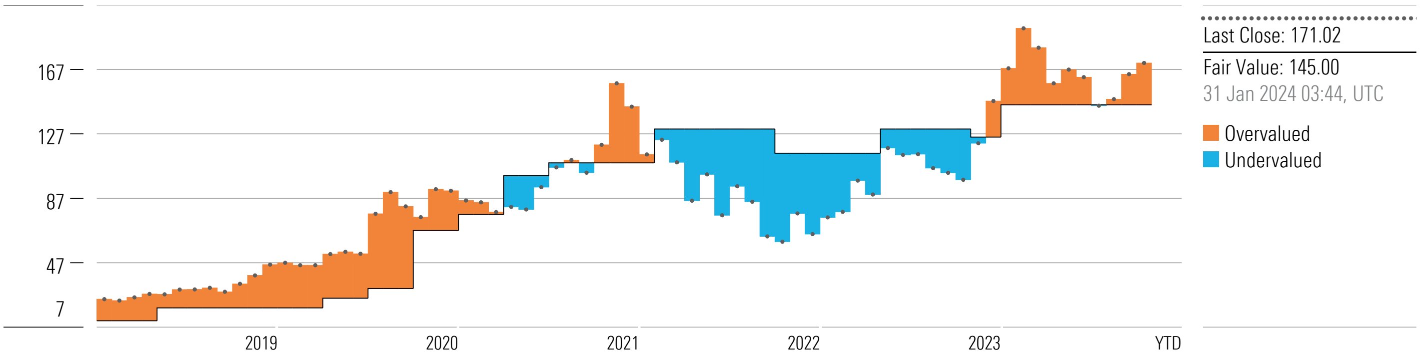
Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS

Advanced Micro Devices Inc AMD ★★ 10 Oct 2024 21:23, UTC

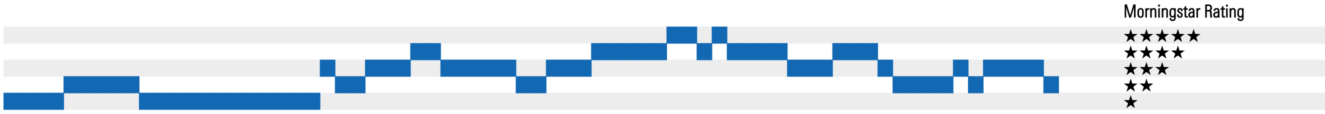
Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
171.02 USD 9 Oct 2024	145.00 USD 31 Jan 2024 03:44, UTC	1.18	265.72 USD Bil 10 Oct 2024	Narrow	Large Growth	High	Exemplary	2 Oct 2024 05:00, UTC

Price vs. Fair Value



	2019	2020	2021	2022	2023	YTD
Price/Fair Value	2.41	1.37	1.32	0.56	1.18	1.18
Total Return %	148.43	99.98	56.91	-54.99	127.59	16.02

Morningstar Rating



Total Return % as of 09 Oct 2024. Last Close as of 09 Oct 2024. Fair Value as of 31 Jan 2024 03:44, UTC.

Contents

Important Disclosure

The conduct of Morningstar's analysts is governed by Code of Ethics/Code of Conduct Policy, Personal Security Trading Policy (or an equivalent of), and Investment Research Policy. For information regarding conflicts of interest, please visit: http://global.morningstar.com/equitydisclosures.

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

Analyst Note Brian Colello, CFA, Strategist, 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

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 2 of 22

Advanced Micro Devices Inc AMD ★★ 10 Oct 2024 21:23, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
171.02 USD 9 Oct 2024	145.00 USD 31 Jan 2024 03:44, UTC	1.18	265.72 USD Bil 10 Oct 2024	Narrow	Large Growth	High	Exemplary	2 Oct 2024 05:00, UTC

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, among others. AMD's traditional strength was in central processing units, CPUs, and graphics processing units, or GPUs, 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, or FPGA, leader Xilinx to diversify its business and augment its opportunities in key end markets such as the data center and automotive.

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.

Business Strategy & Outlook Brian Colello, CFA, Strategist, 31 Jan 2024

Advanced Micro Devices has a wealth of digital semiconductor expertise and is well positioned to prosper from favorable trends in data centers, artificial intelligence, and gaming. 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 three 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 $150 billion by 2027. 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 company to emerge as a second source in AI.

Bulls Say Brian Colello, CFA, Strategist, 31 Jan 2024

- AMD has gained market share in the PC CPU market as Intel's manufacturing prowess has hit several road bumps in recent years.
- AMD's partnership with chip manufacturing leader Taiwan Semi, 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.

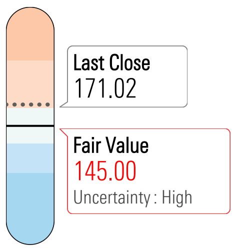
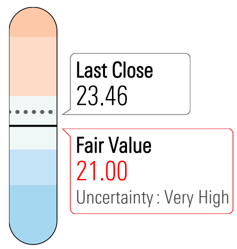
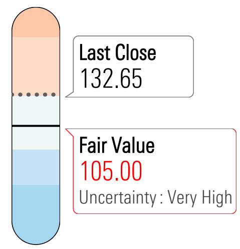
© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS

Advanced Micro Devices Inc AMD ★★ 10 Oct 2024 21:23, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
171.02 USD 9 Oct 2024	145.00 USD 31 Jan 2024 03:44, UTC	1.18	265.72 USD Bil 10 Oct 2024	Narrow	Large Growth	High	Exemplary	2 Oct 2024 05:00, UTC

Competitors

	Advanced Micro Devices Inc AMD	Intel Corp INTC	NVIDIA Corp NVDA
			
Economic Moat	Narrow	None	Wide
Currency	USD	USD	USD
Fair Value	145.00 31 Jan 2024 03:44, UTC	21.00 2 Aug 2024 03:48, UTC	105.00 23 May 2024 02:37, UTC
1-Star Price	87.00	36.75	183.75
5-Star Price	224.75	10.50	52.50
Assessment	Overvalued 10 Oct 2024	Fairly Valued 10 Oct 2024	Fairly Valued 10 Oct 2024
Morningstar Rating	★★10 Oct 2024 21:23, UTC	★★★9 Oct 2024 21:33, UTC	★★★9 Oct 2024 21:33, UTC
Analyst	Brian Colello, Strategist	Brian Colello, Strategist	Brian Colello, Strategist
Capital Allocation	Exemplary	Standard	Exemplary
Price/Fair Value	1.18	1.12	1.26
Price/Sales	12.04	1.81	34.30
Price/Book	4.89	0.87	56.02
Price/Earning	203.60	55.48	62.19
Dividend Yield	0.00%	2.13%	—
Market Cap	265.72 Bil	99.29 Bil	3,307.13 Bil
52-Week Range	93.12—227.30	18.51—51.28	39.23—140.76
Investment Style	Large Growth	Large Value	Large Growth

- 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, CFA, Strategist, 31 Jan 2024

- Despite AMD's recent share gains, Intel remains the industry leader in PC CPUs and it 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 into Nvidia's AI dominance, as Nvidia is strong not only GPUs, but associated AI software tools.
- AMD's gaming semi-custom 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.

