



2018-2019 Student Managed Fund
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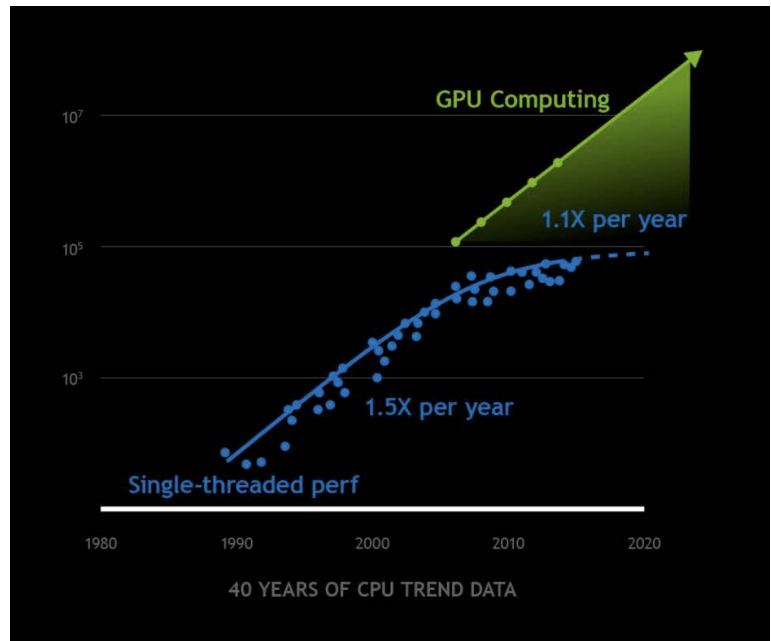
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1. Company Overview:

Twenty-five years ago, Nvidia set out to transform computer graphics. Fueled by the massive growth of the gaming market and its insatiable demand for better 3D graphics, they've invented the GPU and eventually evolved it into a computer brain at the intersection of virtual reality, high performance computing, and artificial intelligence. "NVIDIA GPU computing has become the essential tool of the da Vincis and Einsteins of our time. For them, we've built the equivalent of a time machine. For 30 years, the dynamics of Moore's law held true. But CPU performance scaling has slowed. GPU computing is defining a new, supercharged law" (Nvidia 2018 brochure).

It starts with a highly specialized parallel processor called the GPU and continues through system design, system software, algorithms, and optimized applications. The world is jumping on board — today, there are some 800,000 GPU developers. The GPU was initially used to simulate human imagination, enabling the virtual worlds of video games and films. Today, it also simulates human intelligence, enabling a deeper understanding of the physical world. Its parallel processing capabilities, supported by up to thousands of computing cores, are essential to running deep learning algorithms. This form of AI, in which software writes itself by learning from data, can serve as the brain of computers, robots and self-driving cars that can perceive and understand the world. GPU-powered deep learning continues to be adopted by thousands of enterprises to deliver services and features that would have been impossible with traditional coding. Nvidia has a platform strategy, bringing together hardware, system software, programmable algorithms, libraries, systems, and services to create unique value for the markets they serve. While the requirements of these end markets are diverse, they address them with a unified underlying architecture leveraging GPUs and Compute Unified Device Architecture (CUDA), as the fundamental building blocks. The programmable nature of the architecture allows them to support several multi-billion dollar end markets with the same underlying technology. The large and growing number of developers across our platforms strengthens our ecosystem and increases the value of our platform to our customers



2. Business Segments

Nvidia reports 2 segments; GPU and Tegra Processor. However, both are based on a single underlying architecture. In totality, they currently offer 11 different products which are listed below.

Graphic Processing Unit -A programmable chip (processor) specialized for display functions. The GPU renders images, animations and video for the computer's screen.

- Performs parallel operations. Although it is used for 2D data as well as for zooming and panning the screen, a GPU is essential for smooth decoding and rendering of 3D animations and video. The more sophisticated the GPU, the higher the resolution and the faster and smoother the motion in games and movies.

