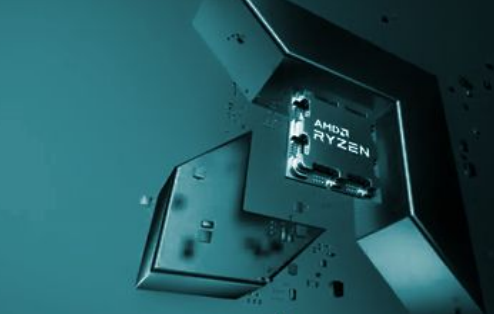


GICS Sector: Information Technology
Industry: Semiconductors
NASDAQ: AMD

Authors: Samantha Gottlieb, Jivitesh Kamboj, Athénaïs Mortier, Benjamin Roe, Brenden Rogers

Advanced Micro Devices, Inc.

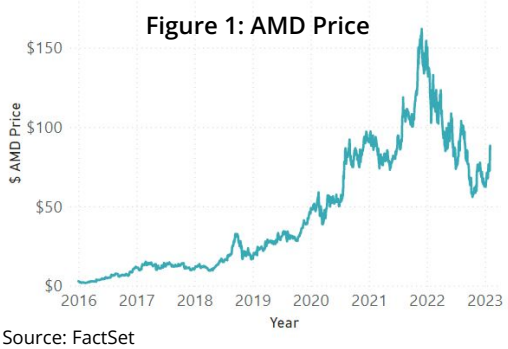
Initiating Coverage
February 10, 2023

BUY	HOLD	**SELL**

Snapshot	
Previous Close (2/9)	$83.21
52 Week High	$132.96
52 Week Low	$54.57
Basic Shares (Millions)	1612.4
Market Cap (Billions)	$134.17
Upside	3.26%
Target Price	$85.92
Upside - Cost of Equity	-15.92%
EV (Billions)	$135.04
EPS (TTM)	$0.84

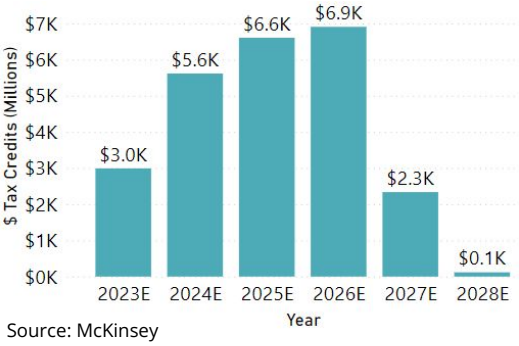
Source: FactSet

Figure 1: AMD Price



Source: FactSet

Figure 2: CHIPS Act Allocation to Manufacturers



Source: McKinsey

Figure 3: Cost of Equity Calculation

Component	Estimate
Risk Premium	**7.95%**
Risk-Free Rate	**3.30%**
Beta	**1.997**
Alpha	**-**
Cost of Equity	**19.18%**

Source: FactSet, Team Analysis

INVESTMENT SUMMARY

OVERVIEW

We issue a **SELL** recommendation with a one-year target price of **$85.92**, providing an expected return of **3.26%.** This target price is derived from Discounted Cash Flow (DCF), Industry, and Comparables models. Our recommendation is based on four key catalysts: (1) Weak Economic Moat, (2) Strong Cyclical Headwinds, (3) Geopolitical Uncertainty, and (4) Current Excessive Valuation. Our sell recommendation stems from significant opportunity costs associated with holding this stock in the next year, with investors earning **15.92%** below the company's required rate of return.

1. Weak Economic Moat: Intel's Competition & ARM's Encroachment

AMD competes with Intel in the x86 CPU market, and possesses a weak economic moat despite recent innovations including the Zen Core microarchitecture and products built on top of this technology. While AMD has had the upper hand on Intel in recent years, the relative competitiveness of their upcoming product lines is uncertain. The product cycle for semiconductors generally lasts 2-3 years, giving Intel multiple opportunities to catch up to AMD advancements. Intel has multiple product offerings debuting in 2023 that could reverse AMD's recent gains, including Emerald Rapids and Meteor Lake processors. Due to the shared chip architecture with Intel, network effects are limited as customers can switch between AMD and Intel at relatively low cost.

The adoption of the ARM chip architecture continues to encroach on AMD's x86 based competitive advantage. While x86 architecture is still dominant, many large players are beginning to switch from x86 to ARM in search of improved energy consumption efficiency. Apple made waves when it switched from Intel's x86 chips to ARM for its product offerings, and Amazon's Graviton custom chip for data centers is also based on ARM architecture. The willingness of major cloud computing hyperscalers and device manufacturers to switch chip architectures should be of great concern to AMD. ARM currently underperforms x86 by most metrics, but is a significant risk to AMD in the intermediate to long term.

2. Strong Cyclical Headwinds: Inventory and Recessionary Pressures

COVID led to a period of abnormally high demand for AMD products, with YoY sales growth reaching 45% and 68.3% in 2020 and 2021 respectively. This growth was driven primarily by work-from-home conditions that led to an increase in demand for computing applications. COVID induced logistic bottlenecks, which further exacerbated the chip supply shortage and necessitated the rapid expansion of supply capacity, resulting in excess inventories. After the reopening of the world economy, there is now a large inventory build-up that will weaken pricing power in the near term.

The recent inflationary episode has set the Fed on a fast paced tightening cycle with a median Fed Funds rate projection of approximately 5% (Figure 14). The recent jobs report indicated that the labor market is still strong, which has raised hopes for a soft landing. However, it also gives the Fed more incentive to keep rates elevated for longer. Higher rates will continue to put downward pressure on economic growth and AMD revenues. Global recessionary pressures have the potential to exacerbate this problem, with the IMF projecting a slowdown in Global GDP growth from 3.4% YoY in 2022 to 2.9% in 2023 (Figure 15).

3. Geopolitical Uncertainty: Regulatory Environment & China-Taiwan Tensions

The regulatory environment for the semiconductor industry is highly uncertain due to its centrality in US-China competition. The CHIPS Act has benefited Intel as the US attempts to bring advanced manufacturing to the United States. The bill includes $200 billion for R&D and commercialization over the next 10 years, but it is uncertain how AMD in particular will benefit from this bill (Figure 2). The future trajectory of US export controls is unknown, but more restrictive policies seem likely as the strategic competition between the US and China heats up.

The possibility of a major conflagration between China and Taiwan is an existential risk to AMD. A Chinese invasion of Taiwan could lead to a US chip embargo which would dampen both Taiwanese and Chinese sales, which represented 37.6% of AMD's sales in 2021 (Figure 46). The Russia-Ukraine conflict has demonstrated on a smaller scale the kind of comprehensive sanction regime that could stem from such a conflict. This would send manufacturing costs soaring as the largest chip fabrication plants in the world would be imperiled.

4. Excessive Valuation: Intrinsically and Extrinsically Overvalued

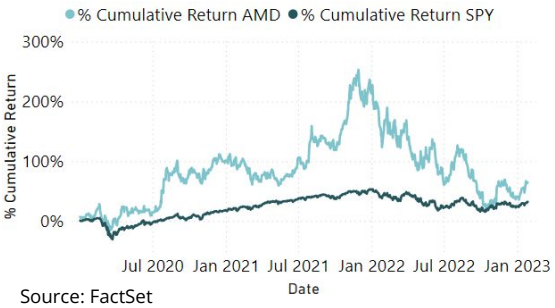
AMD's price is currently overvalued on both an extrinsic and intrinsic basis. From an intrinsic lens, the market is pricing in sales growth significantly higher than the long run average of 15%. We do not see sufficient historical evidence pertaining to stable revenues, profits, or cash flows to completely commit to extrapolating more recent trends forward.

Figure 4: AMD Profile

Advanced Micro Devices, Inc.	
Founded	1969
Headquarters	Santa Clara, CA
Primary Industry	Semiconductor
Chief Executive Officer	Dr. Lisa Su

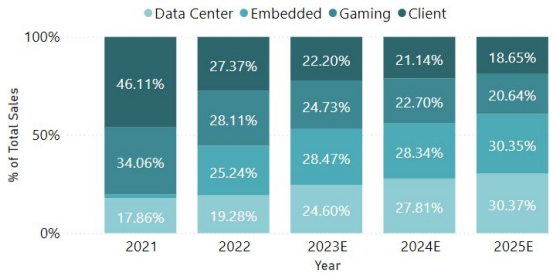
Source: FactSet

Figure 5: Cumulative Return AMD vs SPY



Source: FactSet

Figure 6: Total Sales per Segment (%)

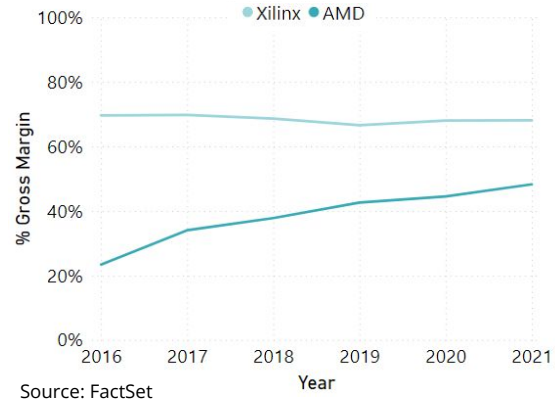


Source: FactSet, Team Analysis

Figure 7: Common Shares Outstanding

Source: FactSet

Figure 8: Gross Margin AMD vs Xilinx (%)



Source: FactSet

Profit margins remain volatile, with EBIT margin ranging from -8% to 22% since 2015. As a result of AMD's weak moat, Intel or other competitors can use their financial position to encroach on AMD's business and products.

From an extrinsic perspective, AMD is currently trading at earnings and EBITDA multiples well above industry medians on 2023 and 2024 estimates (Appendix 2). While some companies demand this premium, we do not believe AMD should be priced above peers due to a lack of market incumbency. While we do see an exciting AMD product roadmap (Appendix 13), particularly in Data Center and Embedded segments, AMD must continue to perform to convince us that it will continue to steal market share and execute on product innovation.

BUSINESS DESCRIPTION

OVERVIEW

Advanced Micro Devices, Inc. (AMD) was founded in Santa Clara, CA in 1969, and became a publicly traded company in 1972. AMD is a global semiconductor company that designs chips for computing applications. AMD expanded from the Central Processing Unit (CPU) to the Graphics Processing Unit (GPU) market in 2006 with the acquisition of Allegheny Technologies, but spun off its manufacturing arm as Global Foundries in 2009. AMD's current product line now includes CPUs, GPUs, Accelerated Processing Units (APUs), and System-on-Chips (SoC's), which are integrated into a wide range of products for personal computing, gaming, cloud computing, and Internet of Things (IoT) applications.

BUSINESS MODEL

AMD designs and sells integrated circuits (ICs) developed with the x86 architecture for a range of computing applications. Manufacturing of computer chips is outsourced to Taiwan Semiconductor Manufacturing Corporation (TSMC) for the most sophisticated processes (7nm and lower), and to Global Foundries for less advanced chip manufacturing. AMD reports financials for 4 business segments (Figure 6). The Data Center Segment designs server processing units for providers of cloud computing infrastructure. The Client segment includes PC processors and chipsets, while AMD's Gaming segment designs discrete GPUs (dGPUs), APUs, and SoC solutions for graphics processing. AMD also develops high performance Semi-Custom chips for gaming consoles like Sony Playstation and Microsoft Xbox. Lastly, the Embedded segment addresses the differentiated edge computing needs for defense, security, automotive, and industrial customers. This involves field programmable gate arrays (FPGAs) which can be reconfigured for specific consumer needs, as well as adaptive SoC products. AMD also derives a very small portion of its revenue from licensing Intellectual Property (IP) to third parties.

EXPENSE DRIVERS

The two main expense drivers for AMD are Cost of Sales (COGS) and Research and Development (R&D). AMD's COGS are driven by skilled engineering labor, and highly specialized design processes. R&D is also a crucial focus for AMD, as its ability to consistently invest could determine whether its products are competitive. R&D spending will continue to be a significant focus for the company.

CUSTOMER BASE

AMD's primary customers are Original Equipment Manufacturers (OEM's) that develop computing products for commercial and consumer uses, including large scale cloud computing service providers and original design manufacturers. AMD also works with customers to create customized products using its CPU, GPU, and APU processors to serve both domestic and overseas companies, with 71.67% of 2021 sales revenue coming from international markets (Figure 46).

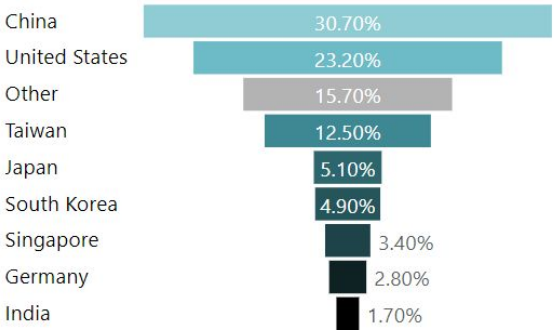
GROWTH STRATEGY

AMD is focusing its growth strategy on expanding its newest generation EPYC Genoa chips that serve a data center portfolio with CPUs, Data Processing Units (DPUs), and adaptive cores for cloud computing. AMD aims to satisfy growing demand for large scale data processing from hyperscalers like Google, Meta, and Amazon. Additionally, AMD plans to increase its footprint in Artificial Intelligence (AI) with FPGAs, SoC's, and increased software integration capabilities. In order to standardize AI programming capabilities, AMD has announced a Unified AI Software roadmap to enable AI developers to work across its full range of chips. Finally, AMD plans to expand further into the Personal Computer (PC) market by improving its graphics offerings and deepening its collaboration with OEM's including Lenovo, Dell and Hewlett-Packard (HP).

