Equity Analysis for

Advanced Micro Devices (AMD)

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Company Overview

In the world of computer performance, AMD is one of the most widely recognized companies.

Globally, AMD is known for their vast array of cost-effective products. Their major products include a range of various central processing units (CPU), graphic processing units (GPU), embedded processors for workstations and personal computers, as well as other embedded systems applications.

AMD sells the majority of these products to OEM companies. These companies turn around, and put AMD's products into their own lineup of products and sell them.

AMD's products include:

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  - Central Processing Unit (CPU)
  - Graphic Processing Unit (GPU)
  - Accelerated Processing Unit (APU)
  - System-on-Chip (SoC)
  - Chipsets
  - Embedded Processors

AMD sells their CPUs as standalone devices or as incorporated into APUs and chipsets. Furthermore, they often pair their CPUs with their various types of GPUs, server and embedded processors, and lastly semi-custom SoC products for gaming consoles.

The general nature of their products is to be broad for many types of computer uses. Therefore, there are many applications that AMD products are used for. Here are some of the most common applications by segment:

Computing and Graphics segment:

- Desktops (retail and commercial)
- 2 in 1's
- All in ones
- Notebooks
- Workstations (laptops)
- Chipsets (for enthusiasts; like gamers)
- Professional Workstations (Such as ones used by graphic designers)
- Datacenters

Some trends that have influenced the Computing and Graphics segment include a general increase in demand for Datacenters, increased used of Computer Aided Design (CAD), online gaming, Virtual Reality (VR), Augmented Reality (AR), Blockchain Technology, Cryptocurrency Mining, Artificial Intelligence (AI), and Autonomous Driving.

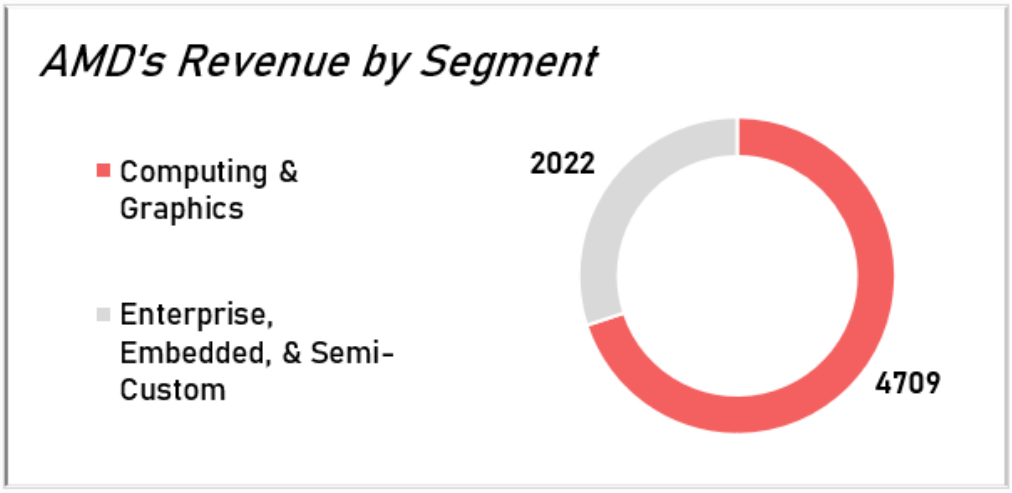
Enterprise, Embedded and Semi-Custom segment:

- Servers (cloud, web, e-mail and print servers)
- Industrial controls for automation
- Kiosks
- Medical Imaging
- Casino gaming machines

Trends influencing the Enterprise, Embedded and Semi-Custom segment are the greater demand for 24/7 hours of operation with minimal human intervention, business intelligence, forecasting tools, and again gaming, Virtual Reality, Augmented Reality, and Artificial Intelligence.