However, GPU's are not just used for Graphic Processing

- Since GPUs perform parallel operations on multiple sets of data, they are increasingly used as vector processors for non-graphics applications that require repetitive computations..... (Artificial Intelligence)
- Can increase speeds by up to 140 times.

Tegra Processor- Tegra chips are known as systems-on-a-chip, (SoCs), meaning that they incorporate most of the critical functionality, such as, processor cores, graphics processors, and other accelerators - onto a single chip

- Used in Gaming Consoles, Mobile Phones, Auto, Etc

GPU	<ul style="list-style-type: none">• GeForce for PC gaming and mainstream PCs• GeForce NOW for cloud-based game-streaming service• Quadro for design professionals working in computer-aided design, video editing, special effects, and other creative applications• Tesla for AI utilizing deep learning and accelerated computing, leveraging the parallel computing capabilities of GPUs for general purpose computing• GRID to provide the power of NVIDIA graphics through the cloud and datacenters• DGX for AI scientists, researchers and developers
Tegra Processor	<ul style="list-style-type: none">• Tegra processors are primarily designed to enable branded platforms - DRIVE and SHIELD• DRIVE AGX automotive supercomputers and software stacks that provide self-driving capabilities• Clara AGX for intelligent medical instruments• SHIELD devices and services designed to harness the power of mobile-cloud to revolutionize home entertainment, AI and gaming• Jetson AGX is a power-efficient AI computing platform for robotics and other embedded use

GPU reported 2018 revenues of \$8,137M (39% growth yoy), vs Tegra Processor revenue of \$1,534 M (86.2% growth yoy); However, the GPU unit reports a Net Income margin of 43% vs 20% for Tegra Processor.

3. Business Markets:

1. Gaming

- GPU's enhance the gaming experience by improving the quality of graphics, increasing the frame rate for smoother gameplay and improving realism by incorporating the behavior of light and physical objects



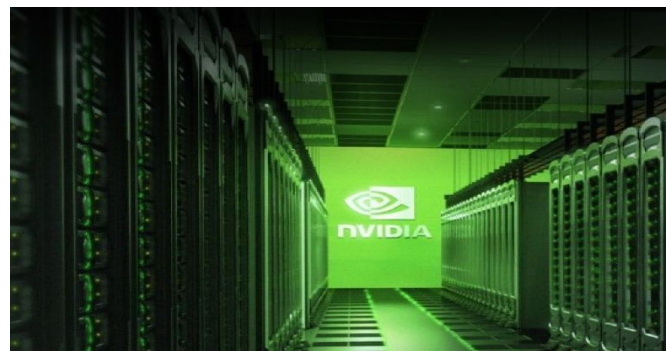
2. Professional Visualization (Virtual Reality)

- GPU's computing solutions enhance productivity and introduce new capabilities for critical parts of the workflow for such major industries as automotive, media and entertainment, architectural engineering, oil and gas, and medical imaging.
- Just as VR is becoming more important in gaming, it is also being incorporated in a growing number of enterprise applications, including within medicine, architecture, product design, and retail. Virtual car showrooms, surgical training, architectural walkthroughs, and bringing historical scenes to life all deploy this technology, powered by GPUs.



3. Data Center

- The NVIDIA accelerated computing platform addresses AI, in which systems learn using unstructured data, and HPC, in which it speeds work toward reaching answers for more narrowly defined problems.



4. Automotive

- NVIDIA's Automotive market is comprised of infotainment solutions, advanced driver assistance systems, and AV opportunities. NVIDIA has demonstrated multiple applications of AI within the car



5. OEM & IP

- Licensing and sale of intellectual property.