XILINX & PENSANDO ACQUISITIONS

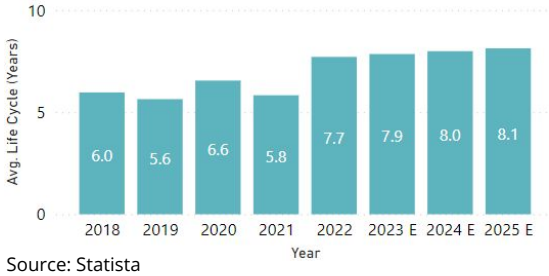
AMD has been active in the Mergers & Acquisitions (M&A) space, most recently acquiring Xilinx in Feb. 2022 for $49 billion in an all-stock transaction. Xilinx predominantly produces FPGAs, which are ICs that can be modified post-manufacturing by the end users. The Xilinx acquisition positions AMD as a leader in the FPGA and Embedded markets and signify its intention to continue to grow in adaptive computing. The $49 billion price tag is a record setting number for the chip industry, and has already had a profound impact within AMD's Embedded segment. Additionally, AMD acquired Pensando Systems for $1.9 billion in a deal that closed in May of 2022. Pensando Specializes in Data Processing Units (DPU), which are used in large scale computational activities. The integration of Pensado products and technology continues to strengthen AMD's rapidly expanding Data Center Segment, and continues to provide cloud solutions to hyperscalers. The ultimate success of these transactions will depend on AMD's ability to integrate product lines and company culture. Currently, AMD indicates no intention to engage in M&A activity in the near future, however strategic M&A has been a source of growth in the past and will likely play an important role in AMD's future growth.

Figure 9: Semiconductor Industry (Region,%)



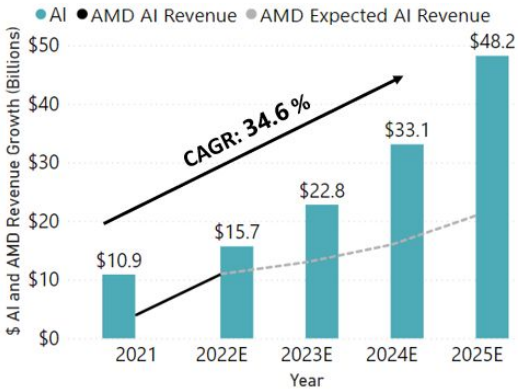
Source: FactSet

Figure 10: Average PC Lifecycle (Years)



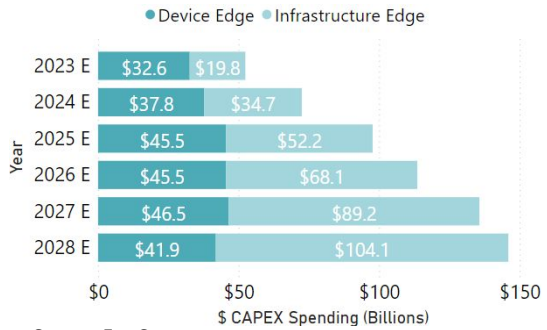
Source: Statista

Figure 11: AI TAM & AMD AI Revenue



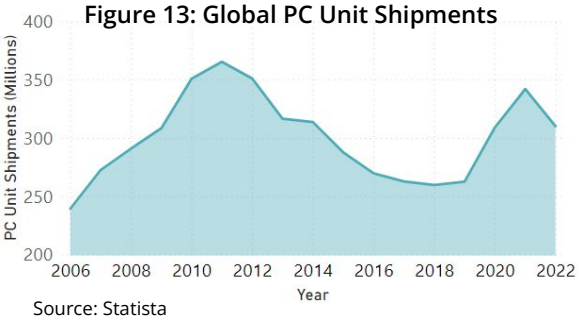
Source: Statista, Team Analysis

Figure 12: Industry Edge Computing CAPEX



Source: FactSet

Figure 13: Global PC Unit Shipments



Source: Statista

INDUSTRY OVERVIEW

TRILLION DOLLAR INDUSTRY

AMD operates within the broad semiconductor industry, one of the fastest growing and most valuable industries in the world. Global semiconductor revenues are expected to exceed $1 trillion by 2025, and the industry has a total market capitalization of $3.17 trillion. Within this broad and lucrative space, the industry is divided across a wide variety of sub-segments including cloud computing, GPUs, CPUs, and other specialty computing niches. Because of this product diversification, there are many major players in the market, including major companies such as Intel, NVIDIA, Qualcomm, and a multitude of global competitors. China, the US, and Taiwan account for a total of 65% of global semiconductor sales, with China alone accounting for nearly one third (Figure 9).

KEY DRIVERS

Personal Computer & Gaming Market: A key component for semiconductor growth prospects going forward is the health of the PC market. Our outlook centers around three key characteristics:

- The life cycle of new PCs is estimated to be more than 7 years
- PCs are a semi-durable goods, and will be impacted by budget cuts or recessionary pressures
- CPU demand is a "derived demand", meaning the market is entirely dependant on the demand for computers and laptops as a whole

PCs saw extreme weakness in Q3 2022 as sales declined 20% YoY, with no clear signs of recovery in Q4. Consumer demand for PCs ballooned during the pandemic, when work from home trends created favorable conditions for technology firms. The aggregate unit shipments of the PC market reached a peak of 342 million in 2021, but declined over 16.3% to 286 million in 2022 (Figure 13). Recently, AMD guided towards 290 million units at the end of the next year, with shipments increasing to 360 million by 2025. We believe this is optimistic given that Intel guided closer to 270 million units this year, and the PC market outlook appears discouraging according to Gartner and IDC. PC life cycles are forecasted to continue improving, which could erode future growth as less consumers look to upgrade their CPU (Figure 10). Many consumers and corporations upgraded computer products during the work from home conditions in 2020 and 2021, contributing to lower demand today.

In addition to weakness in PCs, Discrete GPU (dGPU) sales have slowed along with slower than expected growth in Gaming demand. Crypto miners also use GPUs to mine coins, linking GPU demand to crypto markets. Crypto has fallen significantly, leaving Bitcoin down more than 60% in the last year. Since crypto miners collect a portion of token value, market dynamics have led to lower mining revenues and contributed to lower GPU demand.

Cloud & Artificial Intelligence: In addition to consumer-facing product lines, AMD and other semiconductor firms depend on their relationship with large firms such as Microsoft, Meta, Amazon and other well capitalized industry players. These B2B partnerships ensure chips are not only compatible with, but optimized for a wide range of continually evolving corporate and cloud needs. Many of these needs involve AI, which AMD's CEO, Dr. Lisa Su, has called the most important "megatrend" for semiconductor success. This is a rapidly growing sub industry with total AI chip revenue projected to grow at a 34.6% CAGR through 2025 (Figure 11). AMD and the semiconductor industry at large have the ability to power a comprehensive set of AI use cases from self-driving cars to powerful generative AI models like ChatGPT. There are many well-funded competitors attempting to lead the charge, but NVIDIA has shown dominance in leveraging their strong GPU technology. Other companies that stand to benefit from AI trends include AMD, Intel, and Qualcomm. However, none of these companies can compete with NVIDIA's technology, and battles for AI market share will be crucial in the next decade as product road maps materialize. Although COVID accelerated many of these AI trends, Ms. Ruth Cotter from AMD investor relations noted in January that recent order volume was "experimental." Economic headwinds could delay the conversion of those experimental customers to recurring revenue.

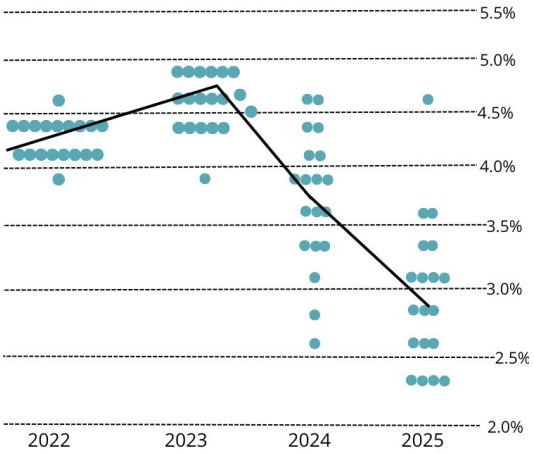
Edge Computing & IoT: Edge computing is an important growth source for semiconductor firms in the future. This includes end-markets like IoT devices and sensors, networking and communication infrastructure, and aerospace. These markets require products that process data in a specialized manner, and can be optimized for a variety of end cases. There are many of the same players in these markets as PC and Cloud, including Amazon, Microsoft, Google, and others. The number of IoT devices is forecasted to grow to 27 billion by 2025, more than doubling the connected devices that existed at the end 2021 (Figure 20). The flood of IoT devices that have recently entered the technology space has created the need to bring data analytics to the device, lending itself to the name "edge", or near the device, computing. Aggregate CAPEX spending on edge computing technology is expected to grow at a CAGR of 26% through 2028, representing the need to power applications interfacing with these end products (Figure 12).

ARM architecture is incredibly competitive in this space, as this architecture has proven most useful for embedded products like mobile devices, where battery life and temperature control are of paramount importance. Industry analysts project that ARM will continue to gain traction and adoption, and will expand into other markets more explicitly controlled by x86.

MACRO ENVIRONMENT

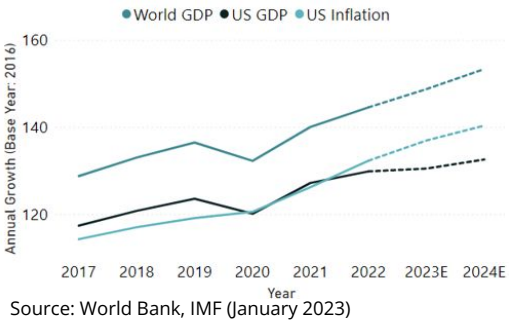
Semiconductors are highly cyclical products, with industry sales that are highly sensitive to the macro environment. According to IMF, global GDP growth will to fall from an estimated 3.4% in 2022 to 2.9% in 2023 - with a potential rise to 3.1% in 2024.

Figure 14: Fed Funds Rate Projections



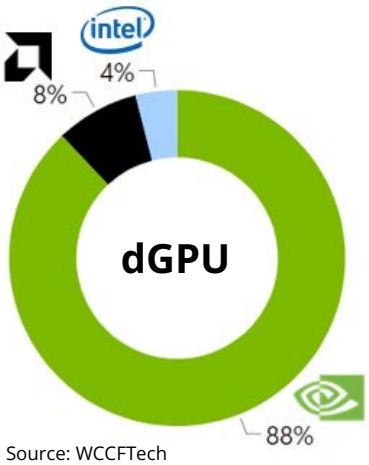
Source: U.S Federal Reserve (December 2022)

Figure 15: GDP & Inflation Growth



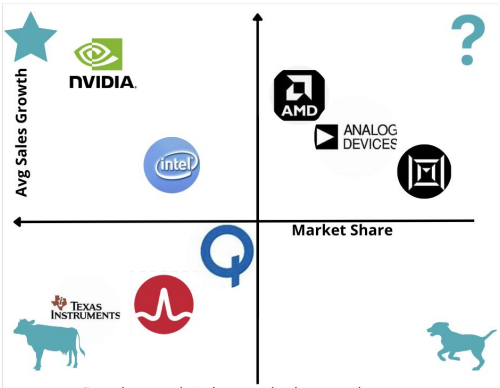
Source: World Bank, IMF (January 2023)

Figure 16: dGPU Market Share



Source: WCCFTech

Figure 17: Boston Consulting Group Chart



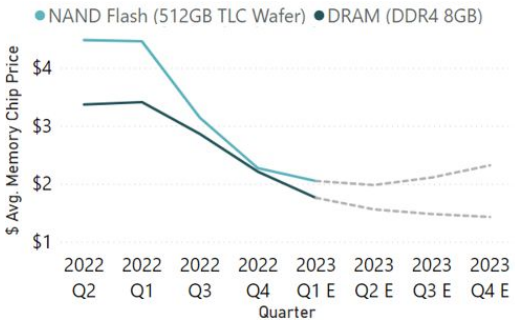
Source: FactSet, Team Analysis

Weakening Consumer: In addition to tightening financial conditions, the US consumer is on shaky economic standing. The personal savings rate as of January 2023 fell to 2.4%, the second lowest reading in the history of the metric. Consumer credit card loans increased more than 15% throughout 2022, even while consumer sentiment (as measured by the University of Michigan's survey) is at a 10-year low. Beyond the U.S, China's COVID surge coupled with declining chip cycles sent Taiwan's GDP into its worst quarter in nearly 13 years leading to a contraction of 0.86% (for Q4 yoy). Weak consumer demand in 2023 could cause PC and gaming markets to collapse further, putting pressure on Microsoft and Google which have consumer facing exposure as well.

Persistent Inflation: Central banks across the world have been aggressively raising rates since March of 2022, part of a response to rising inflation caused in the aftermath of monetary and fiscal stimulus during COVID (Figure 14). The inflation situation has largely improved in recent months, but Central Banks have vowed to continue to raising rates until inflation returns to the FOMC's 2% long run target. Recent recent data indicates that inflation has started to ease from a June 2022 high of 9% (YoY) down to 6.5% in December. Moreover, the Fed seems to have paused 50 bp rate hikes, slowing to a 25 bp rate hike in the latest FOMC meetings. Tech firms are sensitive to interest rate changes since it leads to higher cost of debt and generating/maintaining liquidity. This is a significant factor for firms like AMD who rely on liquidity and cash in order to combat slumps in demand, or must compete by pouring cash into R&D when a competitor releases a new product.

Falling Memory Costs: One of the most important factors contributing to semiconductor industry margins will be the health of memory chip markets, including NAND and DRAM. Memory chips are combined with processors to power tasks requested of computers, and as a result these products are generally considered a leading indicator for semiconductor demand. Many end-users require additional memory to enhance CPU performance. Memory chip manufacturers have been faced with increasing inventories in the second half of 2022, resulting in drastic price cuts for both NAND and DRAM. NAND and DRAM prices are forecasted to decrease from Q4 2022 to Q1 2023 by 9.7% and 20.3%, respectively (Figure 18). Older versions of DRAM (DDR4) that have been more impacted by price cuts are compatible with a wider range of Intel products, which could lead consumers to choose Intel over AMD and NVIDIA, that can only be used with more advanced memory components. This suggests weakness in pricing power for semiconductor companies in 2023, with a possible stabilization in 2024.