Economic Moat Brian Colello, CFA, Strategist, 30 Jan 2024

We assign AMD a narrow economic moat, based on intangible assets around a variety of chip designs

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

(including those from Xilinx, which we rated as narrow moat prior to the business being 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 was 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, Apple, or others) 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.

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 5 of 22

Advanced Micro Devices Inc AMD ★★ 10 Oct 2024 21:23, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
171.02 USD 9 Oct 2024	145.00 USD 31 Jan 2024 03:44, UTC	1.18	265.72 USD Bil 10 Oct 2024	Narrow	Large Growth	High	Exemplary	2 Oct 2024 05:00, UTC

Meanwhile, AMD has partnered closely with Taiwan Semi (TSMC), the world's largest outsourced chip manufacturer or foundry. 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 over 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 has 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 (GPU) 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, and so on 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. Further, Nvidia 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

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 6 of 22

Advanced Micro Devices Inc AMD ★★ 10 Oct 2024 21:23, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
171.02 USD 9 Oct 2024	145.00 USD 31 Jan 2024 03:44, UTC	1.18	265.72 USD Bil 10 Oct 2024	Narrow	Large Growth	High	Exemplary	2 Oct 2024 05:00, UTC

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 that 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, CFA, Strategist, 30 Jan 2024

Our fair value estimate for AMD is $145 per share, which implies a 2024 adjusted price/earnings ratio of 37 times, respectively, and a 2% free cash flow yield.

We expect AMD to achieve a top-line compound annual growth rate of 17% through 2028, which includes the acquisition of Xilinx in 2022. This CAGR also includes the 4% decline that AMD generated in 2023 because of the slump in PC demand. However, we model 12% growth in 2024 and average annual growth of 19% from 2025 to 2028 as AMD’s data center GPU business takes off in artificial intelligence applications.

We are most bullish on AMD's data center segment, in which AMD foresees a $150 billion total

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 7 of 22

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
171.02 USD 9 Oct 2024	145.00 USD 31 Jan 2024 03:44, UTC	1.18	265.72 USD Bil 10 Oct 2024	Narrow	Large Growth	High	Exemplary	2 Oct 2024 05:00, UTC

available market, or TAM, for AI accelerators, such as GPUs, by 2027. Although AMD raised this forecast to $400 billion, we think this TAM includes memory and other items that are not pure accelerators, and we're skeptical that AMD's pure-play accelerator opportunity is this large (and was revised upward so significantly) in just a few years.

We think AMD can carve out a decent portion of this market over time. Over the next five years, we model AMD's data center revenue growing at a 37% CAGR, even ahead of AMD's target made in June 2022 of 20% (albeit before the launch of ChatGPT and exponential boom in AI GPU spending). In turn, we model AMD's data center revenue rising from $1.7 billion in 2020 and $6.5 billion in 2023 to just over $12 billion in 2024 and exceeding $31 billion in 2028.

In GPUs used in large language model training and inference, we expect AMD to generate $4 billion of revenue in 2024, ahead of management's forecast of $3.5 billion. We anticipate AMD reaching $10 billion of GPU revenue in 2026 and $13 billion in 2027, ahead of our prior estimate of $9 billion in 2027. While these estimates pale in comparison to the $100 billion of revenue that we anticipate for Nvidia's DC GPU business in 2027, this revenue was virtually zero just a couple of years ago and it should represent an impressive windfall for AMD in the years ahead.

In client revenue (that is, PC CPUs), we model a 7% CAGR over the next five years as demand rebounds from a severe slump in PC demand in 2023. AMD prospered from the remote working trend during COVID-19, with Client revenue peaking at $6.9 billion of revenue in 2021, followed by $6.2 billion in 2022. Client revenue fell 25% in 2023 to $4.65 billion but we foresee a rebound to $6.4 billion in 2028, thanks to a rebound in PC demand and some modest share gains over Intel.

On the profitability front, Xilinx is margin-accretive to AMD's financials. Adjusted gross margin has expanded from 45% in 2020 to 52% in 2022. The slump in PC demand and stagnant revenue caused adjusted gross margin to be 50% in 2023. Yet as AMD recovers in PCs and grows in data center chips, we think AMD's adjusted gross margin can reach management's long-term target of 57%. Similarly, adjusted operating margin was 27% in 2022 and fell to 21% in 2023, but data center growth should lead to operating margin expansion to 39% in 2028, ahead of management's long-term target.

Risk and Uncertainty Brian Colello, CFA, Strategist, 30 Jan 2024

We assign AMD with a Morningstar Uncertainty Rating of High. 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 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 TPUs and Amazon's Trainium and Inferentia chips were designed with AI workloads in mind, while Microsoft and Meta have announced semiconductor design

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

plans.

In PC's, AMD continues to square off against Intel, formerly the dominant market leader but a company that has lost its manufacturing edge in recent years. If Intel can regain its manufacturing lead (it hopes to do so by 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 along with PC demand and, more recently, the sharp rise and fall of cryptocurrency mining. AMD also has customer concentration in its semi-custom business—it supplies processors into both 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 within the industry. We think the firm has done a solid job in developing chip designers internally.

Capital Allocation Brian Colello, CFA, Strategist, 30 Jan 2024
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 October 2014; she was previously COO. In February 2022, Su was named chair of the board as well. In 2023, Jean Hu took over as CFO from Devinder Kumar, having served as Marvell's CFO previously. Since Su took charge of AMD, 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. Most recently, 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. 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.