By Market					
Revenue	1/28/18	% Chg	1/29/17	% Chg	1/31/16
Gaming	\$ 5,513	35.8%	\$ 4,060	44.1%	\$ 2,818
Professional Visualization	\$ 934	11.9%	\$ 835	11.3%	\$ 750
Data Center	\$ 1,932	132.8%	\$ 830	144.8%	\$ 339
Automotive	\$ 558	14.6%	\$ 487	52.2%	\$ 320
OEM & IP	\$ 777	11.3%	\$ 698	-10.9%	\$ 783
Total Revenue	\$ 9,714	40.6%	\$ 6,910	37.9%	\$ 5,010

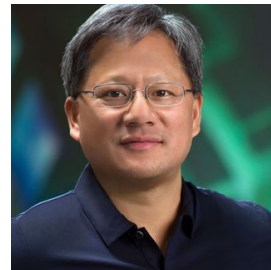
3B. Business Regions:

By Country					
Revenue	1/28/18	% Chg	1/29/17	% Chg	1/31/16
Taiwan	\$ 2,991	17.5%	\$ 2,546	133.2%	\$ 1,912
Other Asia Pacific	\$ 2,066	104.6%	\$ 1,010	134.8%	\$ 749
China	\$ 1,896	45.3%	\$ 1,305	161.9%	\$ 806
Unites States	\$ 1,274	40.9%	\$ 904	140.6%	\$ 643
Europe	\$ 768	16.5%	\$ 659	136.7%	\$ 482
Other Americas	\$ 719	47.9%	\$ 486	116.3%	\$ 418
Total Revenue	\$ 9,714	40.6%	\$ 6,910	137.9%	\$ 5,010

4. Management

A. President and Chief Executive Officer--- **Jen-Hsun Huang**

- a. Co-founded Nvidia in 1993 and has served as CEO since. Previously worked at LSI Logic Corporation and at AMD as a microprocessor designer. Holds a B.S.E.E. from Oregon State University and an M.S.E.E. from Stanford University. Age 55.
- b. **Compensation:** \$995,985 cash + 9,787,000 in stock options + 2,000,000 other= \$13,000,000



B. Executive Vice President and Chief Financial Officer--- **Colette M. Kress**

- a. Joined Nvidia in 2013. Previously worked as Senior VP and CFO for Cisco Systems. Ms. Kress also held a variety of positions at Microsoft and Texas Instruments. She holds degrees from University of Arizona and SMU. Age 51.
- b. **Compensation:** \$889,120 cash + \$3,900,000 in stock options = \$5,000,000



C. Executive Vice President, Worldwide Field Operations--- **Ajay K. Puri**

- a. Joined Nvidia in 2005 as a Senior VP. Previously held various positions at Sun Microsystems, Hewlett Packard, and Booz Allen Hamilton Inc. Age 64.
- b. **Compensation:** \$950,000 cash + \$3,500,000 in stock options = \$5,650,000



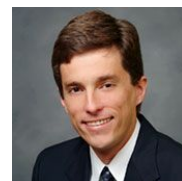
D. Executive Vice President, Operations--- **Debora Shoquist**

- a. Joined Nvidia in 2007 as Senior VP. Previously held positions at JDS Uniphase Corp, Quantum Corp, and Hewlett Packard. Age 64
- b. **Compensation:** 1,350,000 cash + 2,438,904 in stock options= \$3,800,000