Figure 18: Memory Prices



Source: WSJ

COMPETITIVE POSITIONING

x86 DUOPOLY

AMD derives a significant part of its revenue from its license to use the x86 computer architecture. Intel and AMD operate as a duopoly and are the only companies with the rights to develop technology with this instruction set. AMD obtained this license from Intel in 1982 as a result of IBM's supplier diversification requirement for its PC. Since then, Intel has kept AMD at bay and currently controls 63.5% of the x86 CPU market compared to AMD's 36.4% share. Although Intel has historically outperformed in terms of market share and technology, AMD has very recently become increasingly competitive, creating chips that rival Intel's most advanced products across multiple categories. An increase in computational demand will create opportunities for both AMD and Intel, and the execution of product roadmaps will determine which firm has market power moving forward. A common industry belief holds that Intel offers solutions and products that are "good-enough" for current needs. Evolving computing tasks may force Intel to adapt and push into higher performance chips, which would erode AMD's competitive traction.

As of Dec, 2022, Intel held $11.14 B in cash, which is more than double AMD's cash position as of Q4. Intel's financial position and higher revenues give the company flexibility and the incentive to continue investing heavily in future technology. Intel spent $17.5B on R&D in the 2022 fiscal year, against AMD's comparatively small investment of $5B (Figure 44). In addition to improved financial position and larger market share, Intel has a different market position. Intel's status as an Integrated Device Manufacturer (IDM) gives it a different role in the industry supply chain, and leaves it slightly better positioned in the event of a Taiwanese supply shock.

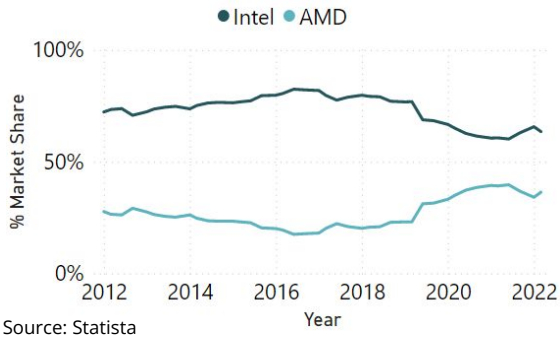
NAVIGATING GEOGRAPHICAL & GEOPOLITICAL CONDITIONS

AMD has global revenue exposure, much like the semiconductor industry as a whole. Changes in demand across Asia materially impacts AMD's business, and is actually more important than the US market on a per dollar basis. The Asia/Pacific super-region has accounted for an average of 62.1% revenue share in 2021, with China alone accounting for 24.3%. The US is still the most important single country for AMD's revenue, accounting for 28.3% of 2021 revenue (Figure 46).

TRAILING GRAPHICS LEADERS

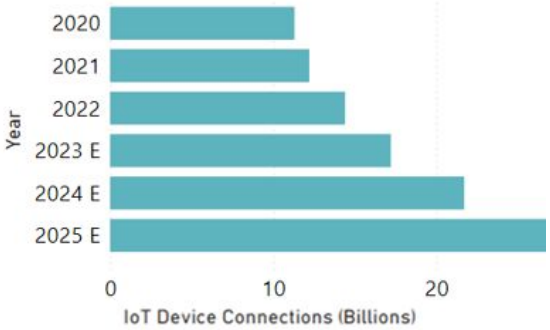
In addition to x86 CPUs, AMD is developing GPUs for use mainly in its Data Center and Gaming Segments. The development and distribution of GPUs is dominated by NVIDIA, which owns 88% of the discrete market, while AMD and Intel's share amount to a mere 8% and 4%, respectively (Figure 16).

Figure 19: x86 Market Share



Source: Statista

Figure 20: IoT Device Connections



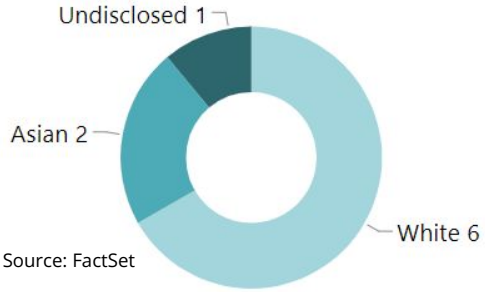
Source: IoT Analytics

Figure 21: ESG Scoring Table

Company	FactSet	Morningstar*	Refinitiv	Average
AMD	72	79.6	70	73.87
NVIDIA	69	86.38	79	78.13
Qualcom	78	85.52	70	77.84
Intel	79	81.67	86	82.22
Marvell	75	82.5	62	73.17
Analog	12	75.74	62	49.91
Texas Inst.	66	74.12	83	74.37
Industry				72.61

Source: FactSet, Refinitiv, Morningstar, Team Analysis *Converted from Risk Level Metric to ESG Score

Figure 22: Board of Directors Diversity



Source: FactSet

Figure 23: Insider Shareholder Ownership (%)

Insider Shareholder	Insider Holdings (%)
Dr. Lisa Su	0.239
Mark Papermaster	0.094
Harry Wolin	0.089
Devinder Kumar	0.034
Victor Peng	0.026
Forrest Norrod	0.018
Richard Bergman	0.010
Paul Grasby	0.007
Darla Smith	0.001

Source: FactSet

The newest Radeon 7900 GPUs by AMD are third to both NVIDIA's RTX 4080 and RTX 4090 in terms of frames per second (FPS), but are priced lower (Figure 41). This suggests less pricing power for AMD, resulting in lower margins in this market. It will be necessary for NVIDIA to stumble for multiple product cycles if any competitors are to gain a foothold in this market, which has not been the case historically. AMD has been developing a full product suite, but can't compete with NVIDIA in the higher performance GPU market. AMD and others have been forced to pursue the low end of the market, where margins are less lucrative.

AMD TECHNOLOGY ROADMAP

AMD has shifted its focus to new Ryzen 7040 series CPUs, which include dedicated AI engines, termed "Ryzen-AI". These CPUs are capable of 12 trillion AI operations per second, still second to NVIDIA's 200 trillion capability. While NVIDIA and Intel control much of the discrete GPU and CPU markets AMD is pursuing and executing on an approach that combines these functions in what it has coined "Accelerated Processing Units" (APUs). AMD's recent announcement of the MI300 Chip epitomizes this strategy. This chip is made with TSMC's cutting-edge 5nm and 6nm processes, boasting strong performance to support AMD's already strong EPYC data center processors. The 5nm metric is a milestone that has famously eluded Intel in the last decade, however new manufacturing tax credits as a result of the CHIPS Act could aid these efforts (Figure 2), and place Intel in a better position after years of product disappointments. In addition, AMD's Xilinx acquisition comes with new products in the FPGA and Embedded markets. These products will be powering autonomous devices in automotives and aerospace, and add diversification to AMD's product mix.

ENVIRONMENTAL, SOCIETAL, & GOVERNANCE

ESG SCORING SYSTEM

To assess AMD's ESG efforts, we combined FactSet, Morningstar, and Refinitiv, giving each equal weight. On this basis, AMD's ESG score of 73.87 ranks slightly higher than the industry's 72.61 (Figure 21).

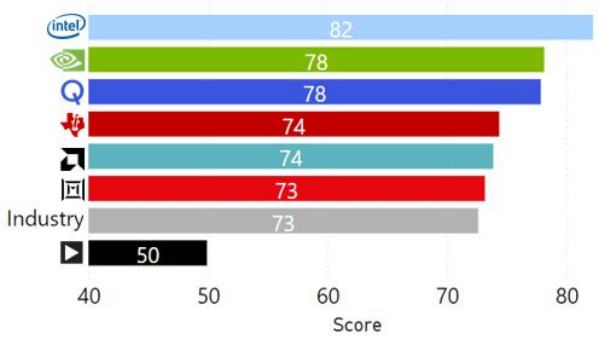
Environmental Impact: AMD is responsible for providing a valued product to its consumers and hence needs to source its product from suppliers in an ethical and responsible manner. AMD was given a 79/100 score by FactSet's Truvalue labs which puts it above the industry average. What differentiates AMD from competitors is its ability to manage energy efficiently, dispose of waste and hazardous materials, and its lower Greenhouse Gas (GHG) emissions. Over the long run, AMD aims to reduce its GHG emissions by 50% (by 2030, base year 2020), and work with suppliers to have GHG emission reduction goals and source from renewable energy. According to AMD, all environmental goals are on track. In addition, AMD does not have any facilities near biodiversity sensitive areas, with strict policies in place for water management, but not biodiversity or deforestation.

Social Impact: AMD claims to put a focus on improving communities, and has created the AMD Foundation with a goal of having 100 million people benefit from philanthropic activities that enable STEM education, scientific research and the workforce of the future by 2025. FactSet reports AMD operations and suppliers have significant risk for incidents of child labor and compulsory labor. However, AMD is on track to have 100% of manufacturing suppliers undergo a Responsible Business Alliance audit by 2025, and 80% to participate in capacity building activities including ethical recruitment. AMD aims to increase the percentage of female hires in engineering roles and under-represented group hires. In 2021 AMD increased employment of female engineers by 1% and underrepresented groups by 1.6%. A 49/100 rating was given by FactSet's Truvalue Labs for AMD's societal capital, and 67/100 for human capital.

CORPORATE GOVERNANCE

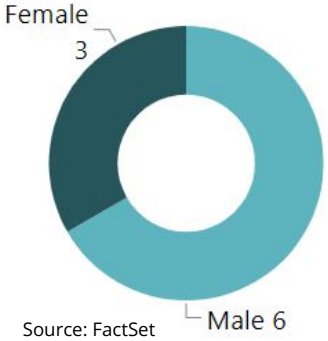
Board of Directors (BoD): AMD is regulated according to United States law and its executive management structure is based on Western European norms including a two-tier BoD and executive management. Over 33% of AMD board members are women and 22.2% are racial minorities, ratios which we think can be improved (Figures 22 & 25). AMDs' BoD has nine members possessing knowledge and experience from various relevant fields strengthening AMDs' position for future challenges and opportunities. Of the leadership members the majority have not worked at AMD, which we find concerning.

Figure 24: Industry ESG Scores



Source: FactSet, Morningstar, Refinitiv, Team Analysis

Figure 25: Gender Distribution



Source: FactSet

Figure 26: Institutional Ownership (%)

Institutional Ownership	Ownership (%)
The Vanguard Group, Inc.	7.93
BlackRock Fund Advisors	4.76
SSgA Funds Management, Inc.	4.09
T. Rowe Price Associates, Inc. (Investment	3
Fidelity Management & Research Co. LLC	2.78
Geode Capital Management LLC	1.78
JPMorgan Investment Management, Inc.	1.69
Fisher Asset Management LLC	1.61
GQG Partners LLC	1.14
Janus Henderson Investors US LLC	0.93

Source: FactSet

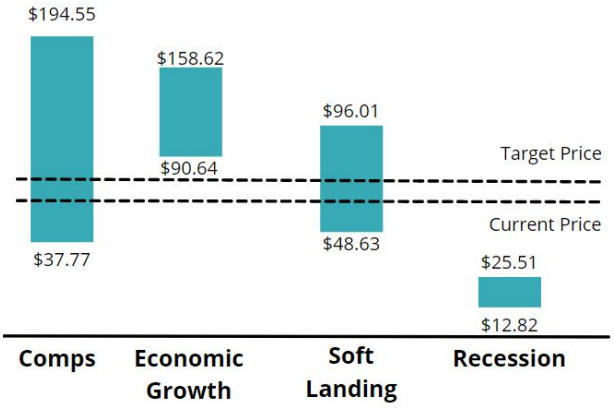
Executive Management: The CEO, Dr. Lisa Su has significant past experiences in the semiconductor industry, working for Freescale Semiconductor Inc. as Senior Vice President and General Manager. The executive team is highly experienced and has relevant educational background in their specialized fields, including technology, finance, and engineering. A 49/100 rating was given by FactSet's Truvalue Labs for AMD's leadership and governance structure.

Shareholders: AMD enjoys a diversified base of institutional shareholders. The company's free float accounts for 99.1% of outstanding shares and each share carries one voting right. The largest shareholders include institutional asset managers and mutual funds with strong ESG mandates. AMD gains brand premium by having reputable institutional investors such as The Vanguard Group and BlackRock as two of its largest shareholders (Figure 26). Furthermore, the company has less than 8% equity concentration by a single investor, which ensures diversity. Furthermore, there is no proxy takeover risk due to AMD's x86 licensing contract, indicating Intel cannot takeover AMD without losing its technology. Institutional investors hold 69.78% of total shares outstanding, which is higher than both Intel and NVIDIA's institutional ownership.

Remuneration: AMD is structured to provide its directors with a mix of cash and equity based compensation that is regulated by internal policy. This compensation structure does not include pensions or retirement for any non-employee director. The cash portion of the remuneration is composed of the following elements (All elements are retainer based fees): services as a director, services on a board committee and services as a board committee chair. In terms of equity compensation, directors are provided with Restricted Stock Unit (RSU) awards which vest in one year from the grant date and follow the formula: $205,000 (Target Equity Value) divided by the average of common stock closing price for the 30 days prior to the grant of the award. The remuneration for the chair of the board is 1.5 times the target Equity value.

