair Value Estimate to $140 From $160 Amid a Weak AI GPU Forecast

Brian Colello, CPA,Senior Equity Analyst,5 Feb 2025

Narrow-moat-rated Advanced Micro Devices reported strong fourth-quarter results with nice growth in client and data center revenue, along with a rebound in gaming revenue. However, all investor eyes are on AMD’s artificial intelligence accelerator, that is, GPU, business, and on this front, AMD provided investors with a disappointing growth forecast, as AI GPU revenue in the first half of 2025 will be on par with what AMD earned in the second half of 2024. AMD expects AI GPU growth in the second half of 2025 and beyond, but concerningly, this business isn’t on the same type of exponential growth trajectory as seen by its rival Nvidia at the start of the AI “Gold Rush.”We cut our fair value estimate to $140 from $160. We’re pleased with AMD’s x86 processor, or CPU, share gains in servers and PCs but are now less optimistic about AMD’s AI GPU growth. Shares still appear undervalued to us as we anticipate that AMD will achieve decent long-term AI GPU growth and carve out a piece of the AI market over time, but admittedly, we see further downside scenarios if AMD were unable to deliver compelling AI solutions over time.AMD’s revenue in the December quarter was $7.66 billion, up 12% sequentially, up 24% year over year, and above the midpoint of guidance of $7.50 billion. Client revenue, which includes x86 PC CPUs, rose 23% sequentially and 58% year over year, as we believe that AMD’s market share gains over Intel are accelerating. Data center revenue rose 9% sequentially and 69% year over year. Within, AMD’s x86 server CPU business rose about 10% quarter over quarter to (by our estimates) just under $2 billion. In turn, we estimate that AMD’s AI GPU business rose sequentially from about $1.65 billion in the September quarter to just under $1.8 billion in the December quarter.

AMD Earnings: On Pace for Hearty Data Center Growth; Raising Fair Value Estimate 10% Brian

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Colello, CPA,Senior Equity Analyst,30 Oct 2024

Narrow-moat Advanced Micro Devices reported solid third-quarter results and provided investors with a healthy fourth-quarter outlook as it continues to generate robust revenue growth in its data center business, thanks to artificial intelligence and share gains from Intel in server processors (central processing units). We suspect investors were looking for more out of AMD's artificial intelligence business, however, and the shares fell after hours. We're encouraged by AMD's progress in CPUs and are now a bit more bullish about AMD's AI opportunities in the long run. We have raised our fair value estimate to $160 per share from $145 and view the shares as fairly valued.Third-quarter revenue was $6.8 billion, up 17% sequentially and 18% year over year and above the guidance midpoint of $6.7 billion. Data center was once again the bright spot, with revenue of $3.55 billion up 122% year over year and 25% sequentially. AMD believes it grew and gained share in Epyc server CPUs while earning robust growth in AI graphics processing units. AMD hinted that AI GPU revenue exceeded $1.5 billion in the quarter versus virtually nothing a year ago, and we're encouraged that it boosted its full-year forecast to $5.0 billion (which the firm will likely exceed) from $4.5 billion. Client revenue growth from the PC end market was also impressive, up 26% sequentially and 29% year over year, which we think came from share gains over Intel. Adjusted gross margin expanded 50 basis points sequentially to 53.6%, in line with guidance.AMD expects fourth-quarter revenue of $7.5 billion at the midpoint, which would be up 10% sequentially and 22% year over year. The company again anticipates tremendous data center product growth and healthy client revenue growth, while also seeing modest sequential growth in gaming and embedded chips. Adjusted gross margin is expected to tick up to 54%.