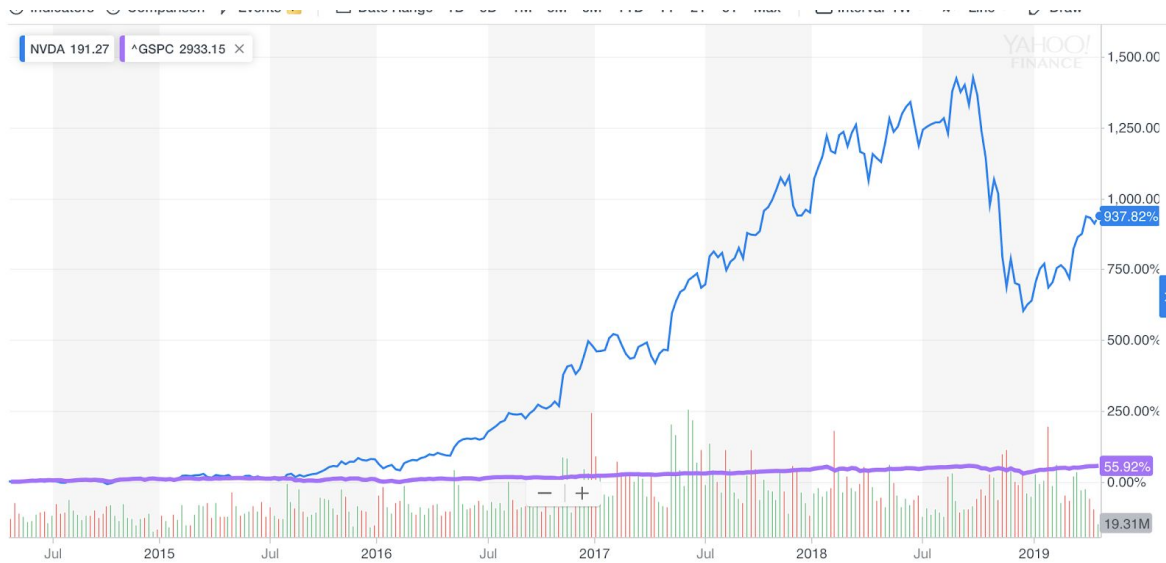
E. Executive Vice President and General Counsel--- **Timothy S. Teter**

- a. Joined Nvidia in 2017 as Senior VP. Previously worked at the law firm Cooley LLP for 2 decades. Age 52.
- b. **Compensation:** \$849,988 + \$500,000 bonus in cash + \$5,668,193 in stock options= \$7,000,000



5. Historical Performance

As the 5 year graph of Nvidia's performance (blue line) vs. the S&P 500 (purple line) shows, Nvidia returned an astounding 937% vs. 55% for the S&P 500 over the same time period. In recent years, Nvidia has managed to grow their revenues while simultaneously improving their margins.



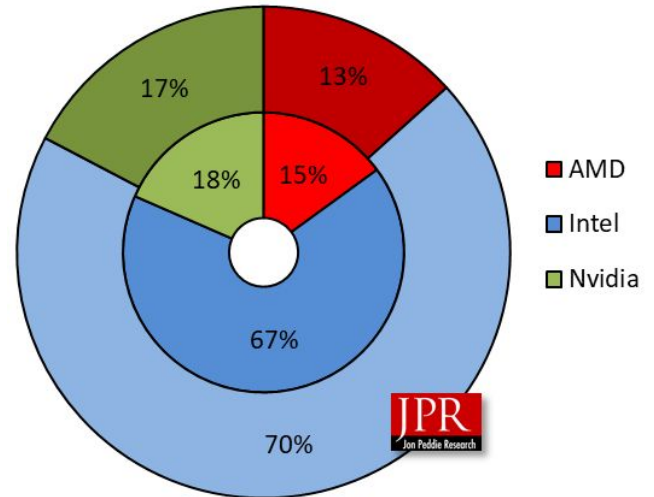
Recent Decline:

In Q3 2018 Nvidia dropped over 40% from its all time highs of \$292. We attributed this decline to a few macroeconomic factors that dragged down the entire market, as well as, a sector wide semiconductor decline. However, Nvidia declined much more, and faster, than the rest of the market. We attributed this to a decline in cryptocurrency mining, which has a two fold effect on Nvidia. Although the company stopped reporting revenue from the sale of GPU's to cryptocurrency miners over 4 quarters ago, this subset of the population still bought and owned a large proportion of the GPU supply in 2018. As a result, when mining became less lucrative, a large number of Nvidia GPUs hit the secondary market and effected their ability to sell the most current model at full price. Furthermore, the demand for GPUs also fell because one of the potential uses was no longer lucrative. We believe the majority of this decline can be attributed to this inventory problem, paired with expected declines in gaming revenue, and the larger macro-economic factors.