VALUATION

Figure 27: Valuation Football Fields



Source: Team Analysis

Figure 28: Model Summary

Model	Weight	Price
DCF	70%	$72.94
Econ. Growth	13%	118.35
Soft Landing	85%	67.29
Recession	2%	17.83
Comps	20%	$69.78
P/E	40%	101.52
EV/EBITDA	40%	62.05
P/S	20%	61.64
Industry	10%	$70.81
Regression	100%	70.81
Fair Value Estimate		**$ 72.09**

Source: Team Analysis

Figure 29: DCF Scenarios

Recession	Soft Landing	Economic Growth
Macroeconomic Factors	**Macroeconomic Factors**	**Macroeconomic Factors**
Inflation remains above the Fed's 2% Target	Inflation moves towards 2% after 2023	Inflation returns to 2% quickly
US slips into a deep recession Fed Funds target rate goes to 6.3%	US growth slows but avoids severe recession	US economy grows modestly and avoids recession
Fed Funds rate rises to 6.1%	Fed Funds rate rises to 5.1%	Fed Funds rate falls to 3.9%
Geopolitical Factors	**Geopolitical Factors**	**Geopolitical Factors**
China-Taiwan tensions lead to an embargo or invasion	China-Taiwan tensions remain high but no conflict occurs	China-Taiwan conflict never occurs
US legislation continues to restrict AMD exports and CHIPS Act helps benefits Intel disproportionately	US export legislation restricts some AMD sales	US legislation subsidizes AMD R&D and eases export controls
Industry Factors	**Industry Factors**	**Industry Factors**
Competitors like Intel and NVIDIA steal market share	AMD market share remains fairly constant	AMD market share grows at a rapid rate in Data Center and Embedded
ARM Architecture chips steal significant market share	Technological innovation within the industry continues at similar pace for all competitors	Intel continues to lag behind AMD in future product cycles
Firm Specific Factors	**Firm Specific Factors**	**Firm Specific Factors**
High R&D spending yields diminishing returns	R&D spending allows AMD to remain competitive	R&D contributes to outperformance of AMD product suite
SG&A costs rise due to increasing legal and ESG related costs	AMD slightly improves business efficiencies over time	Business efficiencies lead to sustained increases in margins
Price:	**Price:**	**Price:**
$17.83	$67.29	$118.35
Probability:	**Probability:**	**Probability:**
2%	85%	13%

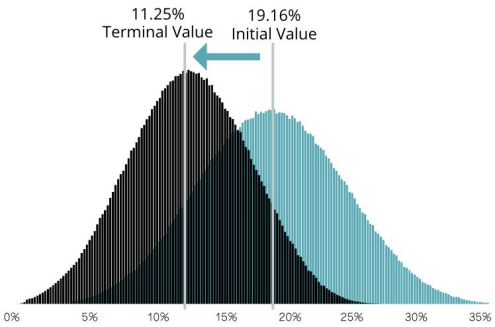
Source: Team Analysis

SCENARIO ANALYSIS

We constructed a free cash flow to equity DCF model representing three economic scenarios: Deep Recession, Soft Landing (base), and Economic Growth (Figure 29). Using a weighted average of scenario prices AMD's intrinsic value is $72.94 (Figure 28). These scenarios reflect our assumptions regarding macroeconomic and firm specific variables. Under each scenario, we are modeling uncertainty in four core income statement line items; Revenue, COGS, R&D, and SG&A, as well Cost of Capital using a 1,000,000 iteration Monte Carlo Simulation. We also considered crucial macroeconomic and geopolitical factors that have the potential to impact AMD's profitability. To weight each scenario we grew each median scenario price by AMDs required rate of return. We then priced options trading at each of those strike prices, and backed out implied probabilities assuming AMD's implied volatility remains constant throughout the next year.

Given our target price of $85.92, which is calculated our fair value estimate grown at the current cost of equity, investors who buy the stock at current levels will realize a return significantly lower than AMD's required rate of return.

Figure 30: Dynamic Cost of Equity



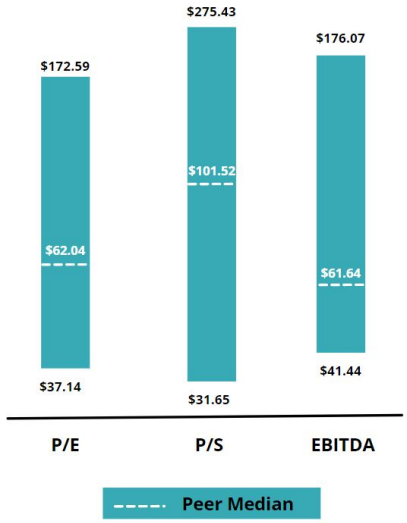
Source: Team Analysis

Figure 31: Cost of Capital

Metric	Value
Cost of Equity	19.18%
Cost of Debt	3.57%
Weight of Equity	98.32%
Weight of Debt	1.68%
Risk-Free Rate	3.30%
Effective Tax-Rate	22.92%
WACC	**18.91%**

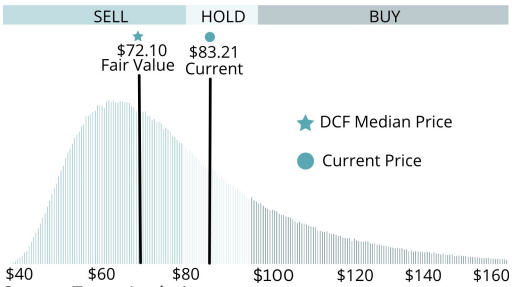
Source: FactSet, Team Analysis

Figure 32: Relative Valuation Prices



Source: Team Analysis, FactSet

Figure 33: Weighted Monte Carlo Output



Source: Team Analysis

Economic Outlooks: We integrated a number of economic risks into our valuation model including interest rates, inflation, and probabilities of a recession. The potential of higher interest rates for a prolonged period will raise AMD's cost of equity capital and contributes to the high discount rate used in their valuation, with a 2023 median target Fed Funds rate of 5.1% as of the last Fed Summary of Economic Projections. Secondly, we believe that the potential of sustained higher inflation could lead to higher raw materials costs and higher payrolls, which will raise AMD COGS. The reopening of the Chinese economy, in conjunction with and a weaker US dollar could also put additional upward pressure on global inflation. We believe our DCF assumptions and forecasts were relatively conservative given the uncertain economic environment, and still cannot justify AMD's current stock price.

Terminal Valuation: The terminal growth rate assigned to each scenario is based on our outlook for long term global growth. Our soft landing scenario employs a 2.5% terminal growth rate (Recession: 2%, Growth: 3%). These assumptions leave us with an average terminal value of cash flows representing 81.9% in our base case, (Recession: 7%, Growth: 89%). Figure 35 depicts the price impacts of changes in these growth assumptions.

Dynamic WACC: The estimated WACC of 18.91% (Figure 31) was obtained from Fama-French factors and AMD's cost of debt. We forecasted a dynamic cost of equity to account for uncertainty and AMD's maturing over the forecast period (Figure 30). The beta for AMD's cost of equity in our model is regressing towards that of its more mature competitor, Intel. To estimate the effective cost of debt, we calculated the ratio between interest expense and total debt. Because AMD's capital structure is entirely equity, we used the cost of equity to discount FCFE in our DCF model.

Comparables Analysis: When selecting comparables, we included a comprehensive list of fabless semiconductors, in addition to other companies that operate in similar end markets. The best comps include Intel, NVIDIA, Qualcomm, and Broadcom among others (Appendix 2). While some of these businesses are priced a bit differently than AMD, we feel it is important to include competitors and partners in comparable end markets, regardless of whether the company designs, manufactures, or designs and manufactures its products.

Using our peer group, we valued AMD using median P/E, P/S, and EV/EBITDA multiples (Figure 32). These metrics support our DCF analysis, and suggest a fair value of $69.78. Applying industry P/E multiples to our base case earnings forecasts for 2023 and 2024, AMD's fair value lies between the range of $54.69 and $57.66 (Figure 34).

Figure 35: Sensitivity Analysis → Terminal Growth & Cost of Equity

$ 66.87	7.3%	8.3%	9.3%	10.3%	11.3%	12.3%	13.3%	14.3%	15.3%	16.3%	17.3%
1.0%	96.17	87.94	80.58	73.98	68.07	62.76	57.98	53.69	49.83	46.34	43.20
1.2%	95.93	87.73	80.39	73.81	67.91	62.61	57.85	53.57	49.72	46.25	43.11
1.4%	95.70	87.52	80.20	73.64	67.75	62.47	57.72	53.46	49.61	46.15	43.03
1.6%	95.46	87.30	80.00	73.46	67.59	62.33	57.59	53.34	49.50	46.05	42.94
1.8%	95.22	87.09	79.81	73.28	67.43	62.18	57.46	53.22	49.40	45.95	42.85
2.0%	94.98	86.87	79.61	73.11	67.27	62.04	57.33	53.10	49.29	45.85	42.76
2.2%	94.74	86.65	79.41	72.93	67.11	61.89	57.20	52.98	49.18	45.75	42.67
2.4%	94.49	86.43	79.21	72.75	66.95	61.74	57.06	52.85	49.07	45.65	42.57
2.6%	94.25	86.21	79.01	72.56	66.78	61.59	56.93	52.73	48.96	45.55	42.48
2.8%	94.00	85.98	78.81	72.38	66.62	61.44	56.79	52.61	48.84	45.45	42.39
3.0%	93.75	85.76	78.61	72.20	66.45	61.29	56.66	52.49	48.73	45.35	42.30

Source: Team Analysis

Industry Model: Because AMD's profitability is strongly linked to the state of the global economy, we constructed a three factor regression model to predict AMD's price. The industry data consists of manufacturers' value of electronic product shipments, semiconductor production, and industrial production of circuit boards, chips, and other electronics. All variables were highly significant, and the model explains 53% of AMD's price variation on an adjusted R-squared basis (Appendix 12). Forecasting these macro variables forward in a manner that is consistent with historical trends, the implied price for AMD is $70.81. This is in line with our findings from both the comparables model and DCF model.

$$\%\Delta \text{ Price} = -44.06 + 0.002 * X1 - 0.019 * X2 + 0.012 * X3$$

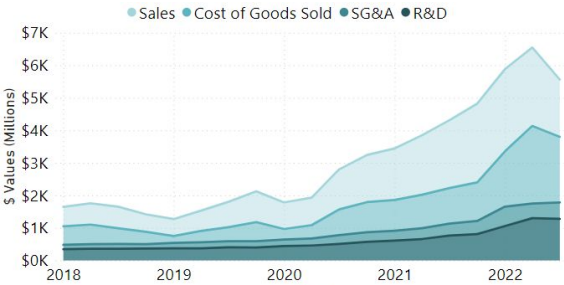
- X1 (%Δ): Value of shipments ($M)
- X2 (%Δ): Industrial production (index 1992 = 100)
- X3 (%Δ): Semiconductor industrial production (index 1992 = 100)

Figure 34: Comparables Summary

Metric	Industry		AMD		Delta		Implied Price	
	23E	24E	23E	24E	23E	24E	23E	24E
EBITDA Multiple	13.9	12.8	19.4	15.4	5.5	2.6	61.64	70.86
P/E Multiple	20.5	16.6	27.1	19.5	6.6	2.9	62.05	73.54
P/S Multiple	6.9	6.3	5.7	4.9	-1.2	-1.3	101.52	111.18

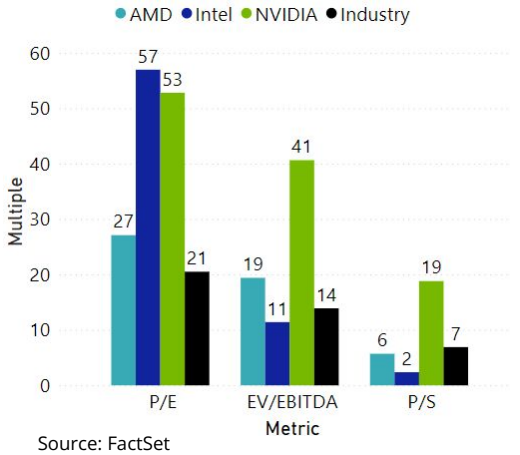
Source: Team Analysis, FactSet

Figure 36: AMD Quarterly Sales and Expenses



Source: FactSet

Figure 37: Comparables Summary



Source: FactSet

Figure 38: AMD Sales & COGS by Year

Source: FactSet, Team Analysis

Figure 39: Pro-Forma Metrics

Ratio	2021A	2022E	2023E	2024E
Profitability				
Revenue ($M)	16,434.00	23,543.00	24,821.38	28,552.10
COGS ($M)	(8,209.00)	(11,521.94)	(13,651.76)	(14,561.57)
Sales Growth	68.33%	43.26%	5.43%	15.03%
Earnings Growth	26.99%	-58.32%	143.34%	36.81%
ROE	47.43%	14.46%	29.00%	35.92%
Gross Margin	50.05%	51.06%	45.00%	49.00%
EBIT Margin	22.38%	6.05%	14.52%	17.56%
Efficiency				
Average Holding Days	74.57	74.43	80.15	84.21
NWC Turnover	3.87	4.10	3.55	3.70
Leverage/Liquidity				
Debt to Equity	9.76%	9.74%	9.86%	9.78%
Current Ratio	2.02	2.03	2.00	2.02
Quick Ratio	1.49	1.50	1.44	1.48

Source: FactSet, Team Analysis

FINANCIAL ANALYSIS

REVENUE

Historically, AMD sales have been highly volatile, with a 20 year average revenue growth of 9% juxtaposed with a 24.5% standard deviation. COVID led to a period of abnormally large sales growth stemming from the elevated demand for PCs due to work at home conditions.

We're forecasting average sales growth of 15.13% through the end of 2027 using a regression model with factors including PC unit shipments, consumer prices for computers and electronics, corporate profits for semiconductors, and capacity utilization for semiconductor manufacturing. These macro and industry variables explain approximately 20% of the variation in AMD's quarterly sales (Appendix 11). Under our soft landing scenario, we project revenue growth of 5.3% in 2023. This scenario reflects our projection that PC unit shipments recover in the latter half of the year as the Chinese economy reopens and the US economy recovers.

To project the growth of AMD's revenues by segment, we considered AMD's competitive position within each market segment. AMD's most likely market share capture in Data Center in terms of total addressable market. AMD will grow faster than the industry average in this segment. Particularly for the newly introduced EPYC product line. Similarly for the embedded segment we project AMD's market share will grow at a rate marginally higher than its competitors. Xilinx will play a prominent role in this growth.

COSTS

AMD has historically had a long run average gross margin of 48.8%, with low variance in this metric. This lower degree of operating leverage when compared to semiconductor manufacturers is the likely source of margin stability, however there are multiple fat tail risks, including tensions surrounding Taiwan that could endanger this moving forward. In addition, we see inflation running higher than expected under a mild recessionary scenario, resulting in a brief gross margin compression in the short term before improving towards 52% gross margins. These projections are consistent with AMD's guidance and recent trends. AMD has recently added operations in higher margin products like FPGAs and continues to pursue cost cutting innovations.