It's also important to note, that Sony PlayStation® as well as Microsoft® Xbox products fall under the Enterprise, Embedded, and Semi-Custom segment. Each company accounts for more than 10% of AMD's total net revenues.

Operations



Computing and Graphics

Central Processing Units

AMD's newest processors are the Ryzen series. Since their debut in 2017, Ryzen chips have immensely grown in popularity. This is mainly because they're known for being the best dollar to performance value that you can find.

With that being said, within the ranks of their own processors AMD has a vast array of choices for the consumer. Cheap processors can be had for just a few hundred dollars, but the more expensive ones can push $1,000.

However, prices for AMD processors are still much cheaper than that of their rival, Intel. AMD and Intel are, by far, the largest players in the microprocessor industry.

Graphic Processing Units

The second important source of revenue for AMD, are their GPUs.

Graphics processing is an important component of almost everything AMD creates. In fact, their GPU's can be found in nearly every combination of APU, CPU, or SoC.

Generally, graphics solutions are used to increase the speed of rendering images, and to help improve image resolution and color definition. The more sophisticated the GPU, the higher the resolution and the faster and smoother moving objects can be displayed on video display or in a virtual environment.

In addition to graphics processing, GPUs are also used in non-graphics applications. For example, they're commonly used for vector processing that requires repetitive computations. These computations include, but are not limited to, supercomputing, deep learning, artificial and machine intelligence, blockchain, cryptocurrency mining, and autonomous driving.

GPU's have become increasingly important to process massive data sets like the ones in the examples above. However, more typical uses of graphics solutions are in the growing fields of Virtual Reality (VR), Augmented Reality (AR), and Computer Aided Design (CAD).

Much like their CPUs, AMD really only faces one major competitor in graphics. Instead if Intel, their GPUs face direct competition from NVIDIA.

Enterprise, Embedded, and Semi-Custom

Enterprise

This part of the segment entirely focuses on setting up servers for small businesses, large businesses, and even personal needs.

The AMD EPYC Series is the most commonly used series in microprocessors under Enterprise. Through Amazon, the EPYC Series has been used for setting up cloud based services.

AMD's partnership with Amazon Web Services (AWS) was established in November of 2018. This agreement named AMD's EPYC processors as the sole source of Amazon's cloud based servers.

Embedded

Markets that are included under embedded, are networking, storage, and edge computer devices (efficiency in data storage).

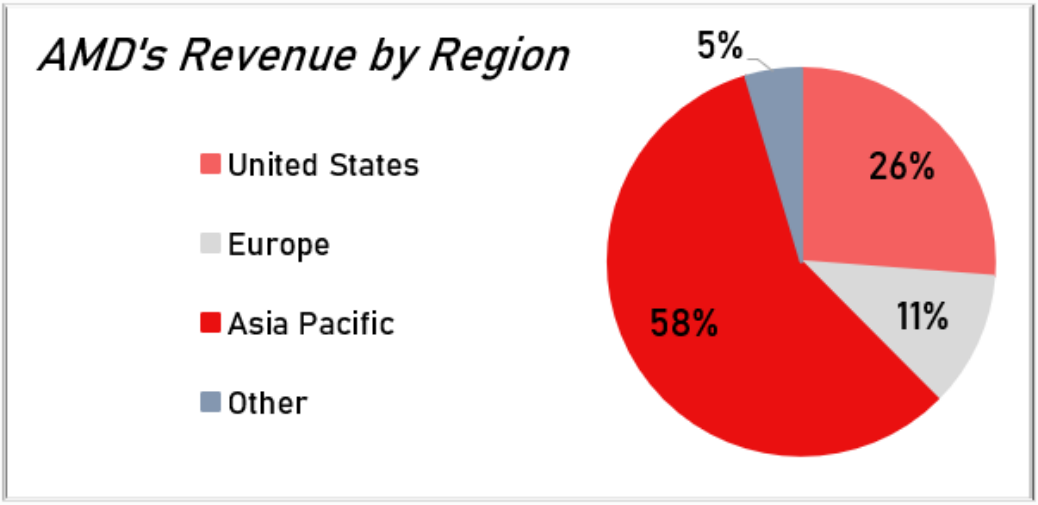
Additional markets include medical imaging, industrial systems, and digital gaming; among others.