**Market share quarter change
(Current quarter outside ring)**

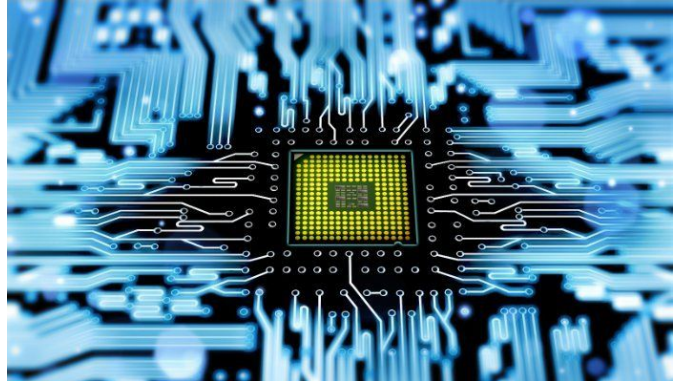
6. Competitive Advantages

Nvidia's major competitors in the semiconductor business include ATI Tech., Intel Corp, AMD, and Texas Instruments. Nvidia dominates these competitors in their GPU market, with a return on total capital in 2017 of 48.6%, compared to ATI of 5.4%, Intel of 27.1% and AMD of 18.9%. Nvidia's competitive advantage comes for their ability to support several multi-billion dollar end markets with the same underlying technology by using a variety of software stacks developed either internally or by third party developers, which are then utilized in all 5 of their platform markets.



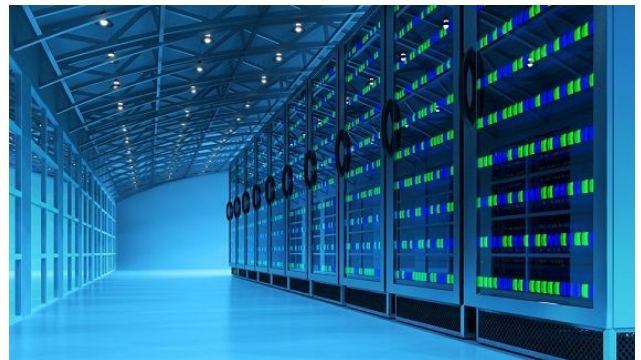
7. Industry Overview

The US semiconductors and semiconductor equipment industry is known for its technological advancements. The semiconductor market includes companies that manufacture and sell integrated circuits and discrete semiconductor devices. The semiconductor equipment market includes companies that manufacture and sell equipment for the production of semiconductor devices. About 5,000 companies operate in this industry, which has approximate annual revenue of \$150 billion. The top 50 companies hold more than 70% of total market share. Major players are Intel (INTC), Texas Instruments (TXN), Qualcomm (QCOM), Micron Technology (MU), and Advanced Micro Devices (AMD). The industry is cyclical and subject to supply/demand fluctuations and price erosion. After experiencing a downturn during the last recessionary period, the semiconductor market is building back on renewed demand. Demand for semiconductor products is indirect and driven by sales of personal computers, cell phones, consumer electronics devices, and other electronic equipment. The industry is capital-intensive and requires significant investments to advance technology and reduce manufacturing costs. Research and development expenses form a major part of capital expenditure and the industry spends over \$15 billion annually. The industry is subject to various environmental regulations related to pollutant emissions, waste-water discharges, and the use of hazardous substances. The European Union's directives, such as the Restriction of Use of Certain Hazardous Substances and the Registration, Evaluation, Authorization, and Restriction of Chemicals are relevant to the manufacturing process. China, which represents the world's second largest semiconductor market and is a major importer of US products, also restricts the use of hazardous substances in electronic products. Although the industry is the second-largest exporting industry in the US, its global market share in chip production has eroded due to insufficient research funding, workforce challenges, and foreign incentives. The demand pattern has shifted production to low cost substitutes and shifted the demand centers to China, Taiwan (China), and the rest of Asia. There has also been a lateral shift of capital as research and development investments move away from the US to Asia.