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 9 of 22

Advanced Micro Devices Inc AMD ★★ 10 Oct 2024 21:23, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
171.02 USD 9 Oct 2024	145.00 USD 31 Jan 2024 03:44, UTC	1.18	265.72 USD Bil 10 Oct 2024	Narrow	Large Growth	High	Exemplary	2 Oct 2024 05:00, UTC

We view AMD as having a solid balance sheet. As of December 2023, AMD has $5.8 billion in cash and cash equivalents against total debt of $2.5 billion. AMD does not pay a dividend but has bought back shares in recent years as part of an $8 billion share-repurchase program announced in February 2022. 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: Acquisition of ZT Systems Should Aid AI Efforts; Maintain $145 Fair Value Estimate Brian Colello, CFA, Strategist, 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.

Advanced Micro Devices Earnings: Fair Value Estimate Intact as Firm Provides Good News on AI GPUs Brian Colello, CFA, Strategist, 31 Jul 2024

Narrow-moat Advanced Micro Devices reported solid second-quarter results and provided investors with a healthy third-quarter forecast, highlighted by the firm's upbeat commentary around its artificial intelligence graphics processor, or GPU, business. We maintain our $145 fair value estimate and view shares as fairly valued. While we're pleased to see the firm lift its 2024 AI GPU revenue outlook to $4.5

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

billion from $4.0 billion, we're not altering our long-term AI GPU forecast too much and acknowledge the wide range of outcomes for the fast-moving AI GPU industry.

Revenue in the June quarter was $5.83 billion, up 7% sequentially, up 9% year over year, and above the midpoint of guidance of $5.70 billion. Data center revenue was the bright spot, up 21% sequentially and 115% year over year to $2.83 billion. AMD crossed the $1 billion mark in quarterly AI GPU revenue, while we were also impressed with AMD's comments around share gains over Intel in x86 processors (CPUs) used in traditional servers. Client revenue, including PC CPUs, rose 9% sequentially and 49% year over year, thanks to an ongoing recovery in the PC market. On the downside, gaming revenue fell 59% year over year, albeit as expected, due to limited demand for semi-custom chips used in gaming consoles. Adjusted gross margin expanded 80 basis points sequentially, as expected, to 53.1%.

AMD expects revenue in the June quarter to be $6.7 billion, which would represent growth of 15% sequentially and 16% year over year. Data center should again be the biggest growth driver for the firm, while client revenue should also increase nicely. Embedded chip revenue should expand modestly, while gaming revenue should be down 10%-plus sequentially yet again. Yet the more important factor in our AMD investment thesis is the higher AI GPU forecast for 2024 as well as optimistic commentary that AMD is ramping up more GPU supply to satisfy healthy demand.

AMD Earnings: Maintaining $145 Valuation as AI GPU Sales Met Our Expectations Brian Colello, CFA, Strategist, 1 May 2024

Narrow-moat Advanced Micro Devices reported solid first-quarter results and provided investors, in our view, with a decent second-quarter forecast. However, we suspect some investors were hoping for a higher forecast for AMD's budding data center graphics processing unit business for artificial intelligence. Shares fell 8% afterhours and approached our unchanged fair value estimate of $145 per share. We anticipate that AMD will take a piece of the AI GPU pie. Its revenue coming from a brand-new business is quite impressive in absolute terms, but we don't see many signs that AMD will reach parity with Nvidia in AI GPUs soon.

Revenue in the March quarter was $5.47 billion, down 11% sequentially due to typical seasonal weakness, but up 2% year over year and ahead of the midpoint of guidance of $5.40 billion. Data Center revenue remains the bright spot, up 80% year over year and up 2% sequentially. We estimate that AMD earned around $600 million of GPU revenue in the first quarter versus virtually zero in the year-ago quarter. AMD believes it gained share in server central processing units. Still, the market isn't growing strongly as leading cloud and enterprise customers are focused on buying GPU servers to run AI workloads rather than CPU servers running traditional workloads. Client revenue (PC CPUs) was down 6% sequentially but up 85% year over year versus the dreadful March 2023 quarter for the PC market. Adjusted gross margin expanded 150 basis points sequentially to 52.3%.

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 11 of 22

Advanced Micro Devices Inc AMD ★★ 10 Oct 2024 21:23, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
171.02 USD 9 Oct 2024	145.00 USD 31 Jan 2024 03:44, UTC	1.18	265.72 USD Bil 10 Oct 2024	Narrow	Large Growth	High	Exemplary	2 Oct 2024 05:00, UTC

AMD expects revenue in the June quarter to be $5.7 billion at the midpoint of guidance, which would be up 4% sequentially and 6% year over year. Data center and client revenue should be up sharply year over year, but gaming and embedded revenue should be down significantly as demand headwinds continue. We estimate AMD will reach $900 million in AI GPU revenue in the June quarter and $4.2 billion for 2024, ahead of the new $4.0 billion guidance.

AMD Earnings: Raising Valuation to $145 From $125 as AI GPU Revenue Is on the Rise Brian Colello, CFA, Strategist, 31 Jan 2024

Narrow-moat Advanced Micro Devices reported solid fourth-quarter results, but we consider the firm's first-quarter forecast to be a mixed bag. We raise our fair value estimate for AMD to $145 from $125, thanks to more optimistic long-term data center revenue assumptions, but after a 78% increase in share price in the past three months (versus 16% for the Morningstar Global Markets Index), we still view shares as overvalued.

We're encouraged that AMD lifted its data center graphics processor forecast to $3.5 billion from its prior guidance of "exceeding $2 billion." We foresee AMD beating this new target and model $4 billion in DC GPU revenue in 2024, but we suspect this new estimate is still short of the expectations of at least some investors, perhaps leading to the 6% selloff in shares afterhours. Further, AMD's first-quarter forecast fell short of our prior estimates, as management cited seasonal weakness in PC processor, or CPU, demand and sharp drops in gaming and embedded chip sales.

Revenue in the December quarter was $6.17 billion, up 6% sequentially, up 10% year over year, and above the midpoint of guidance of $6.10 billion. Data center revenue was the bright spot, up 43% sequentially and 38% year over year, with record revenue in server CPU and DC GPU revenue, the latter of which exceeded management's forecast of $400 million as its latest MI300X GPU appears to be off to a decent start in the marketplace against Nvidia. AMD's PC processor segment (client) was up 1% sequentially but 62% year over year as the PC market continues to rebound from the severe pause in prior quarters.