AMD: We Maintain $145 Fair Value as AMD's "Advancing AI" Event Highlights Its Strong Road Map

Brian Colello, CPA,Senior Equity Analyst,10 Oct 2024

AMD's "Advancing AI" event on Oct. 10 highlighted some solid milestones as, in our opinion, the company continues to progress in AI across a variety of products—processors (both CPUs and GPUs), software, and networking hardware. On the whole, the event announcements are consistent with our thesis that AMD is quite likely to carve out a piece of the AI semiconductor and hardware pie over time but is unlikely to displace industry leader Nvidia anytime soon. We maintain our $145 fair value estimate for narrow-moat AMD and view shares as modestly overvalued.Our biggest industrywide takeaway is that AMD increased its forecast for the AI accelerator industry to $500 billion of revenue in 2028, up from its prior forecast of $400 billion in 2027. The forecast may have underwhelmed some investors, as we saw AMD's stock selloff about 3% immediately after the forecast announcement. However, a 25% growth rate in 2028 wouldn't disappoint us. AMD's line of sight into data center buildouts suggests that no AI chip bubble is imminent. Further, we've received many questions about what the size of the AI chip market might look like at maturity (whenever that might be), and although we're confident the industry won't grow 25% per year forever, it might not decelerate into a flattish market in the next five or 10 years either.We were also pleased with AMD's disclosure that it has 34% revenue share of server processors, highlighting the firm's share gains over Intel in recent quarters. Given Intel's near-term struggles, we anticipate AMD's server share gains will continue. We foresee these gains being gradual over the next few years, but if Intel can't deliver on its manufacturing road map, there's a bullish scenario where AMD's ongoing share gains might accelerate rather rapidly.

AMD: Acquisition of ZT Systems Should Aid AI Efforts; Maintain $145 Fair Value Estimate Brian Colello, CPA,Senior Equity Analyst,19 Aug 2024

We maintain our $145 fair value estimate for narrow-moat Advanced Micro Devices after the company announced a definitive agreement to acquire privately held ZT Systems for $4.9 billion. Strategically, we think the deal is reasonable as it will provide AMD with expertise in artificial intelligence infrastructure systems and services. We agree with AMD, Nvidia, and others that suggest that AI is a systems problem that is more complex than merely buying the best AI graphics processor off the shelf. We think the inclusion of ZT’s design enablement and services business will make AMD a bit more competitive with Nvidia, as we think that the latter’s strength stems at least in part from selling full AI solutions, including software and networking. However, we don’t view this deal as a tectonic shift in the AI landscape, and we still foresee AMD carving out only a sliver of the total AI pie over time.AMD did not raise its 2024 graphics processor revenue forecast (currently at $4.5 billion) while discussing the deal, but management was clear that ZT will help the company win incremental AI revenue in 2026 and beyond to make the deal accretive. ZT supports the largest hyperscale cloud customers, and we speculate that this deal might help AMD cozy up to one or more of the mega-cap tech companies hosting AI workloads. AMD is taking on $150 million of operating expenses by acquiring ZT but thinks the deal will be accretive (or slightly better than breakeven on a non-GAAP basis) by the end of 2025. AMD expects profitability to accelerate in 2026 and beyond.Management disclosed that ZT generates over $10 billion of annual revenue, but most of this is low-margin and pertains to ZT’s data center infrastructure manufacturing business, which is a segment that AMD will seek to spin off (and will be classified as an asset for sale in the meantime). AMD instead sees ZT’s design enablement and services segment as the crown jewel.