8. Industry Catalysts

In the semiconductor industry, some of the key Economic drivers for the growth of the industry As a whole include private investment in computers And software, consumer spending, and the price of Semiconductor and electronic components. However, things like trade disputes and regulatory power has the potential to affect chipmaker stock returns in the long run. Additionally, data-center competition, memory supply and headset weakness could also diminish growth and valuation. When it comes to long term growth catalysts, the Asian data data center capacity will play a large role within the next 5 years due to their expansion of data center by various



9. Drivers of Growth

There are 5 factors that are considered as growth catalysts for Nvidia.

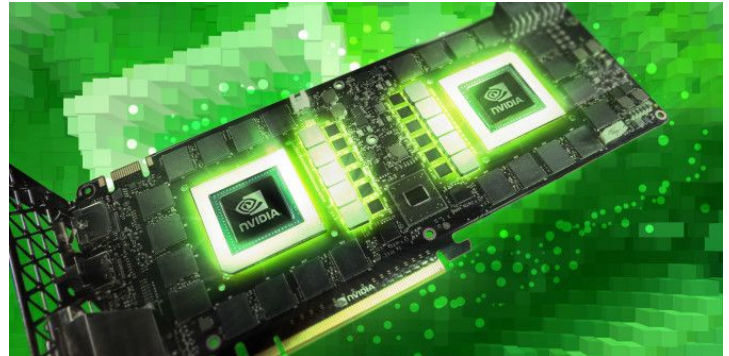
1. **Advancing the GPU computing platform.** Nvidia works to deliver continued GPU performance leaps that outpace Moore's Law by leveraging innovation across the architecture, chip design, system, and software layers. Nvidia strategy is to target markets where GPUs deliver order-of-magnitude performance advantages relative to legacy approaches. Its target markets so far include gaming, professional visualization, datacenter, and automotive. While the requirements of these end markets are diverse, Nvidia addresses them with a unified underlying architecture leveraging its GPUs and CUDA as the fundamental building blocks. The programmable nature of Nvidia architecture allows it to make leveraged investments in R&D. It can support several multi-billion dollar end markets with the same underlying technology by using a variety of software stacks developed either internally or by third party developers and partners. Nvidia utilizes this platform approach in each of our target markets.
2. **Extending our technology and platform leadership in AI.** Nvidia provides a complete, end-to-end GPU computing platform for deep learning, addressing both training and inferencing. This includes GPUs, CUDA programming language, algorithms, libraries, and system software. GPUs are uniquely suited to AI, and Nvidia will continue to add AI-specific features to its GPU architecture to further extend leadership position. Nvidia AI technology leadership is reinforced by own large and expanding ecosystem in a virtuous cycle. Its GPU platforms are available from virtually every major server maker and cloud service provider, as well as on own AI supercomputer. There are over 700,000

CUDA developers worldwide who write programs using CUDA to help deploy our technology in our target markets. Nvidia evangelizes AI through partnerships with hundreds of universities and more than 2,000 startups through our Inception program. Additionally, Nvidia Deep Learning Institute provides instruction on the latest techniques on how to design, train, and deploy neural network-powered machine learning in applications. It covers widely used open-source frameworks and NVIDIA's latest GPU-accelerated deep learning platforms.