AMD expects March-quarter revenue to be $5.4 billion, which would represent 1% growth year over year but a 12.5% sequential decline. Data center revenue should be flattish, as a seasonal downturn in server CPUs, offsetting sequential growth in DC GPUs. Client revenue should face seasonal weakness too but would still be up significantly year over year.

AMD Earnings: Embedded Chip Weakness Leads to a Soft Forecast, but AI Roadmap Is on Track Brian Colello, CFA, Strategist, 1 Nov 2023

Narrow-moat Advanced Micro Devices reported solid third-quarter results but provided investors with a fourth-quarter outlook that fell short of our expectations, due to struggles within its embedded business.

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

More importantly, AMD provided insight into its artificial intelligence accelerator growth trajectory, expecting $400 million of revenue in the fourth quarter and over $2 billion in 2024. These forecasts were below our prior estimates, but we don’t consider them to be a huge disappointment either, and it’s quite possible that such estimates could be conservative. We still think AMD will emerge as the number two player in merchant AI semis, behind only Nvidia. We trim our fair value slightly to $125 from $130, based on lower long-term gaming and embedded growth assumptions, but shares still appear cheap.

Revenue in the September quarter was $5.8 billion, up 8% sequentially, up 4% year over year, and above the midpoint of guidance of $5.7 billion. Data center revenue was the bright spot, up 21% sequentially to $1.6 billion with a nice recovery in server processor sales for traditional workloads. PC processor revenue recovered well, up over 40% both sequentially and year over year to $1.45 billion, as PC chip demand is coming off a cyclical bottom. Embedded revenue faced weakness, however, with muted demand from telecom customers and other broad-based industries, as revenue fell 15% sequentially to $1.2 billion, worse than guidance. Higher sales levels enabled the adjusted gross margin to rise 140 basis points sequentially to 51.1%, just ahead of guidance.

For the December quarter, AMD expects revenue in the range of $5.8 billion-$6.4 billion, which, at the midpoint, represents growth of 5% sequentially and 9% year over year, but is below our prior expectations. Data center should deliver strong growth in both AI accelerators and server processors, but embedded weakness should continue, while gaming revenue should also be soft.

AMD: Shares Undervalued as It Takes a Piece of the AI Pie Brian Colello, CFA, Strategist, 23 Aug 2023

We maintain our $130 fair value estimate, narrow moat rating, and Exemplary capital allocation rating for Advanced Micro Devices, as we continue to like the firm’s chances of carving out a decent position in the artificial intelligence accelerator chip market in the years ahead. With shares trading near $106, we view AMD's shares as undervalued.

AMD is a digital semiconductor leader and is well positioned to prosper from a host of favorable trends in the data center, AI, and gaming. We think AMD benefits from intangible assets across a variety of products—traditionally from central processing units and field-programmable gate arrays, or FPGAs, acquired from Xilinx. However, AMD is one of two notable firms in graphics processing units, or GPUs, which are especially well suited for AI, and its GPU expertise may become increasingly valuable, and lucrative, in the years ahead.

We think AMD’s data center business should boom over the next few years, thanks to the rise of AI workloads within enterprises and leading cloud computing vendors. AMD pegs the total addressable market for AI accelerators, such as GPUs, at $150 billion by 2027. While we foresee Nvidia capturing the bulk of this value over the next several years, we surmise that all AI vendors and customers will seek alternatives to keep Nvidia’s dominance at bay, and AMD might be the best positioned company to

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
171.02 USD 9 Oct 2024	145.00 USD 31 Jan 2024 03:44, UTC	1.18	265.72 USD Bil 10 Oct 2024	Narrow	Large Growth	High	Exemplary	2 Oct 2024 05:00, UTC

emerge as a second source in AI.

AMD has benefitted 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 three years as Intel strives to turn it around, but AMD's gains could be longer lasting if Intel were to stumble further.

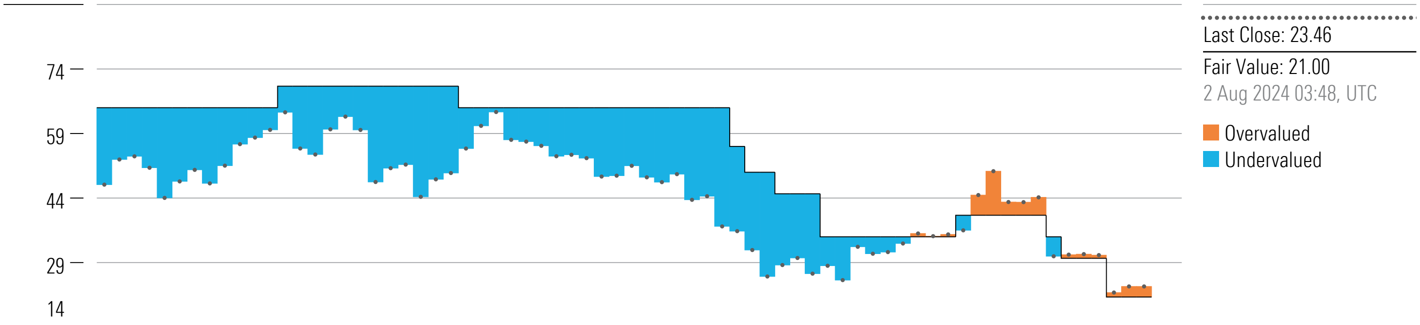
© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 14 of 22

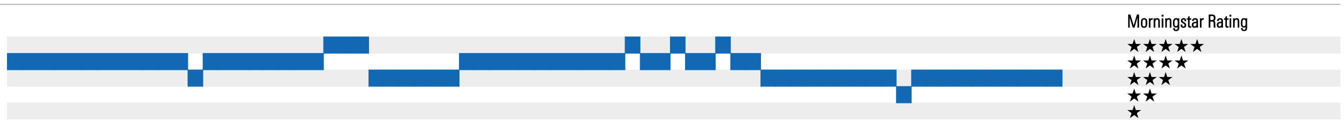
Advanced Micro Devices Inc AMD ★★ 10 Oct 2024 21:23, UTC