AMD has significant commitments towards Research and Development spending, and consistently commits more than 20% of revenues to the development of technology. Spending in this area is directly attributable to the size of its economic moat, as share gains are driven by technological advancements that are, on the margin, better than Intel or other competitors. We see R&D spending decreasing from historical levels in the next 2 years, but returning to above 20% of sales in the long run as AMD must continue to stay ahead of Intel to retain market share in all of its markets. Intel will be looking to regain share losses in data centers, and will be incentivized to better AMD on a spending and innovation basis in this more lucrative market in the next few product cycles. The CHIPS Act also earmarks $11 billion for corporate R&D which AMD is likely to utilize, contributing to artificially lower R&D in the short-term. General administrative expenses are forecasted to increase as a percent of sales in our models, as technology talent will continue to be a challenge to acquire and retain.

EBITDA margins, which have historically averaged 10.7% and have been highly variable, are forecasted to trend towards 18% on the back of improving gross margins and relatively stable R&D and SG&A spending.

The recent acquisitions of Xilinx and Pensando are contributing to abnormally large depreciation and amortization leading to the compressed EBIT margins of 2022. We see EBIT margins normalizing in the long run after the acquisition-related depreciation cycle reaches its final stage. In 2022, EBIT margins fell around 6% and are forecasted to stabilize around 14% afterwards.

PROFITABILITY

AMD's profitability increased significantly between 2020 and 2021 due to the COVID induced surge in demand. The firm's ROE increased by 14% during this period. We have forecasted an increase in 2023 by 29%, which reflects a better ability to generate income from investments, and stabilize around 30% in the long run. Without the outliers of 2020 and 2022, AMD's ROE averaged 51%. However, it experienced a low of 14% in 2022 and we do not see the firm's profitability rising above 2022 levels (Figure 39). Between 2021 and 2022, the gross margin increased by 51% which is close to the long run expectation. Nevertheless, without including outliers in 2020 and 2021, the historical average is 41%.

In May 2021, AMD announced a share buyback program that committed to repurchasing $4 Billion outstanding shares. Share buy back was increased to $8 Billion in February 2022 to offset the effect of dilution caused by issuance. As of February 2022, $3 Billion worth of shares have been repurchased and yet outstanding shares continue to grow as a result of employee stock options being exercised.

OPERATIONS

Over the past decade, AMD has been holding inventory for 78.89 days on average; a typical turnover ratio for the industry. In the next five years, this rate is forecasted to slightly increase, but will largely remain unchanged near 80 days (Figure 39).

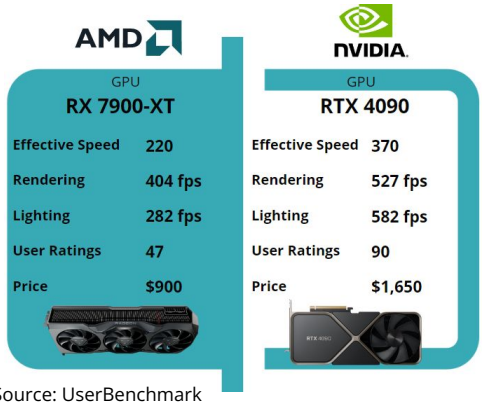
In the next few years, AMD will generate $3.70 in sales for each dollar of working capital which aligns with historical values. This shows that management is not only being very efficient at supporting sales, but also maintaining consistency with short-term assets and liabilities. AMD also has an Altman Z-Score of 8.6 in 2022 and an average score of 3.6 overall which indicates that it is not likely to go bankrupt as it currently stands (Appendix 5).

Figure 40: Risk Valuation Impacts

Risk	Business Impact	Price Valuation Impact
Operational		
O1	Sales drop to -30% (historical minimum)	**-36.21%**
O2	Decrease in sales by 25% (one SD)	**-17.87%**
O3	10% increase in COGS	**-6.32%**
O4	5% increase in SG&A	**< -1%**
O5	1% decrease in revenue each year	**-15.87%**
O6	5% increase in SG&A	**< -1%**
O7	5% increase in SG&A	**< -1%**
O8	10% decrease in Embedded sales	**-1.80%**
Geopolitical		
GP1	10% increase in COGS and elimination of Taiwan and China sales	**46.73%**
GP2	10% decrease in Chinese sales	**-5.22%**
Market		
M1	5% decrease in international revenue	**< -1%**
M2	5% increase in COGS	**-1.80%**
M3	100 basis point increase in the discount rate	**-19.14%**

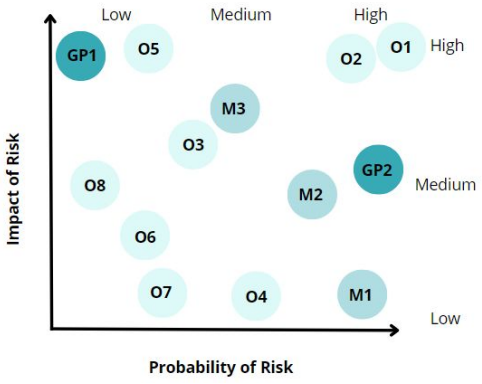
Source: Team Analysis

Figure 41: AMD & NVIDIA GPU Comparison



Source: UserBenchmark

Figure 42: Risk Matrix



Source: Team Analysis

AMD's asset turnover averages 1.405. Over the next five forecasted years which aligns with the trailing short term average of 1.453 times. This suggests that Xilinx was integrated smoothly and the revenues from the AMD post-merger were able to utilize the combined assets of both firms efficiently.

INTELLECTUAL PROPERTY

AMD's technical nature and competitive advantage is founded on a strong base of viable intellectual property (patents and licenses) - one of the most notable being their x86 license. As of February 2023, AMD holds 11,915 granted patents, 330 trademarks and 1,841 pending patent applications (Appendix 4). These intangible assets bring with them amortization costs, most notably for 2022 and 2023 due to the Xilinx acquisition. However, we note that in 2020 and 2021, Intel was among the top companies that filed and earned the highest number of patents in the USA, which may allude to a slowdown of innovation for AMD and an indicator that Intel may make a comeback in the forthcoming technology cycles.

LEVERAGE & LIQUIDITY

Starting in 2014, AMD has reduced its long term debt from 2 billion to 349 million in 2021 in addition to increasing its assets by 197% from 2018 to 2020, which paved the way for its falling Debt-to-Equity ratio. Between 2022 and 2025, AMD's Debt-to-Equity ratio is expected to stay consistent at 9.5%, which is expected to remain near its 5 year historical average. Additionally, AMD acquired Xilinx and Pensando in 2022, and issued no new debt to pay for these acquisitions, but instead increased its total common equity by 600% from 2018 to 2021.

AMD is sufficiently liquid as indicated by the average current ratio of 2.02 for the next 10 years, indicating a high ability to pay short-term obligations. The majority of AMD's liquidity is tied up in operating cash and marketable securities, then receivables, and then inventories. We believe that if all conditions abide similarly, the current ratio is unlikely to change drastically.

AMD's average quick ratio over the next 10 years is forecasted at 1.48. Its quick ratio is also stagnating around 1.5, historically, and in the future, which further supports the idea that AMD is able to meet its short-term obligations. The more conservative mass use of liquidity, the Quick Ratio, we believe is at a healthy level.

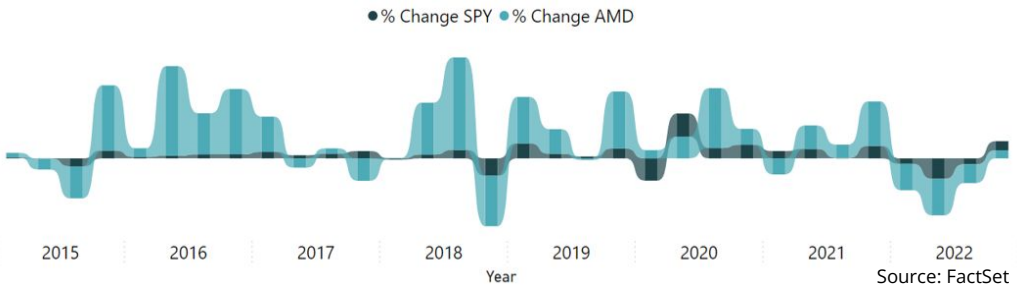
INVESTMENT RISKS

OPERATIONAL RISKS

(O1) Competitive Risk (High Prob, High Impact): AMD competes with Intel in every segment of their business due to the shared duopoly over x86 chip architecture. If AMD's next round of products fall short of Intel's metrics, AMD could lose market share. Intel is introducing several new chip offerings in 2023 that could change the competitive landscape.
Mitigation**:** AMD needs to continue to allocate a large portion of revenues to R&D to remain competitive with Intel and NVIDIA.

(O2) Cyclicality Risk (High Prob, High Impact): The semiconductor industry is highly volatile due to high levels of operational leverage and fluctuations in downstream demand for computer applications.
Mitigation**:** AMD must manage its inventory and cash effectively in order to meet fluctuating demand.

Figure 43: AMD vs SPY Volatility Chart



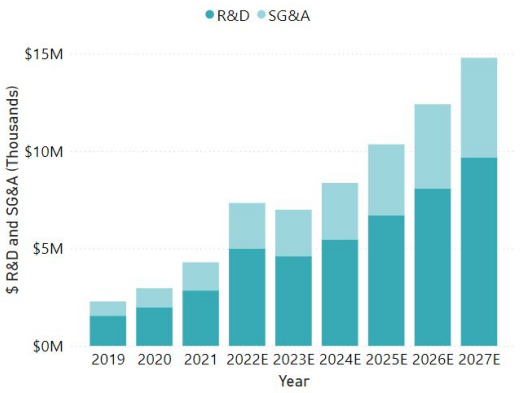
Source: FactSet

(O3) Supply Chain (Medium prob, Medium Impact): AMD relies heavily on a complex, fragmented global supply chain. As a result, the timely release of AMD's products relies on third party manufacturers, assembly, testing, and packaging companies in varying regulatory and security environments.
Mitigation**:** Substantial diversification in supply chain logistics is important to AMD's success.

(O4) Talent Shortage (Medium Prob, Low Impact): The global semiconductor industry faces an acute shortage of engineering and software talent. If this trend continues it could lead to fierce competition between industry firms to acquire and retain employees.
Mitigation**:** AMD should emphasize work life balance and employee retention to reduce this risk

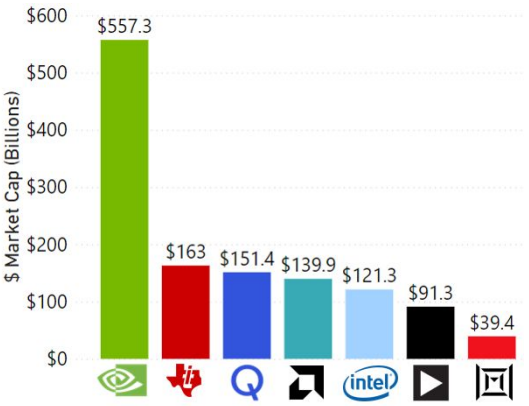
(O5) ARM Chip Architecture: (Low Prob, High Impact): ARM chip architecture is making significant inroads into the CPU market. Amazon, Google, and Microsoft are working to license ARM architecture for data center processing chips, which poses a threat to the x86 chip architecture.
Mitigation**:** AMD should invest in developing products based on ARM architecture in order to take advantage of potential network effects and increased energy efficiency.

Figure 44: AMD R&D & SG&A Expenses



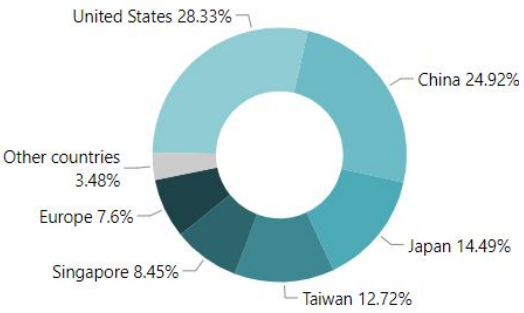
Source: FactSet, Team Analysis

Figure 45: Semiconductor Market Caps



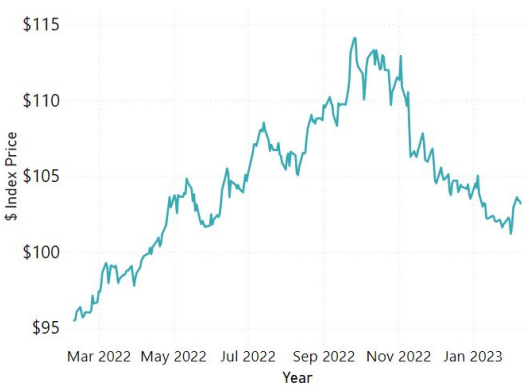
Source: FactSet

Figure 46: AMD International Revenue



Source: FactSet

Figure 47: USD FX Index (DXY)



Source: FactSet

(O6) Cyber Security (Medium Prob, Low Impact): Cyber attacks and theft of AMD's IP & customer data pose a significant threat since AMD spends large sums of money developing its patent portfolio each year. A serious breach in security could cause significant damage to its reputation and loss of customer and vendor data.
Mitigation**:** AMD must continue to invest heavily in cyber security to ensure that its intellectual property is safe from increasingly common data breaches.

(O7) ESG Risk (High prob, Low impact): AMD is subject to environmental restrictions in many jurisdictions pertaining to clean energy. Additionally, AMD must comply with regulations on the disclosure of "conflict minerals" from the Democratic Republic of Congo, and ensure that there are no occurrences of forced labor in their supply chain. Due to the complex nature of AMD's supply chains, it is difficult and costly to ensure compliance with these measures. Issues in this area have potential to cause reputational damage to AMD in the future.
Mitigation: AMD should continue to invest in robust compliance infrastructure that will mitigate the risk of litigation and reputational costs.