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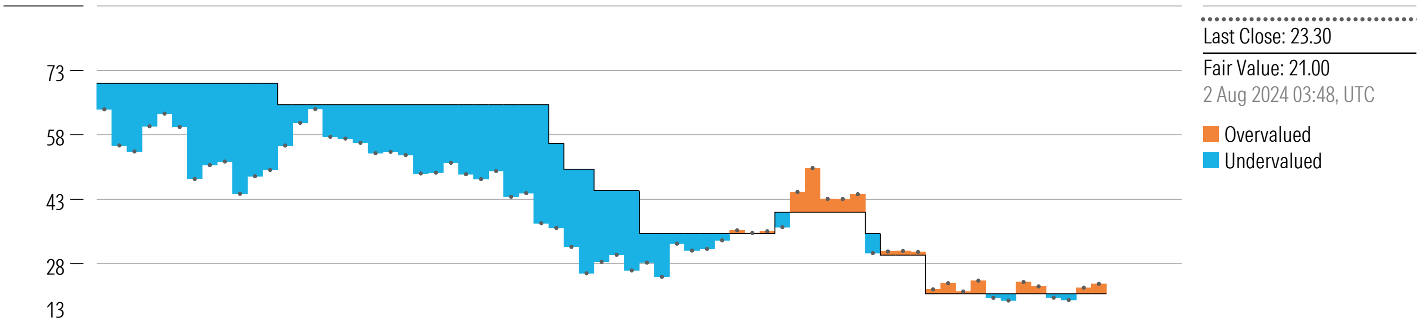
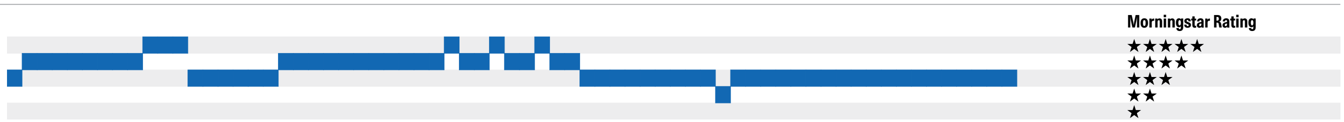
Advanced Micro Devices Inc AMD ★★★ 15 Jul 2025 16:47, UTC

Competitors Price vs. Fair Value

Intel Corp INTC

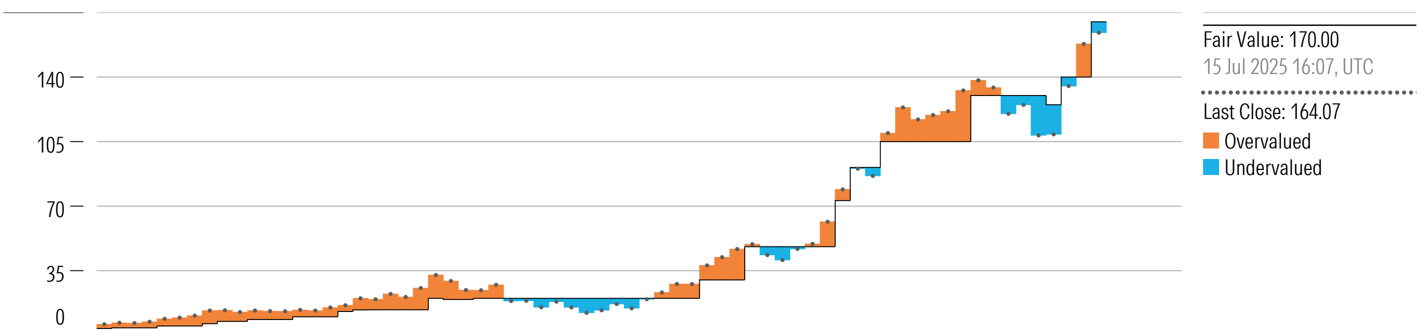


2020	2021	2022	2023	2024	YTD	
0.71	0.79	0.59	1.26	0.95	1.11	Price/Fair Value
-14.55	6.16	-45.84	92.92	-59.35	16.21	Total Return %

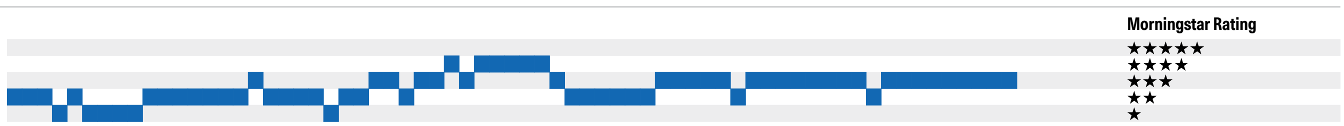


Total Return % as of 14 Jul 2025. Last Close as of 14 Jul 2025. Fair Value as of 2 Aug 2024 03:48, UTC.