Semi-Custom

Semi-Custom sales are primarily made to Sony for their PlayStation, and Microsoft for their Xbox.

Semi-Custom represents a sizable portion of the company's revenues. As noted previously, Sony PlayStation® as well as Microsoft® Xbox products account for more that 10% of AMD's total net revenues each.

Geography



Industry

However, prices for AMD processors are still much cheaper than that of their rival, Intel. AMD and Intel are, by far, the largest players in the microprocessor industry. (and also NVIDIA for GPUs)

Whereas AMD focuses on raw performance and price, Intel takes sort of a luxury stance on chips. Intel's prices are generally higher, and as of late their sales volume has been lower as well.

Nonetheless, each company tends to go back and forth. With anticipated releases of new products, either company can boost their sales for a few months prior.

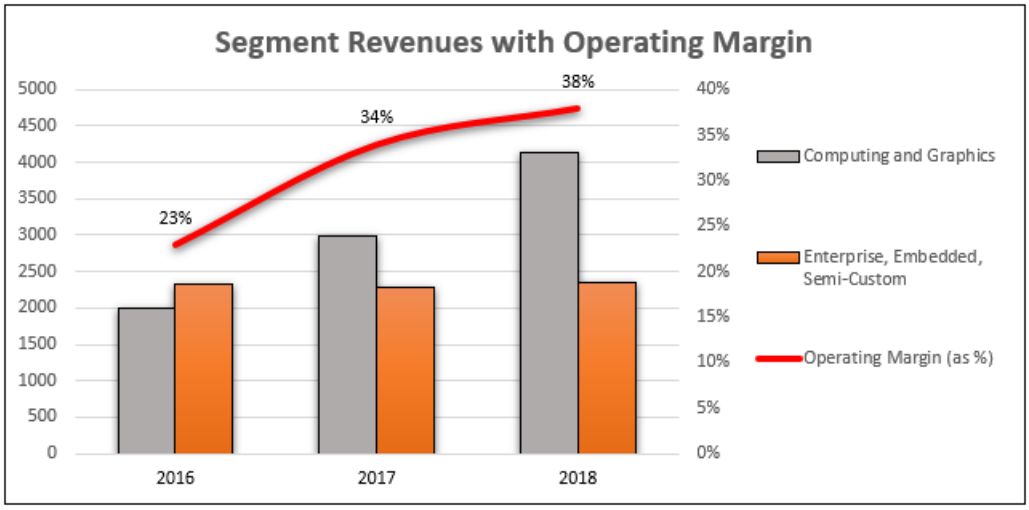
Short Term Outlook

Since the end of 2015, AMD has had a growth in share price of well over 1000%.

This is because, after decades of being considered a second-rate company, AMD has now emerged as a viable threat to their processing competitors.

Their combination of rising quality, and cheap prices have led to an explosion of revenue in their Computing and Graphics segment. This was a segment that, prior to Ryzen, made up under half of their total revenue. Computing and Graphics now accounts for around 64% of revenues.

In addition to creating more revenue, CPUs tend to create a larger margin for AMD as well.



In contrast to their CPUs, AMD still hasn't been able to raise their GPU quality to that of NVIDIA yet. Instead, AMD has been forced to compete on the basis of price.

Regardless, the demand for NVIDIA's GPUs has led to a decline in revenues for AMD this year.

In the Enterprise, Embedded, and Semi-Custom segment, revenues have been relatively flat. Though revenues should begin to pick up from the introduction of the new PlayStation and Xbox.

Anticipation for these releases has caused gamers to hold out on current products, and just wait for the new consoles to come out at the end of the year.