Competitors Price vs. Fair Value

Intel Corp INTC

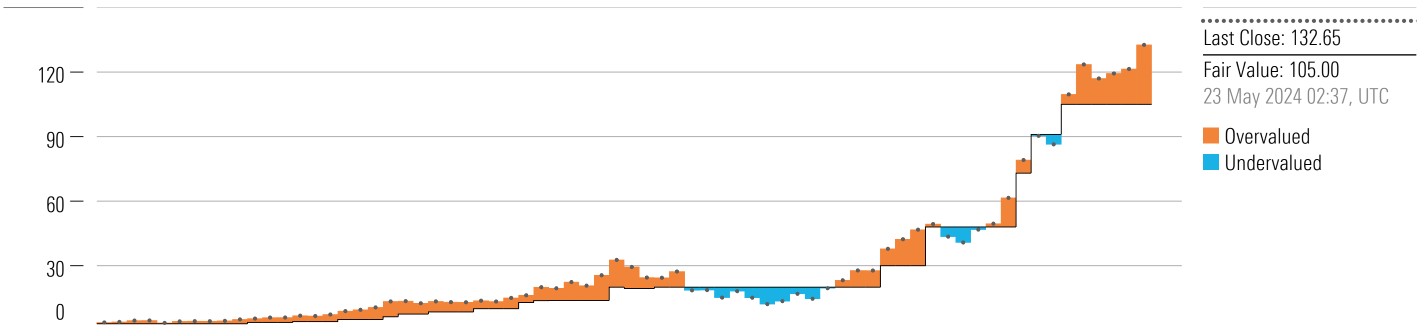


	2019	2020	2021	2022	2023	YTD
Price/Fair Value	0.92	0.71	0.79	0.59	1.26	1.12
Total Return %	30.22	-14.55	6.16	-45.84	92.92	-52.57

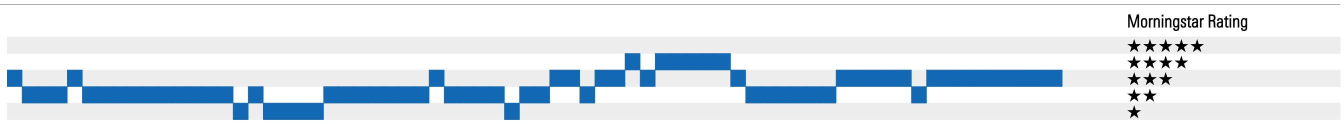


Total Return % as of 09 Oct 2024. Last Close as of 09 Oct 2024. Fair Value as of 2 Aug 2024 03:48, UTC.

NVIDIA Corp NVDA



	2019	2020	2021	2022	2023	YTD
Price/Fair Value	1.62	1.54	1.52	0.73	1.03	1.26
Total Return %	76.73	122.20	125.41	-50.26	238.98	167.91



Total Return % as of 09 Oct 2024. Last Close as of 09 Oct 2024. Fair Value as of 23 May 2024 02:37, UTC.

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS

Advanced Micro Devices Inc AMD ★★ 10 Oct 2024 21:23, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
171.02 USD 9 Oct 2024	145.00 USD 31 Jan 2024 03:44, UTC	1.18	265.72 USD Bil 10 Oct 2024	Narrow	Large Growth	High	Exemplary	2 Oct 2024 05:00, UTC

Morningstar Historical Summary

Financials as of 30 Jun 2024

Fiscal Year, ends 31 Dec	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	YTD	TTM
Revenue (USD Bil)	5.51	3.99	4.32	5.25	6.48	6.73	9.76	16.43	23.60	22.68	11.31	23.28
Revenue Growth %	3.9	-27.5	8.2	21.6	23.3	4.0	45.1	68.3	43.6	-3.9	5.6	6.4
EBITDA (USD Mil)	-18	-319	-160	262	621	724	1,676	4,166	5,534	4,149	2,018	4,364
EBITDA Margin %	-0.3	-8.0	-3.7	5.0	9.6	10.8	17.2	25.4	23.5	18.3	17.8	18.8
Operating Income (USD Mil)	149	-352	-383	127	451	631	1,369	3,648	1,264	401	305	871
Operating Margin %	2.7	-8.8	-8.9	2.4	7.0	9.4	14.0	22.2	5.4	1.8	2.7	3.7
Net Income (USD Mil)	-403	-660	-498	-33	337	341	2,490	3,162	1,320	854	388	1,354
Net Margin %	-7.3	-16.5	-11.5	-0.6	5.2	5.1	25.5	19.2	5.6	3.8	3.4	5.8
Diluted Shares Outstanding (Mil)	768	783	835	952	1,064	1,120	1,207	1,229	1,571	1,625	1,638	1,638
Diluted Earnings Per Share (USD)	-0.53	-0.84	-0.60	-0.03	0.32	0.30	2.06	2.57	0.84	0.53	0.24	0.84
Dividends Per Share (USD)	—	—	—	—	—	—	—	—	—	—	—	—

Valuation as of 30 Sep 2024

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Recent Qtr	TTM
Price/Sales	0.3	0.5	2.2	2.0	3.2	8.4	12.7	11.9	4.2	10.8	11.5	11.5
Price/Earnings	38.2	-2.4	-16.7	-172.4	55.9	243.9	123.5	44.2	39.7	1,428.6	196.1	196.1
Price/Cash Flow	-10.6	-12.9	-232.6	-76.3	60.2	294.1	114.9	54.1	24.9	129.9	140.8	140.8
Dividend Yield %	—	—	—	—	—	—	—	—	—	—	—	—
Price/Book	3.9	-6.8	27.5	19.1	16.5	24.6	28.7	24.3	1.9	4.3	4.7	4.7
EV/EBITDA	-185.7	-11.8	-68.0	39.9	30.3	74.0	65.6	41.0	18.4	56.7	0.0	0.0

Operating Performance / Profitability as of 30 Jun 2024

Fiscal Year, ends 31 Dec	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	YTD	TTM
ROA %	-10.0	-19.3	-15.6	-1.0	8.3	6.4	33.2	29.6	3.3	1.3	0.6	2.0
ROE %	-110	—	-24900	-6.5	36.2	16.7	57.5	47.4	4.2	1.5	0.7	2.4
ROIC %	-11.5	—	-23.5	2.0	18.3	14.0	51.0	42.9	4.1	1.3	0.7	2.5
Asset Turnover	1.4	1.2	1.3	1.5	1.6	1.3	1.3	1.5	0.6	0.3	0.2	0.3