NVIDIA Corp NVDA



2020	2021	2022	2023	2024	YTD	
1.54	1.52	0.73	1.03	1.03	1.17	Price/Fair Value
122.20	125.41	-50.26	238.98	171.24	22.19	Total Return %



Total Return % as of 14 Jul 2025. Last Close as of 14 Jul 2025. Fair Value as of 15 Jul 2025 16:07, UTC.

Morningstar Equity Analyst Report | Report as of 15 Jul 2025 16:52, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS

Advanced Micro Devices Inc AMD ★★★ 15 Jul 2025 16:47, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
146.24 USD 14 Jul 2025	140.00 USD 15 Jul 2025 16:43, UTC	1.04	252.55 USD Bil 15 Jul 2025	Narrow	Large Growth	Very High	Exemplary	4 Jun 2025 05:00, UTC

Morningstar Valuation Model Summary

Financials as of 15 Jul 2025	Actual			Forecast				
Fiscal Year, ends 31 Dec	2022	2023	2024	2025	2026	2027	2028	2029
Revenue (USD Mil)	23,601	22,680	25,785	34,311	39,529	45,110	51,297	56,750
Operating Income (USD Mil)	1,162	367	2,038	5,612	8,002	10,491	13,536	16,364
EBITDA (USD Mil)	5,438	3,854	4,964	8,630	10,963	13,434	16,471	19,173
Adjusted EBITDA (USD Mil)	5,438	3,854	4,964	8,630	10,963	13,434	16,471	19,173
Net Income (USD Mil)	1,320	854	1,641	4,819	6,885	9,071	11,660	14,065
Adjusted Net Income (USD Mil)	5,504	4,302	5,420	8,331	10,397	12,585	15,196	17,518
Free Cash Flow To The Firm (USD Mil)	3,439	415	-498	6,540	8,386	8,843	11,104	13,548
Weighted Average Diluted Shares Outstanding (Mil)	1,571	1,625	1,637	1,637	1,637	1,637	1,637	1,637
Earnings Per Share (Diluted) (USD)	0.84	0.53	1.00	2.94	4.21	5.54	7.13	8.59
Adjusted Earnings Per Share (Diluted) (USD)	3.50	2.65	3.31	5.09	6.35	7.69	9.29	10.70
Dividends Per Share (USD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Margins & Returns as of 15 Jul 2025		Actual			Forecast					
	3 Year Avg	2022	2023	2024	2025	2026	2027	2028	2029	5 Year Avg
Operating Margin %	4.8	4.9	1.6	7.9	16.4	20.2	23.3	26.4	28.8	23.0
EBITDA Margin %	—	23.0	17.0	19.3	25.2	27.7	29.8	32.1	33.8	—
Adjusted EBITDA Margin %	—	23.0	17.0	19.3	25.2	27.7	29.8	32.1	33.8	29.7
Net Margin %	5.3	5.6	3.8	6.4	14.1	17.4	20.1	22.7	24.8	19.8
Adjusted Net Margin %	21.1	23.3	19.0	21.0	24.3	26.3	27.9	29.6	30.9	27.8
Free Cash Flow To The Firm Margin %	4.8	14.6	1.8	-1.9	19.1	21.2	19.6	21.7	23.9	21.1