Lastly, AMD has their partnership with Amazon Web Services that began in late 2018. Through their partnership and the growing demand for servers and datacenters, revenue has been growing rapidly in the Enterprise segment.

Long Term Outlook

Computing and Graphics

In order to keep up with Intel, AMD has to remain innovative in their CPU products. Although they have performance that closely relates to Intel's, while also having much cheaper prices, it's unlikely this trend will continue.

Intel's market share, margins and significant financial resources enable them to market their products aggressively. What's more, they've been known to target AMD's customers as well as their independent distributors with special incentives to try and influence them into the direction of Intel. Subsequently, Intel is able to gain back some of the lost market share while also forcing AMD margins to be lower.

On the other hand, the semiconductor industry as a whole is expected to see large growth in the coming years. Much of this growth will be coming from the movement towards Artificial Intelligence. That being said, AMD isn't focused on creating an AI specific chip. Thus, they won't directly benefit from much of the early movement.

Rather, AMD has continued its focus on capturing market share from both Intel for CPU sales, and NVIDIA for GPU sales. What this means, is that even if they aren't chasing after AI, they still have a massive $75 billion market for their high-performance computing and graphics products.

This is because, much like developing AI-specific products would be very capital intensive. Considering AMD is somewhat of a smaller company compared to other semiconductor firms, waiting out developing these AI-focused products makes sense.

In the meantime, AMD plans on working with third-party accelerator companies to connect their chips with their own CPU and GPU products.

Enterprise, Embedded, and Semi-Custom

In connection with Amazon Web Services, AMD has seen massive growth in the Enterprise segment. What's more, the release of their new EPYC Rome processors will continue to boost cloud sales.

Rome is on track to deliver four times the floating-point performance and double the compute performance compared to the current generation EPYC processors.

In addition to re-innovating what they already offer, AMD has also started to branch out into another business. Although they have previously ignored the cell phone market, AMD plans to join it in a big way.

A recent deal with Samsung, has given AMD the rights to produce GPUs for a System of Chip (SoC) setup that's already in the phones. Ultimately, Samsung was looking to get an "ultra-low power, high-performance" graphics technologies in their smartphones.

This deal will add around $100 million of revenue in 2019. Yet, the real benefit is that they will be collaborating with them in the future; which could lead to much more than that.

Lastly, Sony has selected an AMD powered SoC for newest line of PlayStations. This will create a huge opportunity of growth in the future, as did the release of the PlayStation 4. Similarly, the new Microsoft Xbox is also exclusively powered by AMD's line of products.

Risk Factors

Share Dilution

The first problem that we see, are the dilution of AMD shares. Through various employee buyback programs, additional public offerings, and funding agreements, the total share count of AMD has risen from approximately 800 million in 2016 to 1,200 million today.

The most obvious source of the increasing outstanding share balance has been through AMD's employee incentive programs. Programs such as their Employee Stock Purchase Plan (ESPP) as well as their bonus structure (involving RSUs), have added 36 million shares to the outstanding share balance just in 2018.

There are also currently 28 million total unvested RSUs, which will inevitably add to the outstanding share balance in the next few years.

Lastly, AMD also utilizes a typical stock options plan, where they grant employees common stock at a fixed price for a fixed period of time. The aggregate balance of employee stock options is currently around 13 million.

Going forward the company plans to add quite a few more shares to the share count.

Convertible Notes

There are also AMD's 2.125% convertible notes.

Much like the additional public offering, these notes were meant to pay off some of AMD's outstanding debt. These notes will eventually convert into a total of 100.6 million outstanding shares.

By the September 1, 2026 maturity date, all of the convertible notes will have been converted into stock. However, a clause based around AMD share price made the notes available for conversion during the second calendar quarter of 2019.