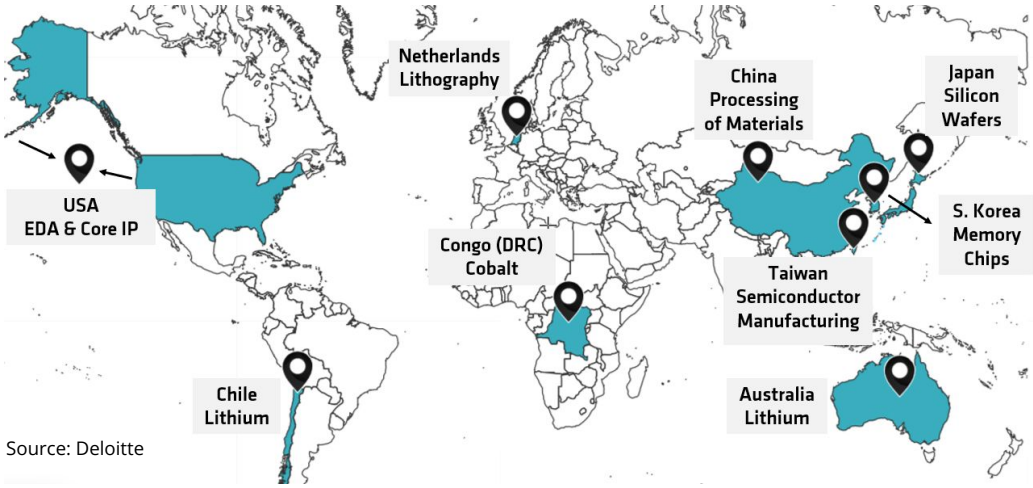
(O8) Mergers and Acquisition Risk (Low Prob, Moderate Impact): As a means to increase their competitive advantage, AMD has recently acquired several companies, including Xilinx and Pensando. Despite the fairly smooth transition, the M&A risk remains significant and failure could have considerable impact on AMD's growth.
Mitigation**:** AMD should devote effort to integrate these firms into its operations. Mentorship programs to align acquirees with AMD's goals, in addition to respecting cultures, will aid transition.

GEOPOLITICAL RISKS

(GP1) Taiwan (Low Prob, High Impact): AMD's most sophisticated chips (7nm and under) are produced by TSMC in Taiwan. If these facilities are threatened by a Chinese invasion or embargo, AMD's ability to operate in its highest margin segments would be severely impeded.
Mitigation**:** AMD's ability to move its highest end manufacturing to less geopolitically sensitive areas will decrease its exposure to this risk. US efforts to reshore semiconductor manufacturing could aid in this effort, as TSMC plans to build a fabrication plant with 3nm production capabilities in Arizona.

(GP2) China Trade War: (High prob, Medium Impact): The United States' export controls restrict export of the most advanced AI computing chips to China. The baseline model for this restriction is the AMD Instinct MI250 GPU. However, AMD claims this will not materially affect its revenues because it does not impede shipments of its less powerful MI100 chips.
Mitigation: AMD's ability to continue this line of business will depend on its ability to obtain special export licenses. AMD may reduce negative effects by developing other markets for these products.

Figure 48: Supply Chain Map



Source: Deloitte

MARKET RISKS

(M1) Currency Exchange (High Prob, Low Impact): The export nature of AMD's business model makes AMD vulnerable to fluctuations in foreign exchange rates. Most of AMD's sales are denominated in US dollars, and relative dollar strengthening may adversely affect demand from foreign customers.
Mitigation**:** AMD should continue to hedge its foreign currency risk with derivatives, and maintain sufficient cash reserves to protect against the effects of currency fluctuations.

(M2) Inflation (High prob, Medium impact): December's CPI index declined to 6.5% YoY, down from the highs experienced in mid-2022, but above the Fed's 2% target. If inflationary conditions persist, AMD could see compressed margins from elevated materials and service costs.
Mitigation**:** AMD can maintain pricing power by developing the highest performing chips to offset the costs of higher raw materials.

(M3) Interest rates: (Medium Prob, High Impact): If inflation does not meet the Fed's 2% goal, interest rates may stay elevated. High interest rates will continue to put recessionary pressure on the US economy. The level of the Fed Funds rate over the course of 2023 will play a large role in market sentiment and US economic growth.
Mitigation**:** Limit new debt issuance and pay down current debt.

APPENDICES

Appendix 1: Technical Glossary

Term	Acronym	Definition
Artificial Intelligence	AI	Applies advanced analysis and logic-based techniques to interpret events, support and automate decisions, and take actions
Cloud Computing	-	A service that includes servers and databases which provides data storage and computing power over the internet
Cores	-	Receives instructions and performs operations inside a CPU. Multi-core processors can perform operations in more than one place at the same time
Central Processing Unit	CPU	Piece of machinery that allows a computer or device to perform tasks and interpret instructions provided by programs
Data Centers	-	Houses and maintains back-end IT systems and data sources
Dynamic RAM	DRAM	Volatile memory that does not retain data when disconnected from power source. Used in many different electronics products, placed on the motherboard but not sold as part of the CPU
Edge Computing	-	Computing where information processing takes place on the device closer to the user, rather than being sent to another source. Enables faster processing and quick return times
Embedded Systems	-	Any electronic system that uses a computer chip, but that is not a general-purpose workstation, desktop or laptop computer
Field Programmable Gate Array	FPGA	A chip that allows for post-purchase firmware customization
Frames per Second	FPS	A metric used to evaluate performance of GPUs primarily and to measure graphics quality
Graphics Processing Unit	GPU	Used in mobile phones, gaming consoles, personal computers, and embedded systems, GPUs manipulate memory to accelerate image creation for displays
Hyperscaler	-	A cloud computing provider that offers immense scalability for computing and storage
Internet of Things	IoT	The network created by devices through their ability to connect with each other through the internet
Not AND	NAND	Non-volatile memory that retains data when disconnected from power source
Original Equipment Manufacturers	OEM	A technology provider that distributes devices produced by another company under its own brand name
Personal Computer	PC	A single user computer
Radeon	-	A family of AMD graphics cards based on RDNA 3 chip technology
Ryzen	-	A family of AMD x86 CPUs for laptop and desktop computers
Semiconductor	-	An essential component in electronic devices composed of a conductive substance like Silicon or Germanium
System-on-Chip	SoC	A group of processing units on a single chip that were at one time composed of several separate chips
Threads	-	Virtualization of semiconductor core that allows software to execute multiple operations simultaneously
x86	-	Dominant chip design architecture for laptops, desktops and servers
Zen	-	AMD microarchitecture that splits CPU into 4 sub components, and lowers power consumption while maintaining efficiency and performance

Appendix 2: Valuation Comparables Table

Ticker	Price	EBITDA		Earnings		Revenue		Book Value		EBITDA Multiple		Price/Earnings		Price/Sales		Price/Book	
		23E	24E	23E	24E	23E	24E	23E	24E	23E	24E	23E	24E	23E	24E	23E	24E
Intel	$ 29.05	11,769	18,435	0.51	1.79	50,670	58,524	23.45	23.76	11.41	7.29	56.96	16.23	2.37	2.05	1.24	1.22
NVIDIA	$ 221.73	13,627	15,408	4.20	5.45	28,994	34,857	9.82	11.88	40.63	35.93	52.79	40.68	18.81	15.65	22.58	18.66
Qualcomm	$ 136.63	14,964	16,820	10.15	11.61	39,914	43,721	20.01	25.20	10.76	9.57	13.46	11.77	3.82	3.48	6.83	5.42
Texas Instruments	$ 183.49	9,500	10,517	7.52	8.37	18,143	19,611	17.54	19.78	17.51	15.82	24.40	21.92	9.16	8.48	10.46	9.28
Marvell Technology	$ 46.78	2,220	2,763	2.06	2.75	6,019	7,185	18.13	19.22	19.69	15.82	22.71	17.01	6.63	5.56	2.58	2.43
Analog Devices	$ 181.02	6,063	6,532	9.92	10.56	12,272	12,769	71.41	70.83	15.97	14.82	18.25	17.14	7.48	7.18	2.53	2.56
NXP	$ 193.24	4,817	5,331	12.58	14.16	12,419	13,456	32.05	37.43	11.91	10.77	15.36	13.65	4.03	3.72	6.03	5.16
Broadcom	$ 614.45	22,851	23,758	41.12	43.71	35,481	36,849	55.95	65.20	11.24	10.81	14.94	14.06	7.24	6.97	10.98	9.42
MediaTek	$ 23.66	3,744	4,298	1.93	2.22	17,422	19,237	8.88	8.94	9.23	8.04	12.26	10.66	2.16	1.96	2.66	2.65
Monolithic Power	$ 467.62	768	934	12.86	15.21	1,955	2,290	44.10	57.59	27.62	22.71	36.36	30.74	11.23	9.59	10.60	8.12
AMD	$ 85.02	6,913	8,680	3.14	4.35	23,966	27,808	34.52	35.99	19.39	15.44	27.08	19.54	5.72	4.93	2.46	2.36

Source: FactSet, Team Analysis

Appendix 3: Ratio Analysis

Figure A3.1: Ratio Analysis Table

Ratio	2018A	2019A	2020A	2021A	2022E	2023E	2024E	2025E
Profitability								
Revenue ($M)	6,475.00	6,731.00	9,763.00	16,434.00	23,543.00	24,821.38	28,552.10	33,999.99
COGS ($M)	(3,889.00)	(3,721.00)	(5,199.00)	(8,209.00)	(11,521.94)	(13,651.76)	(14,561.57)	(17,340.00)
Sales Growth	21.50%	3.95%	45.05%	68.33%	43.26%	5.43%	15.03%	19.08%
Earnings Growth	683.72%	1.19%	630.21%	26.99%	-58.32%	143.34%	36.81%	9.30%
ROE	35.91%	16.66%	57.48%	47.43%	14.46%	29.00%	35.92%	33.57%
Gross Margin	39.94%	44.72%	46.75%	50.05%	51.06%	45.00%	49.00%	49.00%
EBIT Margin	7.66%	8.66%	14.17%	22.38%	6.05%	14.52%	17.56%	16.53%
Efficiency								
Average Holding Days	74.33	89.61	83.58	74.57	74.43	80.15	84.21	79.96
NWC Turnover	4.47	3.39	3.23	3.87	4.1	3.55	3.7	3.77
Leverage/Liquidity								
Debt to Equity	99.00%	26.00%	9.80%	9.76%	9.74%	9.86%	9.78%	9.78%
Current Ratio	1.7800	1.9487	2.5416	2.0242	2.0291	2.0009	2.0193	2.0193
Quick Ratio	1.2200	1.4354	1.8064	1.4896	1.5001	1.4393	1.4788	1.4788

Source: FactSet, Team Analysis

Figure A3.2: Historical and Forecasted Ratio Averages

	Historical				Forecast			
	Mean	Std. Dev	Min	Max	Mean	Std. Dev	Min	Max
Profitablity								
Sales Growth	12.73%	28.48%	-27.52%	68.33%	15.67%	10.61%	2.50%	43.26%
Earnings Growth	200.23%	441.91%	-340.94%	683.72%	19.22%	45.11%	-58.32%	143.34%
ROE	-2433.43%	7878.83%	-24850.00%	586.67%	30.38%	5.37%	14.46%	35.92%
Gross Margin	39.99%	6.41%	30.24%	50.05%	50.22%	1.97%	45.00%	52.00%
EBIT Margin	4.96%	8.70%	-7.99%	22.38%	16.22%	3.36%	6.05%	18.45%
Efficiency								
Average Holding Days	80.8	8.72	62.58	91.09	81.42	3.06	74.43	86.08
NWC Turnover	3.87	0.57	3.05	4.82	3.72	0.15	3.53	4.1
Leverage/Liquidity								
Debt to Equity	210.90%	437.77%	-549.03%	1182.89%	9.76%	0.04%	9.72%	9.86%
Current Ratio	1.89	0.26	1.62	2.54	2.03	0.01	2	2.04
Quick Ratio	1.28	0.25	0.94	1.81	1.49	0.02	1.44	1.51

Source: FactSet, Team Analysis

Appendix 4: Financial Statements

Figure A4.1: Income Statement

$ (In Millions)	2019A	2020A	2021A	2022E	2023E	2024E	2025E	2026E	2027E	2028E
Sales	6,731.00	9,763.00	16,434.00	23,543.00	24,821.38	28,552.10	33,999.99	40,256.14	47,389.66	55,464.98
COGS	(3,721.00)	(5,199.00)	(8,209.00)	(11,521.94)	(13,651.76)	(14,561.57)	(17,340.00)	(20,289.09)	(23,656.92)	(27,421.89)
Gross Profit	3,010.00	4,564.00	8,225.00	12,021.06	11,169.62	13,990.53	16,660.00	19,967.04	23,732.74	28,043.09
R&D	(1,547.00)	(1,983.00)	(2,845.00)	(4,993.47)	(4,595.49)	(5,457.88)	(6,703.70)	(8,074.97)	(9,668.05)	(11,505.32)
SG&A	(738.00)	(981.00)	(1,406.00)	(2,330.76)	(2,388.11)	(2,899.19)	(3,633.54)	(4,320.14)	(5,106.88)	(6,001.91)
EBITDA	725.00	1,600.00	3,974.00	4,696.83	4,186.03	5,633.46	6,322.75	7,571.94	8,957.81	10,535.87
Depreciation and Amortization	(142.00)	(217.00)	(296.00)	(3,272.50)	(581.54)	(619.92)	(700.91)	(801.65)	(910.32)	(1,026.17)
EBIT	583.00	1,383.00	3,678.00	1,424.33	3,604.49	5,013.55	5,621.84	6,770.28	8,047.49	9,509.70
Net Interest Expense	(94.00)	(47.00)	(34.00)	(84.42)	(101.60)	(110.85)	(127.34)	(148.86)	(172.87)	(199.59)
Non-Operating Income (Loss)	(117.00)	(56.00)	31.00	108.30	18.60	(88.55)	(236.38)	(434.89)	(694.43)	(1,026.35)
EBT	372.00	1,280.00	3,675.00	1,448.20	3,521.49	4,814.15	5,258.12	6,186.54	7,180.19	8,283.76
Incomes Taxes	(31.00)	1,210.00	(513.00)	(130.34)	(314.59)	(426.85)	(462.71)	(540.29)	(622.28)	(712.40)
Other Income (Loss	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Incomes Before Ext. Items	341.00	2,490.00	3,162.00	1,317.87	3,206.90	4,387.29	4,795.41	5,646.25	6,557.91	7,571.35
Minority Interest in Earnings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Preferred Dividends	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Income (available to common)	**341.00**	**2,490.00**	**3,162.00**	**1,317.87**	**3,206.90**	**4,387.29**	**4,795.41**	**5,646.25**	**6,557.91**	**7,571.35**