Financial Leverage

Fiscal Year, ends 31 Dec	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Recent Qtr	TTM
Debt/Capital %	91.6	—	77.5	69.0	46.8	19.5	8.3	4.5	5.0	3.9	3.8	—
Equity/Assets %	5.0	—	12.5	16.8	27.8	46.9	65.1	60.4	81.0	82.3	83.3	—
Total Debt/EBITDA	-122.9	—	-9.0	5.3	2.0	0.9	0.3	0.2	0.5	0.7	1.1	—
EBITDA/Interest Expense	-0.1	-2.0	-1.0	2.1	5.1	7.7	35.7	122.5	62.9	39.1	40.4	42.4

Morningstar Analyst Historical/Forecast Summary as of 19 Aug 2024

Financials

			Estimates		
Fiscal Year, ends 31 Dec 2023	2022	2023	2024	2025	2026
Revenue (USD Mil)	23,601	22,680	25,527	30,606	36,931
Revenue Growth %	43.6	-3.9	12.6	19.9	20.7
EBITDA (USD Mil)	5,438	3,854	5,015	7,576	10,861
EBITDA Margin %	23.0	17.0	19.6	24.8	29.4
Operating Income (USD Mil)	1,162	367	2,048	4,745	7,999
Operating Margin %	4.9	1.6	8.0	15.5	21.7
Net Income (USD Mil)	5,504	4,302	5,410	8,246	10,949
Net Margin %	23.3	19.0	21.2	26.9	29.7
Diluted Shares Outstanding (Mil)	1,571	1,625	1,640	1,640	1,640
Diluted Earnings Per Share(USD)	3.50	2.65	3.30	5.03	6.68
Dividends Per Share(USD)	0.00	0.00	0.00	0.00	0.00

Forward Valuation

			Estimates		
	2022	2023	2024	2025	2026
Price/Sales	4.4	10.5	10.8	9.0	7.5
Price/Earnings	18.5	55.6	51.8	34.0	25.6
Price/Cash Flow	—	—	—	—	—
Dividend Yield %	—	—	—	—	—
Price/Book	1.9	4.3	4.7	4.4	4.0
EV/EBITDA	18.7	61.0	54.6	36.1	25.2

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

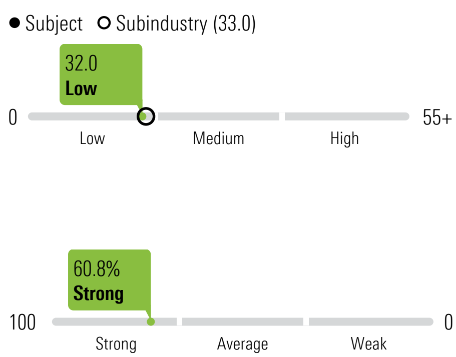
Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS

Advanced Micro Devices Inc AMD ★★ 10 Oct 2024 21:23, UTC

Last Price	Fair Value Estimate	Price/FVE	Market Cap	Economic Moat™	Equity Style Box	Uncertainty	Capital Allocation	ESG Risk Rating Assessment[1]
171.02 USD 9 Oct 2024	145.00 USD 31 Jan 2024 03:44, UTC	1.18	265.72 USD Bil 10 Oct 2024	Narrow	Large Growth	High	Exemplary	2 Oct 2024 05:00, UTC

ESG Risk Rating Breakdown

Exposure		
Company Exposure[1]	32.0	
– Manageable Risk	29.8	
Unmanageable Risk[2]	**2.1**	
Management		
Manageable Risk	29.8	
– Managed Risk[3]	18.1	
Management Gap[4]	**11.7**	
Overall Unmanaged Risk	**13.8**	



- 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 60.8% 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 Oct 02, 2024. Highest Controversy Level is as of Oct 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 02 Oct 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		
Advanced Micro Devices Inc	32.0 | Low	0	55+	60.8 | Strong	100	0	13.8 | Low	0	40+
Micron Technology Inc	51.9 | Medium	0	55+	69.7 | Strong	100	0	18.6 | Low	0	40+
Intel Corp	48.4 | Medium	0	55+	74.2 | Strong	100	0	15.1 | Low	0	40+
NVIDIA Corp	32.2 | Low	0	55+	63.4 | Strong	100	0	13.2 | Low	0	40+
—	— | —	0	55+	— | —	100	0	— | —	0	40+

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS Page 17 of 22

Appendix
Historical Morningstar Rating

Advanced Micro Devices Inc AMD 9 Oct 2024 21:33, 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
★	★	★	★★	★★	★★	★★	★★	★	★	★	★

Intel Corp INTC 9 Oct 2024 21:33, 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
★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★	★★★★

NVIDIA Corp NVDA 9 Oct 2024 21:33, 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 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

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.

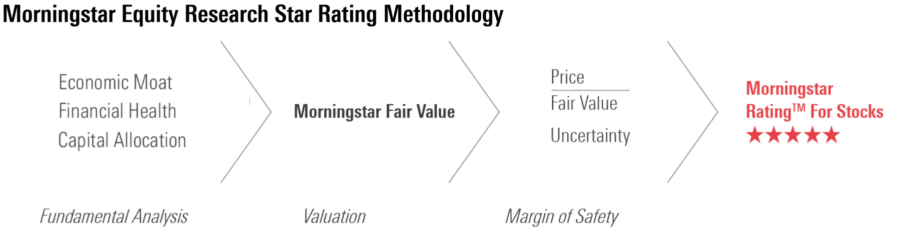
Because a dollar earned today is worth more than a dollar earned tomorrow, we discount our projections of cash flows in stages I, II, and III to arrive at a total present value of expected future cash flows. Because we are modeling free cash flow to the firm—representing cash available to provide a return 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



© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Morningstar Equity Analyst Report | Report as of 10 Oct 2024 21:54, UTC | Reporting Currency: USD | Trading Currency: USD | Exchange: NASDAQ - ALL MARKETS

Research Methodology for Valuing Companies

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.