Lastly, it's important to point out that the authorized share count has risen from 1.5 billion to a staggering 2.25 billion. Authorized share count is the maximum amount of outstanding shares that shareholders determine they would want a company issue. Essentially, the company can't just keep issuing shares without shareholder consent.

Supply Agreement

Since AMD doesn't make every part of their product in-house, they're subject outsourcing Supply Agreements. The major product they outsource, are their chip wafers.

A chip wafer is basically just a blank canvas for semiconductor companies to use. After getting these wafers, AMD can add on their fabrication to make the chips their own.

In 2009, AMD entered into an agreement with their own spin-off company, GlobalFoundries, to purchase nearly all of what they needed in wafer supply. Two short years later in 2011, GlobalFoundries was not able meet the needs of AMD's quality demands.

In addition to not being able to meet quality demands, GlobalFoundries has also found themselves in the middle of several lawsuits and investigations. Fortunately, AMD has gone out and started also buying wafers from Taiwan Semiconductor company. However, Taiwan Semiconductor has also been at the front of the recent US China trade war, which is creating its own set of problems.

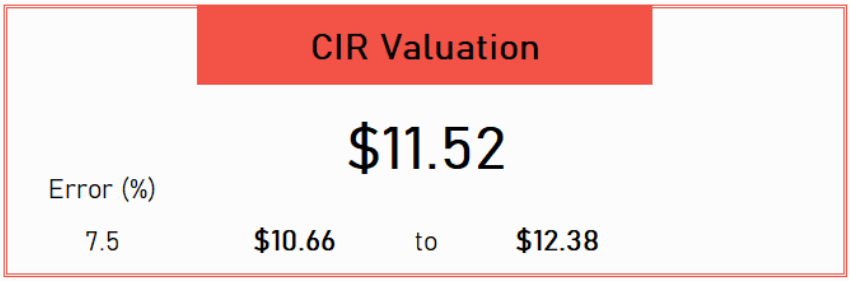
In summation, AMD's wafer supply has been quite rocky in the past.

Inventory

Another problem that many semiconductor companies face is the problem of inventory. When there is a slowdown, or a shift in chip demand, companies are left with large amounts of inventory that they cannot get rid of. This inventory becomes obsolete relatively fast because of the ever-changing nature of semis.

If AMD can't correctly foresee demand for certain chips at certain times, then they can be left with a balance sheet full of inventory. This inventory would need to eventually be written down.

Valuation



AMD has a bright future ahead of them. However, we believe that their growth opportunities have already been priced in. In fact, investors have likely been over-optimistic on the company's future prospects.

Advanced Micro Devices has showcased their ability to reinvest their earnings, and to do it well. This is expressed through the company's impressive Return on Equity of 17%. This ROE will propel the company's earnings forward, at a rate of around 13.7% for the next several years.

Though the company's shift from high to low growth comes with pitfalls, it also means that they will be reinvesting a lower percent of their earnings to drive that growth. This ultimately means that more cash flow will be available to shareholders in the coming years. Nonetheless, we eventually adjusted the reinvestment rate to mirror the industry average, 55%.

AMD is currently at the stage where they can achieve more favorable terms on debt agreements. Thus, it makes more sense for them to increase the amount of debt in their capital structure, in order to achieve shareholder value. By the end of our valuation time frame, the company will have a debt/equity that closely resembles the industry average of 11.80%.

	Short Term		Long Term
Unlevered Beta:	1.18		
Levered Beta:	2.45	→	2.25
Growth Rate:	13.9%	→	7.8%
Discount Rate:	14.3%	→	13.2%

Cash Flows

	ADJ 0	1	2	3	4	5	6	7	8	9	10
Net Income	341	394	695	931	1228	1584	1992	2447	2943	3479	4065
FCFE		456	756	946	1162	1386	1602	1795	1950	2059	2117

Terminal Value

$$\frac{4{,}065 \quad (1.03) \quad (0.45)}{(\ 0.1323 \quad - \quad 0.03\ )} = 18{,}416$$

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