Source: FactSet, Team Analysis

Appendix 4 (cont.): Financial Statements

Figure A4.2: Balance Sheet

$ (In Millions)	2019A	2020A	2021A	2022E	2023E	2024E	2025E	2026E	2027E	2028E
Assets										
Cash and Cash Equivalents	1,507.00	2,290.00	3,608.00	5,168.74	5,449.41	6,268.47	7,464.52	8,838.03	10,404.16	12,177.05
Receivables	1,879.00	2,076.00	2,708.00	3,879.42	4,090.08	4,704.82	5,602.53	6,633.42	7,808.88	9,139.54
Inventories	982.00	1,399.00	1,955.00	2,743.99	3,251.21	3,467.89	4,129.58	4,831.91	5,633.97	6,530.61
Other Current Assets	229.00	378.00	312.00	446.96	471.23	542.06	645.49	764.26	899.69	1,053.00
Total Current Assets	4,597.00	6,143.00	8,583.00	12,239.12	13,261.93	14,983.24	17,842.12	21,067.62	24,746.71	28,900.20
PP&E (Net)	705.00	849.00	1,069.00	1,531.43	1,614.58	1,857.26	2,211.63	2,618.58	3,082.61	3,607.89
Investments	58.00	63.00	69.00	98.85	104.22	119.88	142.75	169.02	198.97	232.88
Intangibles	499.00	518.00	617.00	883.90	931.90	1,071.96	1,276.50	1,511.38	1,779.20	2,082.38
Other Assets	169.00	1,389.00	2,081.00	2,981.20	3,143.08	3,615.49	4,305.34	5,097.54	6,000.84	7,023.40
Total Assets	**6,028.00**	**8,962.00**	**12,419.00**	**17,734.49**	**19,055.70**	**21,647.83**	**25,778.35**	**30,464.15**	**35,808.33**	**41,846.76**
Liabilities										
Current Debt	43.00	41.00	383.00	546.93	587.67	667.62	795.00	939.51	1,104.32	1,290.55
Accounts Payable	1,201.00	546.00	1,406.00	1,973.43	2,338.21	2,494.04	2,969.92	3,475.02	4,051.85	4,696.70
Income Taxes Payable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Current Liabilities	1,115.00	1,830.00	2,451.00	3,511.25	3,701.91	4,258.32	5,070.83	6,003.88	7,067.79	8,272.16
Total Current Liabilities	2,359.00	2,417.00	4,240.00	6,031.61	6,627.80	7,419.97	8,835.74	10,418.41	12,223.96	14,259.40
Long-Term Debt	685.00	531.00	349.00	498.38	535.51	608.35	724.43	856.11	1,006.29	1,175.98
Other Liabilities	146.00	166.00	321.00	459.86	484.83	557.70	664.11	786.31	925.65	1,083.38
Deferred Taxes	11.00	11.00	12.00	17.19	18.12	20.85	24.83	29.39	34.60	40.50
Total Liabilities	**3,201.00**	**3,125.00**	**4,922.00**	**7,007.03**	**7,666.26**	**8,606.87**	**10,249.11**	**12,090.23**	**14,190.50**	**16,559.26**
Equity										
Minority Interest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Preferred Stock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paid in Common Capital (Net)	9,922.00	10,425.00	8,951.00	10,863.60	8,318.68	5,582.90	3,275.77	474.21	(2,839.79)	(6,741.48)
Retained Earnings	(7,095.00)	(4,588.00)	(1,454.00)	(136.13)	3,070.77	7,458.06	12,253.47	17,899.71	24,457.62	32,028.97
Total Common Equity	**2,827.00**	**5,837.00**	**7,497.00**	**10,727.46**	**11,389.44**	**13,040.96**	**15,529.24**	**18,373.93**	**21,617.83**	**25,287.49**
Total Liabilities and Equity	**6,028.00**	**8,962.00**	**12,419.00**	**17,734.49**	**19,055.70**	**21,647.83**	**25,778.35**	**30,464.15**	**35,808.33**	**41,846.76**

Source: FactSet, Team Analysis

Figure A4.3: Statement of Cash Flows

$ (In Millions)	2019A	2020A	2021A	2022E	2023E	2024E	2025E	2026E	2027E	2028E
OPERATING:										
Net Income	341.00	2,490.00	3,162.00	1,317.87	3,206.90	4,387.29	4,795.41	5,646.25	6,557.91	7,571.35
Depreciation and Amortization	142.00	217.00	296.00	3,272.50	581.54	619.92	700.91	801.65	910.32	1,026.17
Increase in Deferred Taxes	0.00	0.00	1.00	5.19	0.93	2.72	3.98	4.57	5.21	5.90
Increase in Other Liabilities	(35.00)	20.00	155.00	138.86	24.97	72.87	106.41	122.20	139.34	157.73
Fund from Operations	448.00	2,727.00	3,614.00	4,734.41	3,814.35	5,082.81	5,606.71	6,574.67	7,612.77	8,761.15
Increase in Receivables	(610.00)	(197.00)	(632.00)	(1,171.42)	(210.65)	(614.75)	(897.70)	(1,030.89)	(1,175.46)	(1,330.65)
Increase in Inventory	(137.00)	(417.00)	(556.00)	(788.99)	(507.22)	(216.67)	(661.69)	(702.34)	(802.06)	(896.64)
Increase in Other Current Assets	36.00	(149.00)	66.00	(134.96)	(24.27)	(70.83)	(103.43)	(118.77)	(135.43)	(153.31)
Increase in Accounts Payable	140.00	(655.00)	860.00	567.43	364.79	155.83	475.88	505.11	576.83	644.85
Increase in Other Curr. Liabilities	328.00	715.00	621.00	1,060.25	190.66	556.41	812.51	933.05	1,063.91	1,204.37
Cash from Operations	**205.00**	**2,024.00**	**3,973.00**	**4,266.71**	**3,627.65**	**4,892.79**	**5,232.27**	**6,160.83**	**7,140.55**	**8,229.76**
INVESTING:										
Capital Expenditures	(499.00)	(361.00)	(516.00)	(3,734.93)	(664.70)	(862.59)	(1,055.29)	(1,208.60)	(1,374.34)	(1,551.45)
Increase in Investments	0.00	(5.00)	(6.00)	(29.85)	(5.37)	(15.66)	(22.87)	(26.27)	(29.95)	(33.91)
Purchases of Intangibles	16.00	(19.00)	(99.00)	(266.90)	(48.00)	(140.07)	(204.54)	(234.88)	(267.82)	(303.18)
Increase in Other Assets	(74.00)	(1,220.00)	(692.00)	(900.20)	(161.88)	(472.41)	(689.85)	(792.20)	(903.30)	(1,022.56)
Cash From Investing	**(557.00)**	**(1,605.00)**	**(1,313.00)**	**(4,931.87)**	**(879.94)**	**(1,490.74)**	**(1,972.55)**	**(2,261.95)**	**(2,575.42)**	**(2,911.10)**
FINANCING:										
Increase in Debt	(522.00)	(156.00)	160.00	313.31	77.87	152.79	243.46	276.19	315.00	355.92
Net Issuance of Common Stock	1,212.00	503.00	(1,474.00)	1,912.60	(2,544.92)	(2,735.78)	(2,307.13)	(2,801.56)	(3,314.00)	(3,901.69)
Clean Surplus Plug	8.00	17.00	(28.00)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cash from Financing	**698.00**	**364.00**	**(1,342.00)**	**2,225.90**	**(2,467.05)**	**(2,582.99)**	**(2,063.66)**	**(2,525.37)**	**(2,999.01)**	**(3,545.77)**

Source: FactSet, Team Analysis

Appendix 5: Altman's Z-Score

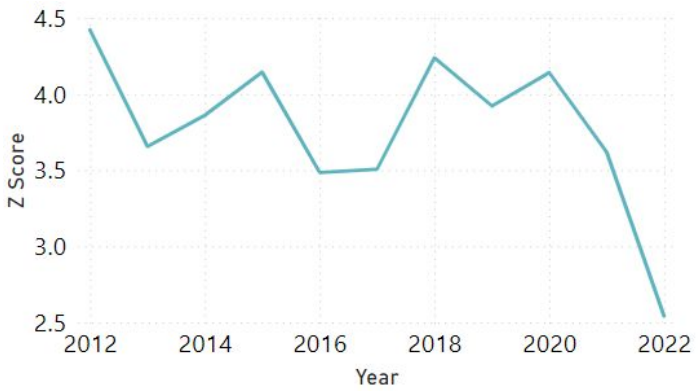
Altman's Z-score is a five-ratio based weighted formula that is used to evaluate the health of a company. A score below 1.8 indicates that a company is susceptible to bankruptcy, while a company with a score above 3 is not likely to go bankrupt. In comparison to a major competitor like Intel, Inc, it is evident that the health of AMD is significantly weaker. Though AMD and Intel both have strong scores, AMD lacks a higher average Z-score and score consistency YoY. From 2012 - 2017, AMD had a Z-score below 1.8 while Intel consistently scored about 3.

Figure A5.1: Altman's Z-Score Data

Altman's Z-Score - AMD INPUT VARIABLES Z-Score = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Current Assets	2,265	2,884	2,736	2,320	2,530	2,634	3,540	4,597	6,143	8,583	15,019
Current Liabilities	1,397	1,618	1,440	1,403	1,346	1,513	1,984	2,359	2,417	4,240	6,369
Total Liabilities	3,462	3,793	3,580	3,496	2,905	2,956	3,290	3,201	3,125	4,922	12,830
Total Assets	4,000	4,337	3,767	3,084	3,321	3,552	4,556	6,028	8,962	12,419	67,580
Retained Earnings	-6,160	-6,243	-6,646	-7,306	-7,803	-7,775	-7,436	-7,095	-4,605	-1,451	-131
Revenues	5,422	5,299	5,506	3,991	4,272	5,253	6,475	6,731	9,763	16,434	23,601
Operating Income	-945	88	178	-331	-469	67	456	589	1,383	3,678	1,355
Market Capitalization	5,200	1,950	2,610	2,000	1,740	10,020	12,050	25,590	54,990	106,620	172,170
Working Capital	868	1,266	1,296	917	1,184	1,121	1,556	2,238	3,726	4,343	8,650
DERIVED VARIABLES											
A = working capital / total assets	0.217000	0.291907	0.344040	0.297341	0.356519	0.315597	0.341528	0.371267	0.415755	0.349706	0.127996
B = retained earnings / total assets	-1.5400	-1.4395	-1.7643	-2.3690	-2.3496	-2.1889	-1.6321	-1.1770	-0.5138	-0.1168	-0.0019
C = earnings before interest and tax / total assets	-0.23625	0.02029052	0.04725246	-0.10732815	-0.14122252	0.018862613	0.100087796	0.097710683	0.154318233	0.296159111	0.020050311
D = market value of equity / total liabilities	1.50	0.51410493	0.72905028	0.57208238	0.5989673	3.389715832	3.662613982	7.994376757	17.5968	21.66	13.42
E = sales / total assets	1.3555	1.22181231	1.46164056	1.29409857	1.28635953	1.478885135	1.421202809	1.116622429	1.089377371	1.323294951	0.349230542
ALTMAN'S Z-SCORE Amd	(0.4185)	(0.0677)	(0.0021)	(1.6766)	(1.6819)	0.8892	2.0739	5.0334	11.9362	15.5539	8.6179
ALTMAN'S Z-SCORE Intel	4.42	3.66	3.86	4.14	3.49	3.51	4.24	3.92	4.14	3.62	2.54
AVERAGE ALTMAN'S Z-SCORE AMD	3.6598										
AVERAGE ALTMAN'S Z-SCORE INTEL	3.77645										

Source: FactSet, Team Analysis

Figure A5.2 Intel Altman's Z-Score



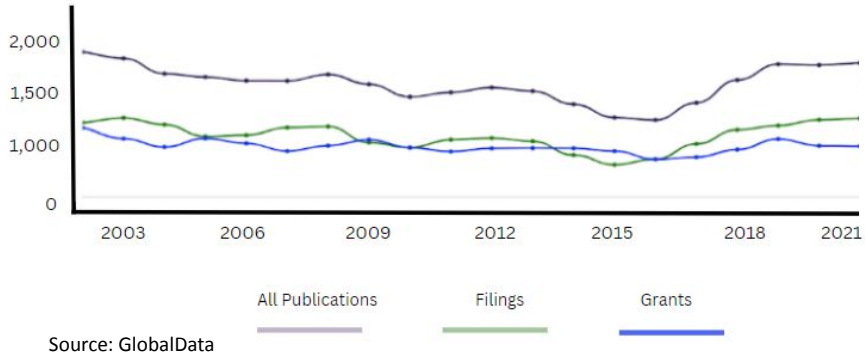
Source: Team Analysis

Figure A5.2: AMD Altman's Z-Score

Source: Team Analysis

Appendix 6: Intellectual Property Portfolio Analysis

Figure A6.1: AMD Patent Portfolio



Source: GlobalData

After conducting an Intellectual Property portfolio analysis, it is evident that AMDs innovation has become more stagnant. As evident by the declining number of grant applications, publications, and filings, AMD has lacked the innovation that it needs to maintain its competitive edge. When analyzing Intel vs AMD's IP portfolio, AMDs focus on innovation is inadequate in comparison to its competitors with Intel having more than 60,000 patents which is the fifth most in the world in 2020. Seeking Alpha claims that in 2021 Intel filed more than 170 patents giving them the ability to offer better results for the same price.