Growth & Ratios as of 15 Jul 2025		Actual			Forecast					
	3 Year CAGR	2022	2023	2024	2025	2026	2027	2028	2029	5 Year CAGR
Revenue Growth %	16.2	43.6	-3.9	13.7	33.1	15.2	14.1	13.7	10.6	17.1
Operating Income Growth %	-17.5	-68.0	-68.4	455.3	175.4	42.6	31.1	29.0	20.9	51.7
EBITDA Growth %	10.6	32.1	-29.1	28.8	73.9	27.0	22.5	22.6	16.4	32.5
Adjusted EBITDA Growth %	6.4	32.1	-29.1	28.8	73.9	27.0	22.5	22.6	16.4	31.0
Earnings Per Share Growth %	-27.0	-67.3	-37.5	90.8	193.8	42.9	31.8	28.5	20.6	53.7
Adjusted Earnings Per Share Growth %	-27.0	25.4	-24.4	25.1	53.7	24.8	21.1	20.8	15.3	53.7

Valuation as of 15 Jul 2025	Actual			Forecast				
	2022	2023	2024	2025	2026	2027	2028	2029
Price/Earning	18.5	55.6	36.5	28.7	23.0	19.0	15.7	13.7
Price/Sales	4.4	10.5	7.6	6.9	6.0	5.3	4.6	4.2
Price/Book	1.9	4.3	3.4	3.9	3.5	3.1	2.7	2.3
Price/Cash Flow	—	—	—	—	—	—	—	—
EV/EBITDA	18.7	61.0	39.0	27.2	21.4	17.5	14.2	12.2
EV/EBIT	87.5	640.9	95.0	41.8	29.3	22.4	17.3	14.3
Dividend Yield %	—	—	—	—	—	—	—	—
Dividend Payout %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Free Cash Flow Yield %	—	—	—	—	—	—	—	—

Operating Performance / Profitability as of 15 Jul 2025	Actual			Forecast				
Fiscal Year, ends 31 Dec	2022	2023	2024	2025	2026	2027	2028	2029
ROA %	2.0	1.3	2.4	6.3	8.1	9.4	10.6	11.1
ROE %	2.4	1.5	2.9	7.8	10.0	11.7	13.0	13.6
ROIC %	9.8	4.7	6.1	9.6	11.5	13.1	14.9	16.1

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Advanced Micro Devices Inc AMD ★★★ 15 Jul 2025 16:47, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
146.24 USD 14 Jul 2025	140.00 USD 15 Jul 2025 16:43, UTC	1.04	252.55 USD Bil 15 Jul 2025	Narrow	Large Growth	Very High	Exemplary	4 Jun 2025 05:00, UTC

Financial Leverage (Reporting Currency)	Actual			Forecast				
Fiscal Year, ends 31 Dec	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Debt/Capital %	2.7	1.3	1.1	0.7	0.7	0.6	0.5	0.5
Assets/Equity	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Net Debt/EBITDA	-0.6	-0.7	-0.6	-1.1	-1.6	-2.1	-2.4	-2.8
Total Debt/EBITDA	0.5	0.8	0.4	0.2	0.2	0.1	0.1	0.1
EBITDA/ Net Interest Expense	68.0	-42.4	-55.8	-359.6	-114.2	-74.6	-91.5	-106.5

Forecast Revisions as of 15 Jul 2025	2025		2026		2027	
Prior data as of 8 May 2025	**Current**	**Prior**	**Current**	**Prior**	**Current**	**Prior**
Fair Value Estimate Change (Trading Currency)	140.00	120.00	—	—	—	—
Revenue (USD Mil)	34,311	33,111	39,529	37,678	45,110	42,785
Operating Income (USD Mil)	5,612	4,373	8,002	7,001	10,491	9,198
EBITDA (USD Mil)	8,630	7,391	10,963	9,962	13,434	12,141
Net Income (USD Mil)	8,331	7,253	10,397	9,525	12,585	11,461
Earnings Per Share (Diluted) (USD)	2.94	2.30	4.21	3.69	5.54	4.87
Adjusted Earnings Per Share (Diluted) (USD)	5.09	4.43	6.35	5.82	7.69	7.00
Dividends Per Share (USD)	0.00	0.00	0.00	0.00	0.00	0.00

Key Valuation Drivers as of 15 Jul 2025	
Cost of Equity %	9.0
Pre-Tax Cost of Debt %	6.5
Weighted Average Cost of Capital %	9.0
Long-Run Tax Rate %	15.0
Stage II EBI Growth Rate %	9.1
Stage II Investment Rate %	46.7
Perpetuity Year	15

Additional estimates and scenarios available for download at https://pitchbook.com/.