3. **Extending our technology and platform leadership in visual computing.** Nvidia applies the research and development resources to extending leadership in visual computing, enabling us to enhance the user experience for consumer entertainment and professional visualization applications. Technologies are instrumental in driving gaming forward, as developers leverage libraries and algorithms to create near-cinematic and VR experiences. Nvidia close collaboration with game developers allows it to deliver an optimized gaming experience on our GeForce platform. GeForce Experience gaming application further enhances each gamer's experience by optimizing their PC's settings, as well as enabling the recording and sharing of gameplay. Nvidia also enables interactive graphics applications - such as games, movie and photo editing and design software - to be accessed by almost any device, almost anywhere, through cloud platforms such as GRID for enterprise and GeForce NOW for gaming.
4. **Advancing the leading autonomous vehicle platform.** AI is the key technology enabler of this opportunity, as the algorithms required for autonomous driving - such as perception, localization, and planning - are too complex for legacy hand-coded approaches, and will run on multiple trained neural networks instead. Therefore, Nvidia has provided a full functionally safe AI-based hardware and software solution for the AV market under the DRIVE brand, which are bringing to market through partnerships with automotive original equipment manufacturers, or OEMs, tier-1 suppliers, and start-ups. AV solution also includes the GPU-based hardware required to train the neural networks before in-vehicle deployment, as well as to re-simulate operation prior to any over-the-air software updates. The comprehensive, top-to-bottom and end-to-end approach will enable the transportation industry to solve the complex problems arising from the shift to autonomous driving.
5. **Leveraging our intellectual property.** Nvidia intellectual property is a valuable asset that can be accessed by customers and partners through licenses and development agreements when they desire to build such capabilities directly into their own products, or have Nvidia do so through a custom development. Such license and development arrangements can further enhance the reach of our technology.

10. Investment Thesis

Our investment thesis centers around how essential GPU's are to the process of maximizing a device's computing power, all while considering the ever-increasing desire to maximize the amount of devices that can process more information, faster and with more efficiency. Their sustained growth is dependent on their ability provide the most powerful and integratable GPU's to each of their end markets as they continue to grow. Each market is expected to grow meaningfully in the next 5 years, led by the 36% growth in the gaming (2017) and the 133% gain in the artificial intelligence business (2017). In addition to industry leading gross margins and virtually no debt, Nvidia converts about 30% of their revenue to profit. Their effectiveness allows them to maintain an ROA of 37.42%. Finally, Nvidia holds a large amount of cash and maintains a large portion of liquid assets to fuel growth and limit financial risk.



11. Valuation

Using a discounted cash flow method we arrived at a value of \$222.16 per share, or a 18.93% increase from current prices (\$186.60). We believe this model used a conservative estimate of Nvidia's future growth rates, assigning about 16% revenue growth yoy for 4 years and then around 8% thereafter. This is significantly less than historic revenue growth. Furthermore, we grew COGS at 15% yoy to reflect some of the challenges that end markets such as Automotive create. Our growth rates for each of the 4 markets (and OEM) can be seen below. Finally, we assigned a cost of capital of 9% and a perpetual growth rate of 3%.