Appendix 7: Environmental Social & Governance

Figure A7.1: Corporate Governance Tree

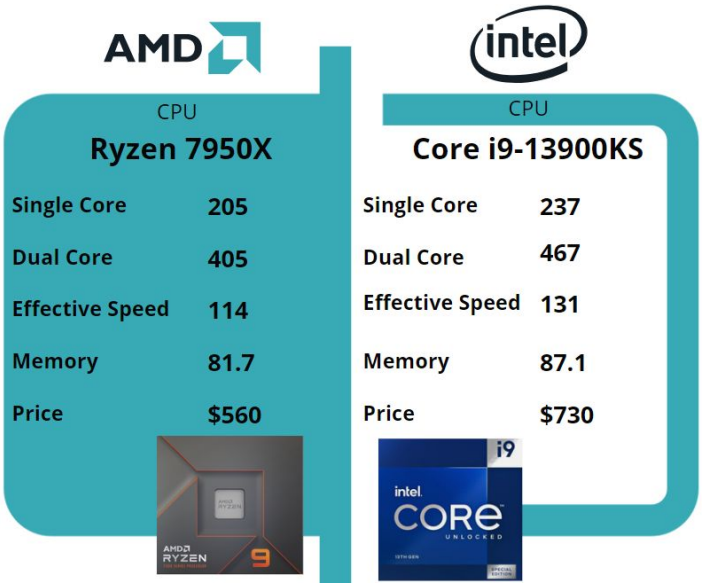
Source: Company Data

Figure A7.2: ESG Comparables

Company	FactSet	Morningstar*	Refinitiv	Average
AMD	72	79.6	70	73.87
NVIDIA	69	86.38	79	78.13
Qualcom	78	85.52	70	77.84
Intel	79	81.67	86	82.22
Marvell	75	82.5	62	73.17
Analog	12	75.74	62	49.91
Texas Inst.	66	74.12	83	74.37
Industry				72.61

Source: FactSet, Refinitiv, Morningstar, Team Analysis
*Converted from Risk Level Metric to ESG Score

Appendix 8: AMD & Intel CPU Comparison



Source: UserBenchmark

Scores are “points” from UserBenchmark. Prices are as of February 10, 2023

Appendix 9: SWOT Analysis

STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
S	W	O	T
-Datacenter Segment Products: Continued market share gains in the sticky revenue Data Center segment with new EPYC processors.	**-Legislation:** US legislation has limited AMD's ability to operate in the Chinese market, which may limit its potential revenue growth.	**-Datacenter Market:** Intel's continued deterioration in the datacenter space provides an opportunity for AMD to take over more cloud computing workloads.	**-Geopolitical:** Supply chain fragility stemming from China-Taiwan pose a threat to AMD's ability to produce chips.
-Xilinx Acquisition: Embedded business is already providing a large revenue stream due to Xilinx acquisition.	**-Innovation Requirement:** As a pure play chip designer, AMD has an implicit obligation to innovate at a very rapid pace which may be unsustainable.	**-Pervasive AI:** New FPGA products from the Xilinx acquisition give AMD the opportunity to expand further into pervasive AI.	**-Adopting ARM:** The continued adoption of ARM chip architecture poses a threat to the AMD x86 duopoly.
-Extinguish Debt: Strong financial position consolidated with the recent extinguishment of large debts.			**-Rival Firm Innovation:** Attempts by cloud computing companies to develop their own chips pose a threat to AMD's expansion in the datacenter segment.
-Diversified Product Suite: AMD has a variety of products to serve its four segments Data Centers, Client, Gaming, and Embedded.			

Source: Team Analysis

Appendix 10: Porter's 5 Forces Summary

Rivalry: AMD faces fierce competition from rivals like Intel and NVIDIA and operates with a high fixed cost structure, however a high growth industry provides some relief for all companies to grow

Buyer Power: AMD customers are large and well capitalized technology and manufacturing firms. These buyers are less price sensitive, purchase in large volumes, and are mostly reliant on x86 chip architecture

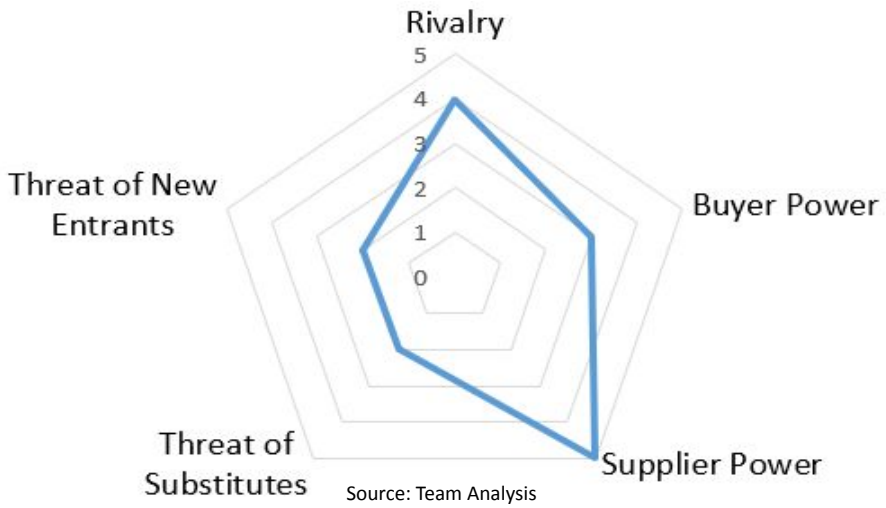
Supplier Power: AMD is highly reliant on TSMC for manufacturing its most sophisticated chip offerings. If TSMC were to raise prices or cease operations for any reason, AMD would not have a viable alternative for producing their products

Threat of New Entrants: The threshold for designing and developing semiconductors is very high. AMD's lack of manufacturing capacity makes them more vulnerable to new entrants

Threat of Substitutes: There is currently no viable alternative to AMD's x86 chips for most computing applications. ARM has been making slow inroads into chip design, but can't compete in most areas as of now

Source: Team Analysis

Porter's Radar Chart



Source: Team Analysis

Appendix 10: Porter's 5 Forces (cont.)

Force	Element	AMD's Position
Rivalry- Moderate	Concentration and relative size of competitors	The Semiconductor industry is concentrated with a few large players operating on a global scale. AMD's primary rivals include Intel and Nvidia, which both have large capacity for innovation and competition
	Relatively standardized products	AMD's products in the personal computing segment are fairly standardized with differentiation primarily based on efficiency and computing power.
	Switching costs for buyers	Switching costs are high for consumers in all AMD business segments due to the onerous burden on OEM's of implementing new designs and protocols for product integration with different chips.
	Growth and demand for products	AMD operates in a rapidly growing industry with a forecasted Sales CAGR of 26%.
	Levels of unused production capacity	AMD's fabless business model allows it to outsource the manufacturing processes to third parties like TSMC and GlobalFoundries. This shields AMD from potential losses due to unused production capacity.
	Fixed/storage costs	AMD has high fixed costs relating to R&D as its continued success depends on its ability to innovate. AMD must also hold large inventory reserves in case of demand fluctuations which raises storage costs.
	Exit barriers	As a fabless chip designer, AMD's barriers to exit are relatively low compared to manufacturers like Intel. However AMD has made large investments into R&D, highly specialized employee training, and long term contracts that would make it difficult to exit the industry.
Buyer Power- Moderate	Concentration and size of buyers	Many of AMD's immediate buyers are firms with substantial capital resources, capabilities and highly customized needs for chips. Due to this, the threat of buyers designing their own chips is significant. Moreover, the number of entities that purchase directly from AMD is small which means that a potential switch to a rival by the buyer may mean significant losses for AMD.
	Threat of backward integration	There is a low threat of backward integration as no AMD buyer holds licenses for x86 chip architecture which means in order for buyers to design their own chips, product specifications will need to shift away from x86 standards
	Buyer Price Sensitivity	AMD customers generally have strong balance sheets and diversified products lines. This makes them more sensitive to measures of efficiency and quality rather than price point.
	Buyer Purchase Volume	Buyers purchase in large volumes for large scale manufacturing, cloud computing initiatives, and edge computing which means that buyers take on the risk that the product put forth by AMD satisfies their needs. Coupled with this kind of buyer concentration, buyers have higher power to demand products and customizations.
	Buyers' utilization of product	The utilization of semiconductors in global end-markets has been incredibly high, and manufacturing shortages have been common in the past. Moreover, the technical nature of the product makes it vital to the buyers' end product quality and performance
Supplier Bargaining Power- High	Concentration and size of supplier	AMD's supplier base is concentrated in just two companies, TSMC and GlobalFoundries. AMD relies heavily on it's relationships with these suppliers to extend its product offerings which significantly increases supplier bargaining power.
	Threat of forward integration	There is a low threat of forward integration as no AMD suppliers hold licenses for x86 chip architecture. This limits the ability of a manufacturer like TSMC to begin designing their own chips and taking AMD market share.
Threat of New Entrants- Low	Economies of Scale & Technical Nature of Business	AMD carries large economies of scale due to incredibly large order volumes and sales. Designing semiconductor chips also requires incredible specialization as a result of large research and development efforts.
	Network effects	AMD operates in the x86 duopoly which is currently the market leading chip architecture. This incumbency gives AMD a continued opportunity to exploit network effects.
	Government policy restrictions	AMD is threatened by the US export ban on certain AI computing chips to China. Future restrictions may restrict AMD's ability to operate in the lucrative Chinese market.
Threat of Substitutes- Low	Awareness and Availability	The ARM architecture continues to gain traction in the CPU market, which poses a threat to the x86 architecture that AMD utilizes.
	Price and Performance	Price and performance trade-off dynamics shift every innovation cycle, and AMD is reliant on its own R&D spending to compete with the newest ARM products.

Source: Team Analysis

Appendix 11: Sales Forecast Model Regression

Sales Forecast Model: Summary Output	
Regression Statistics	
Multiple R	0.5202
R Square	0.2707
Adjusted R Square	0.2123
Standard Error	0.1211
Observations	55.0000

ANOVA	*df*	*SS*	*MS*	*F*	*Significance F*
Regression	4.0000	0.2721	0.0680	4.6388	0.0029
Residual	50.0000	0.7333	0.0147		
Total	54.0000	1.0054			

	Coefficients	*Standard Error*	*t Stat*	*Lower 95%*	*Upper 95%*
Intercept	0.0446	0.0242	1.8420	-0.0040	0.0933
L-GlobalPCShipments	0.5576	0.1680	3.3181	0.2201	0.8951
L-CapitalUtlization	0.4981	0.4544	1.0961	-0.4146	1.4108
L-CPI	1.4414	1.1194	1.2877	-0.8069	3.6897
L-CorporateProfits	0.2009	0.1280	1.5702	-0.0561	0.4580

Variables:	**Definition**
Explanatory:	**All variables are log changes (L) and consist of quartely data from 01/01/09-10/01/22.**
L-GlobalPCShipments	Global PC unit shipments
L-CapitalUtlization	Output index divided by a capacity index that represets the greatest level of output a plant can maintain within the framework of a realistic work schedule, after factoring in normal downtime and assuming sufficient availability of inputs to operate the capital in place
L-CPI	Consumer Price Index for All Urban Wage Earners and Clerical Workers: Computers, Peripherals, and Smart Home Assistants in U.S. City Average
L-CorporateProfits	Corporate profits with inventory valuation adjustments in domestic, nonfinancial, and manufacturing industries including durable goods like computer and electronic products
Independent:	
L-AMDSales:	AMD Sales.

Source: Team Analysis

Appendix 12: Industry Model Regression

Industry Model: Summary Output	
Regression Statistics	
Multiple R	0.7278
R Square	0.5296
Adjusted R Square	0.5257
Standard Error	17.1983
Observations	359.0000

ANOVA	*df*	*SS*	*MS*	*F*	*Significance F*
Regression	3.0000	118232.9700	39410.9900	133.2400	0.0000
Residual	355.0000	105002.7300	295.7800		
Total	358.0000	223235.7000			

	Coefficients	*Standard Error*	*t Stat*	*Lower 95%*	*Upper 95%*
Intercept	-44.0640	8.1380	0.0000	-60.0690	-28.0590
Value of Shipments	0.0020	0.0000	0.0000	0.0020	0.0020
Industrial Production	-0.0190	0.0020	0.0000	-0.0230	-0.0160
Inustrial Prod. (semis)	0.0120	0.0010	0.0000	0.0100	0.0140

Variables:	**Definition**
Explanatory:	
Value of Shipments	Manufacturer's value of shipments for computers and electronics ($M)
Industrial Production	Manufacturing for semiconductors and electronic componenets
Semiconductor Production	Durable goods production of semiconductors, circuits, and other devices
Independent:	
AMD Prices	AMD monthly prices

Source: Team Analysis

Appendix 13: Product Comparison

	AMD	intel
CPU	Zen 4 Ryzen 7000: -Better power consumption efficiency	Raptor Lake Series: Better performance Lower price/higher value
Workstations	AMD Threadripper Pro: 64 cores (128 threads) Superior multi-core processing	Core i9 13900k: 16 cores (24 threads) Comparable single-core performance
Gaming CPU - High End	Ryzen 7 5800X3D: 3D V-Cache is built specifically gaming Doesn't work well with all games	Core i9 13900k: Better at running simultaneous loads for gaming/streaming
Gaming CPU - Low End	Ryzen 5 5600x: Better power consumption and efficiency	Core i5-12600k: Slightly superior performance at a lower price point
Graphics	Radeon RX 7900: Superior for exclusive gaming purposes More power efficient	Arc A770: Better for running simultaneous loads Low relative performance to leading GPUs
Data Center	EPYC Genoa: Most powerful data center chip Better Power efficiency	Xeon: Less efficiency Increased reliability High bandwidth memory
Embedded	Xilinx Artix Ultrascale: Proven roadmap Currently most user friendly and powerful FPGA	Agilex: New series aiming to provide tailor-made solutions for embedded and network markets

Source: Company Data, UserBenchmark

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