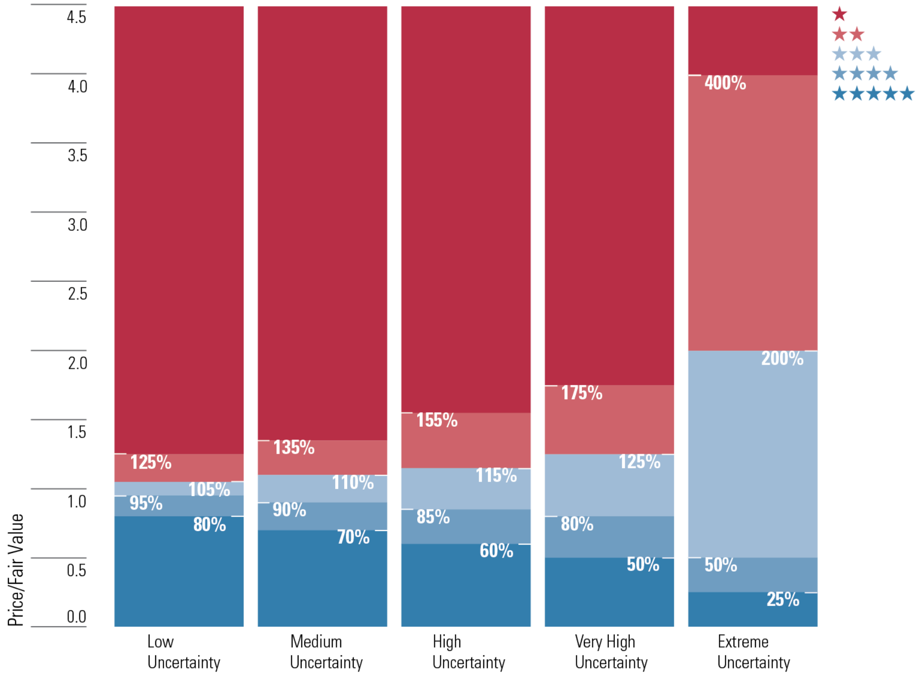
4. Market Price

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-

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Research Methodology for Valuing Companies

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.

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.

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.

Risk Warning

Please note that investments in securities are subject to market and other risks and there is no assurance or guarantee that the intended investment objectives will be achieved. Past performance of a security may or may not be sustained in future and is no indication of future performance. A security investment return and an investor's principal value will fluctuate so that, when redeemed, an investor's shares may be worth more or less than their original cost. A security's current investment performance may be lower or higher than the investment performance noted within the report. Morningstar's Uncertainty Rating serves as a useful data point with respect to sensitivity analysis of the assumptions used in our determining a fair value price.

General Disclosure

Unless otherwise provided in a separate agreement, recipients accessing this report may only use it in the country in which the Morningstar distributor is based. Unless stated otherwise, the original distributor of the report is Morningstar Research Services LLC, a U.S.A. domiciled financial institution.

This Report is for informational purposes, should not be the sole piece of information used in making an investment decision, and has no regard to the specific investment objectives, financial situation or particular needs of any specific recipient. This publication is intended to provide information to assist investors in making their own investment decisions, not to provide investment advice to any specific investor. Therefore, investments discussed herein may not be suitable for all investors; investors must exercise their own independent judgment as to the suitability of such investments and recommendations in the light of their own investment objectives, experience, taxation status and financial position. Morningstar encourages Report recipients to read all relevant issue documents (e.g., prospectus) pertaining to the security concerned, including without limitation, information relevant to its investment objectives, risks, and costs before making an investment decision and when deemed necessary, to seek the advice of a financial, legal, tax, and/or accounting professional. The information, data, analyses and opinions presented herein are not warranted to be accurate, correct, complete or timely. Unless otherwise provided in a separate agreement, neither Morningstar, Inc. or the Equity Research Group represents that the report contents meet all of the presentation and/or disclosure standards applicable in the jurisdiction the recipient is located.

Except as otherwise required by law or provided for in a separate agreement, the analyst, Morningstar, Inc. and the Equity Research Group and their officers, directors and employees shall not be responsible or liable for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions within the report.

The Report and its contents are not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or which would subject Morningstar, Inc. or its affiliates to any registration or licensing requirements in such jurisdiction.

Where this report is made available in a language other than English and in the case of inconsistencies between the English and translated versions of the report, the English version will control and supersede any ambiguities associated with any part or section of a report that has been issued in a foreign language. Neither the analyst, Morningstar, Inc., or the Equity Research Group guarantees the accuracy of the translations.

This report may be distributed in certain localities, countries and/or jurisdictions ("Territories") by independent third parties or independent intermediaries and/or distributors ("Distributors"). Such Distributors are not acting as agents or representatives of the analyst, Morningstar, Inc. or the Equity Research Group. In Territories where a Distributor distributes our report, the Distributor is solely responsible for complying with all applicable regulations, laws, rules, circulars, codes and guidelines established by local and/or regional regulatory bodies, including laws in

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Research Methodology for Valuing Companies

connection with the distribution third-party research reports.

Conflicts of Interest

- No interests are held by the analyst with respect to the security subject of this investment research report.
- Morningstar, Inc. may hold a long position in the security subject of this investment research report that exceeds 0.5% of the total issued share capital of the security. To determine if such is the case, please click http://msi.morningstar.com and http://mdi.morningstar.com
- Analysts' compensation is derived from Morningstar, Inc.'s overall earnings and consists of salary, bonus and in some cases restricted stock.
- Neither Morningstar, Inc. or the Equity Research Group receives commissions for providing research nor do they charge companies to be rated.
- Morningstar's overall earnings are generated in part by the activities of the Investment Management and Research groups, and other affiliates, who provide services to product issuers.
- Morningstar employees may not pursue business and employment opportunities outside Morningstar within the investment industry (including but not limited to, working as a financial planner, an investment professional or investment professional representative, a broker-dealer or broker-dealer agent, a financial writer, reporter, or analyst) without the approval of Morningstar's Legal and if applicable, Compliance teams.
- Neither Morningstar, Inc. or the Equity Research Group is a market maker or a liquidity provider of the security noted within this report.
- Neither Morningstar, Inc. or the Equity Research Group has been a lead manager or co-lead manager over the previous 12-months of any publicly disclosed offer of financial instruments of the issuer.
- Morningstar, Inc.'s investment management group does have arrangements with financial institutions to provide portfolio management/investment advice some of which an analyst may issue investment research reports on. However, analysts do not have authority over Morningstar's investment management group's business arrangements nor allow employees from the investment management group to participate or influence the analysis or opinion prepared by them.
- Morningstar, Inc. is a publicly traded company (Ticker Symbol: MORN) and thus a financial institution the security of which is the subject of this report may own more than 5% of Morningstar, Inc.'s total outstanding shares. Please access Morningstar, Inc.'s proxy statement, "Security Ownership of Certain Beneficial Owners and Management" section https://shareholders.morningstar.com/investor-relations/financials/sec-filings/default.aspx
- Morningstar, Inc. may provide the product issuer or its related entities with services or products for a fee and on an arms' length basis including software products and licenses, research and consulting services, data services, licenses to republish our ratings and research in their promotional material, event sponsorship and website advertising.