Nvidia												
Millions	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	
Total Revenue	\$ 9,714.00	\$ 11,636.10	\$ 14,090.18	\$ 16,676.09	\$ 19,874.59	\$ 21,727.58	\$ 23,830.56	\$ 26,154.35	\$ 28,626.38	\$ 31,288.84	\$ 34,211.43	
Growth (YoY)	28.9%	16.5%	17.4%	15.5%	16.1%	8.5%	8.8%	8.9%	8.6%	8.5%	8.5%	
Gaming	\$ 5,513.00	\$ 6,616	\$ 7,939	\$ 9,526	\$ 11,432	\$ 12,575	\$ 13,832	\$ 15,216	\$ 16,737	\$ 18,411	\$ 20,252	
Growth (yoy)	36%	20%	20%	20%	20%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	
Professional Visualization	\$ 934.00	\$ 981	\$ 1,030	\$ 1,081	\$ 1,135	\$ 1,192	\$ 1,252	\$ 1,314	\$ 1,380	\$ 1,449	\$ 1,521	
Growth (yoy)	12%	5%	5%	5%	5%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
Data Center	\$ 1,932.00	\$ 2,705	\$ 3,787	\$ 4,733	\$ 5,917	\$ 6,508	\$ 7,159	\$ 7,875	\$ 8,663	\$ 9,529	\$ 10,482	
Growth (YoY)	57%	40%	40%	25%	25%	10%	10%	10%	10%	10%	10%	
Automotive	558	558	558	558	614	675	810	972	1,069	1,123	1,179	
Growth (YoY)	0.0%	0.0%	0.0%	0.0%	10.0%	10.0%	20.0%	20.0%	10.0%	5.0%	5.0%	
OEM and IP	\$ 777.00	\$ 777	\$ 777	\$ 777	\$ 777	\$ 777	\$ 777	\$ 777	\$ 777	\$ 777	\$ 777	
Growth (yoy)	11.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Cost of Goods Sold	3,892	4,475.80	5,147.17	5,919.25	6,807.13	7,487.85	8,236.63	9,060.29	9,966.32	10,962.95	12,059.25	
Growth (YoY)	26.8%	15.0%	15.0%	15.0%	15.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	
Gross Profit	5822	7160	8943	10757	13067	14240	15594	17094	18660	20326	22152	
% Profit Margin	59.9%	61.5%	63.5%	64.5%	65.7%	65.5%	65.4%	65.2%	65.2%	65.0%	64.8%	
Operating Expenses	2612	1745	2114	2501	2981	3259	3575	3923	4294	4693	5132	
% Revenue	26.9%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	
Other Income (expense)	47	58	70	83	99	109	119	131	143	156	171	
% Revenue	0.5%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
EBIT	3257	5473	6900	8339	10186	11089	12138	13302	14509	15789	17192	
% Revenue	33.5%	47.0%	49.0%	50.0%	51.2%	51.0%	50.9%	50.9%	50.7%	50.5%	50.3%	
Net Interest Expense	61	60	60	60	60	60	60	60	60	60	60	
% Revenue	0.6%	0.5%	0.4%	0.4%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%	0.2%	
Taxable Income	3196	5414	6840	8279	10126	11030	12079	13242	14450	15730	17132	
Current Income Taxes	149	1137	1436	1739	2126	2316	2537	2781	3034	3303	3598	
Effective Tax Rate	5%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	
Net Income	3047	4277	5404	6541	8000	8713	9542	10461	11415	12426	13534	
Plus: Depreciation & Amortization	199	194	194	194	194	194	194	194	194	194	194	
% Revenue	2.0%	1.7%	1.4%	1.2%	1.0%	0.9%	0.8%	0.7%	0.7%	0.6%	0.6%	
Capital Expenditures	593.00	581.81	704.51	833.80	993.73	1,086.38	1,191.53	1,307.72	1,431.32	1,564.44	1,710.57	
% Revenue	6.1%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	
Free Cash Flow	2,653	3,889	4,894	5,901	7,200	7,821	8,545	9,348	10,178	11,056	12,018	

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Total Free Cash Flow	2,653	3,889	4,894	5,901	7,200	7,821	8,545	9,348	10,178	11,056	12,018
Discounted FCF	2,653	3,568	4,119	4,557	5,101	5,083	5,095	5,114	5,108	5,091	5,077

Perpetuity Growth	3.00%
Discount Rate	9.00%

Terminal Value	\$ 84,609,317
Sum of Present Value of FCF	\$ 50,565,302
Total Enterprise Value	\$ 135,174,619
Less: Net Debt & Pensions	\$ 1,988
Plus: Cast and Equivalents	\$ 7,422
Total Equity Value	\$ 135,180,053
Shares Outstanding	608.49
Per Share Value	\$ 222.16
Current Stock Price	\$ 186.80
Margin of Safety	18.93%

Million (2018 10K)

12. Risks

Because Nvidia is predominantly an international corporation, where assembly and packaging is conducted abroad, the company faces a variety of both domestic and international risks. Its large international business exposes the company to many political and trade war risks with the countries where it does business. This transitions into their large third party manufacturing dependence, where there is a risk of lack of guaranteed supply of wafers and components due

to supply constraints (and potentially trade constraints.) However, no one supplier accounts for more than 10% of Nvidia's COGS. Furthermore, their ability to purchase supplies and operate from outside the U.S may help alleviate some of the consequences of a potential trade war, that U.S based companies may have to face, while simultaneously allowing it to pay a lower tax rate of around 11%.