Discounted Cash Flow Valuation as of 15 Jul 2025	**USD Mil**
Present Value Stage I	36,084
Present Value Stage II	54,375
Present Value Stage III	124,880
Total Firm Value	**215,338**
Cash and Equivalents	5,132
Debt	1,721
Other Adjustments	0
Equity Value	**218,749**
Projected Diluted Shares	1,637
Fair Value per Share (USD)	**140.00**

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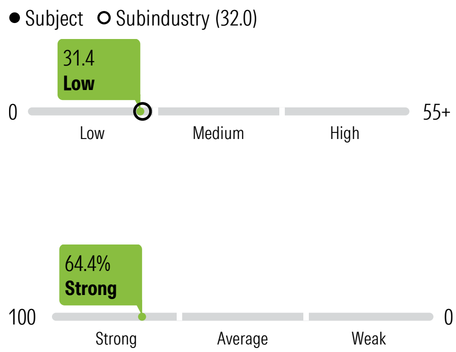
Advanced Micro Devices Inc AMD ★★★ 15 Jul 2025 16:47, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
146.24 USD 14 Jul 2025	140.00 USD 15 Jul 2025 16:43, UTC	1.04	252.55 USD Bil 15 Jul 2025	Narrow	Large Growth	Very High	Exemplary	4 Jun 2025 05:00, UTC

ESG Risk Rating Breakdown

Exposure	
Company Exposure[1]	31.4
– Manageable Risk	29.3
Unmanageable Risk[2]	**2.1**
Management	
Manageable Risk	29.3
– Managed Risk[3]	18.8
Management Gap[4]	**10.4**
Overall Unmanaged Risk	**12.5**



- 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 64.4% 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 Jun 04, 2025. Highest Controversy Level is as of Jul 08, 2025. 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 Jun 2025

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		
Advanced Micro Devices Inc	31.4 | Low	0	55+	64.4 | Strong	100	0	12.5 | Low	0	40+
Intel Corp	48.9 | Medium	0	55+	65.9 | Strong	100	0	19.2 | Low	0	40+
NVIDIA Corp	30.2 | Low	0	55+	62.9 | Strong	100	0	12.5 | Low	0	40+
Maxscend Microelectronics Co Ltd	44.8 | Medium	0	55+	25.3 | Average	100	0	34.3 | High	0	40+
—	— | —	0	55+	— | —	100	0	— | —	0	40+

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Appendix
Historical Morningstar Rating

Advanced Micro Devices Inc AMD 14 Jul 2025 21:21, UTC

Dec 2025	Nov 2025	Oct 2025	Sep 2025	Aug 2025	Jul 2025	Jun 2025	May 2025	Apr 2025	Mar 2025	Feb 2025	Jan 2025
—	—	—	—	—	★★★	★★★	★★★	★★★★	★★★★	★★★★	★★★★
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
★★	★★	★★★	★	★	★	★	★	★	★	★	★

Intel Corp INTC 14 Jul 2025 21:22, UTC

Dec 2025	Nov 2025	Oct 2025	Sep 2025	Aug 2025	Jul 2025	Jun 2025	May 2025	Apr 2025	Mar 2025	Feb 2025	Jan 2025
—	—	—	—	—	★★★	★★★	★★★	★★★	★★★	★★★	★★★
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
★★★★★	★★★★★	★★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★