Further information on Morningstar, Inc.'s conflict of interest policies is available from http://global.morningstar.com/equitydisclosures. Also, please note analysts are subject to the CFA Institute's Code of Ethics and Standards of Professional Conduct.

Risk Warning Please note that investments in securities are subject to market and other risks and there is no assurance or guarantee that the intended investment objectives will be achieved. Past performance of a security may or may not be sustained in future and is no indication of future performance. A security's investment return and an investor's principal value will fluctuate so that, when redeemed, an investor's shares may be worth more or less than their original cost. A security's current investment performance may be lower or higher than the investment performance noted within the report. For investments in foreign markets there are further risks, generally based on exchange rate changes or changes in political and social conditions.

For more information about Morningstar's methodologies, please visit global.morningstar.com/equitydisclosures

For a list of securities which the Equity Research Group currently covers and provides written analysis on please contact your local Morningstar office. In addition, for historical analysis of securities covered, including their fair value estimate, please contact your local office.

For recipients in Australia: This Report has been issued and distributed in Australia by Morningstar Australasia Pty Ltd (ABN: 95 090 665 544; ASFL: 240892). Morningstar Australasia Pty Ltd is the provider of the general advice ('the Service') and takes responsibility for the production of this report. The Service is provided through the research of investment products.

To the extent the Report contains general advice it has been prepared without reference to an investor's objectives, financial situation or needs. Investors should consider the advice in light of these matters and, if applicable, the relevant Product Disclosure Statement before making any decision to invest. Refer to our Financial Services Guide (FSG) for more information at http://www.morningstar.com.au/fsg.pdf

For recipients in New Zealand: This report has been issued and distributed by Morningstar Australasia Pty Ltd and/or Morningstar Research Ltd (together 'Morningstar'). This report has been prepared and is intended for distribution in New Zealand to wholesale clients only and has not been prepared for use by New Zealand retail clients (as those terms are defined in the Financial Markets Conduct Act 2013).The information, views and any recommendations in this material are provided for general information purposes only, and solely relate to the companies and investment opportunities specified within. Our reports do not take into account any particular investor's financial situation, objectives or appetite for risk, meaning no representation may be implied as to the suitability of any financial product mentioned for any particular investor. We recommend seeking financial advice before making any investment decision.

For recipients in Hong Kong: The Report is distributed by Morningstar Investment Management Asia Limited, which is regulated by the Hong Kong Securities and Futures Commission to provide services to professional investors only. Neither Morningstar Investment Management Asia Limited, nor its representatives, are acting or will be deemed to be acting as an investment professional to any recipients of this information unless expressly agreed to by Morningstar Investment Management Asia Limited.

For recipients in India: This investment research is issued by Morningstar Investment Adviser India Private Limited. Morningstar Investment Adviser India Private Limited is registered with SEBI as a Portfolio Manager (registration number INP000006156) and as a Research Entity (registration number INH000008686). Morningstar Investment Adviser India Private Limited has not been the subject of any disciplinary action by SEBI or any other legal/regulatory body. Morningstar Investment Adviser India Private Limited is a wholly owned subsidiary of Morningstar Investment Management LLC. In India, Morningstar Investment Adviser India Private Limited has one associate, Morningstar India Private Limited, which provides data-related services, financial data analysis, and software development. The research analyst has not served as an officer, director, or employee of the fund company within the last 12 months, nor have they or their associates engaged in market-making activity for the fund company.The ESG-related information, methodologies, tool, ratings, data and opinions contained or reflected herein are not directed to or intended for use or distribution to India-based clients or users and their distribution to Indian resident individuals or entities is not permitted, and Morningstar/Sustainalytics accepts no responsibility or liability whatsoever for the actions of third parties in this respect.

*The Conflicts of Interest disclosure above also applies to relatives and associates of Manager Research Analysts in India # The Conflicts of Interest disclosure above also applies to associates of Manager Research Analysts in India. The terms and conditions on which Morningstar In-

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.

Research Methodology for Valuing Companies

vestment Adviser India Private Limited offers Investment Research to clients, varies from client to client, and are detailed in the respective client agreement.

For recipients in Japan: The Report is distributed by Ibbotson Associates Japan, Inc., which is regulated by Financial Services Agency, for informational purposes only. Neither Ibbotson Associates Japan, Inc., nor its representatives, are acting or will be deemed to be acting as an investment professional to any recipients of this information.

For recipients in Singapore: For Institutional Investor audiences only. The Report is distributed by Morningstar Investment Adviser Singapore Pte. Limited, which is licensed by the Monetary Authority of Singapore to provide financial advisory services in Singapore. Morningstar Investment Adviser Singapore Pte. Limited is the entity responsible for the creation and distribution of the research services described in this presentation. Investors should consult a financial adviser regarding the suitability of any investment product, taking into account their specific investment objectives, financial situation or particular needs, before making any investment decisions.

For recipients in Korea: The report is distributed by Morningstar Korea Ltd., which has filed to the Financial Services Committee, for informational purposes only. Neither Morningstar Korea Ltd. nor its representatives are acting or will be deemed to be acting as an investment advisor to any recipients of this information.

© Morningstar 2024. All Rights Reserved. Unless otherwise provided in a separate agreement, you may use this report only in the country in which its original distributor is based. The information, data, analyses and opinions presented herein do not constitute investment advice; are provided solely for informational purposes and therefore are not an offer to buy or sell a security; and are not warranted to be correct, complete or accurate. The opinions expressed are as of the date written and are subject to change without notice. Except as otherwise required by law, Morningstar shall not be responsible for any trading decisions, damages or other losses resulting from, or related to, the information, data, analyses or opinions or their use. The information contained herein is the proprietary property of Morningstar and may not be reproduced, in whole or in part, or used in any manner, without the prior written consent of Morningstar. Investment research is produced and issued by subsidiaries of Morningstar, Inc. including, but not limited to, Morningstar Research Services LLC, registered with and governed by the U.S. Securities and Exchange Commission. To order reprints, call +1 312-696-6100. To license the research, call +1 312-696-6869. Please see important disclosures at the end of this report.