NVIDIA Corp NVDA 15 Jul 2025 16:09, UTC

Dec 2025	Nov 2025	Oct 2025	Sep 2025	Aug 2025	Jul 2025	Jun 2025	May 2025	Apr 2025	Mar 2025	Feb 2025	Jan 2025
—	—	—	—	—	★★★	★★★	★★★	★★★	★★★	★★★	★★★
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
★★	★★	★★	★	★	★	★	★★	★	★★	★★	★★

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

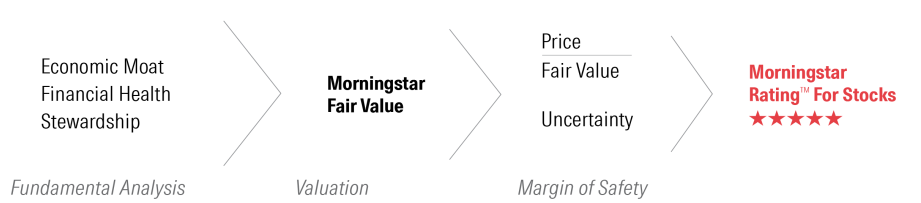
Combining our analysts' financial forecasts with the firm's economic moat helps us assess how long returns on invested capital are likely to exceed the firm's cost of capital. Returns of firms with a wide economic moat rating are assumed to fade to the perpetuity period over a longer period of time than 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.

Morningstar Equity Research Star Rating Methodology



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

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outcomes for the intrinsic value of a company, and anything 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.

Qualitative Analysis Uncertainty Ratings	Margin of Safety ★★★★★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

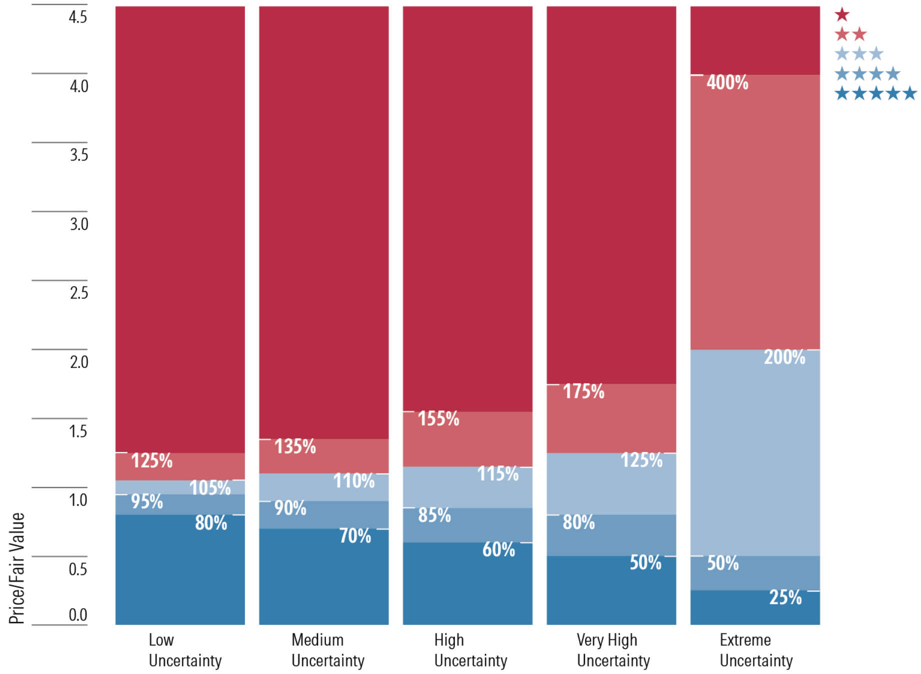
Our uncertainty rating is based on the interquartile range, or the middle 50% of potential outcomes, covering the 25th percentile–75th percentile. This means that when a stock hits 5 stars, we expect there is a 75% chance that the intrinsic value of that stock lies above the current market price. Similarly,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



Morningstar Star Rating for Stocks

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 multi-year 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,

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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.

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/

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