

A Work Project, presented as part of the requirements for the Award of a Master Degree in Economics / Finance / Management from the NOVA – School of Business and Economics.

NVIDIA: LIMITLESS POTENTIAL FOR A
LIMITLESS ERA OF TECHNOLOGY



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A Project carried out on the Master in (Economics/Finance/Management) Program, under the supervision of:

(Professor Francisco Martins)

17th DECEMBER 2021

Abstract

Nvidia is a US-based company that operates in the semiconductor industry, specialized in the design and manufacturing of GPUs. The company has seen staggering returns in the last year compared to the S&P500 benchmark, with total cumulative returns of nearly 140% since January 2021.

This Equity Research aims at valuing the company's stock price as of December 2022 using the Adjusted Present Value (APV) model. The main catalysts identified are the fast-growing gaming popularity, Facebook's Metaverse, strong demand from corporations for Data Center applications, the \$8B design win pipeline in Automotive, and new CMP product offering directed at cryptominers. Nvidia's acquisition of Arm is still pending approval, and we don't expect the transition to materialize until the March 2022 deadline.

Our APV valuation indicates a FY23 price target of \$285,52 per share, resulting in a HOLD recommendation and an upside potential of 1,39% from the market close share price of \$281,61 as of December 13, 2021. Total shareholder return is 1,14% for an investor holding the stock throughout 2022.

Keywords: Nvidia, Semiconductor, Cryptocurrency, Equity Research

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This report is part of the “Nvidia: powering the next era of computing” report (annexed) and should be read as an integral part of it.

NVIDIA CORPORATION

SEMICONDUCTOR

STUDENT: GONALO MOITEIRO

COMPANY REPORT

17 DECEMBER 2021

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Nvidia: powering the next era of computing

Strong outlook but expensive price limits upside for FY2023

- Our APV valuation indicates a FY23 price target of **\$285,52 per share**, resulting in a HOLD recommendation and an upside potential of 1,39% from the market close share price of \$281,61 as of December 13, 2021.
- Nvidia's acquisition of Arm to SoftBank is pending approval.** Regulators with concerns over Nvidia creating barriers for their rivals to access key technology, but also due to national security concerns from the UK. FTC sued to block the acquisition.
- Fast-growing Gaming population and increasing popularity** over Nvidia's cloud-based gaming platform, e-sports, streaming and RTX improvements. **Facebook's Metaverse presents opportunities in Professional Visualization** through Nvidia's Omniverse platform developments.
- Strong sustainable demand from corporations for Data Center** applications such as AI, machine and deep learning, and data analytics. **\$8B design win pipeline expected until FY2028 in Automotive**, with over 370 partners on Nvidia DRIVE, and transition from Infotainment to AVs. **New CMP product offering for the OEM & Others segment**, directed at cryptominers, as an attempt to shift abnormal demand from gaming GPUs to CMPs.
- Solid Gross Margins during semiconductor shortage due to increasing ASPs**, however the continuation of a chip shortage could imply an accumulation of unmet demand and loss of potential revenues.

Company description

Nvidia is an American company operating in the semiconductor industry, specialized in the design and manufacturing of graphics processor units (GPUs), as well as system on a chip units (SoCs). Currently, Nvidia operates worldwide in four market segments: Gaming, Professional Visualization, Data Center and Automotive. Most recognizable product lines include the GPU GeForce series, Nvidia RTX / Quadro, DGX systems, and A series DC GPUs.

Recommendation: **HOLD**

Price Target FY23¹: **285,52 \$**

*Nvidia's FY23 goes from January 2022 to January 2023

Price (as of 13-Dec-21) **281,61 \$**

Reuters: NVDA.O, Bloomberg: NVDA:US

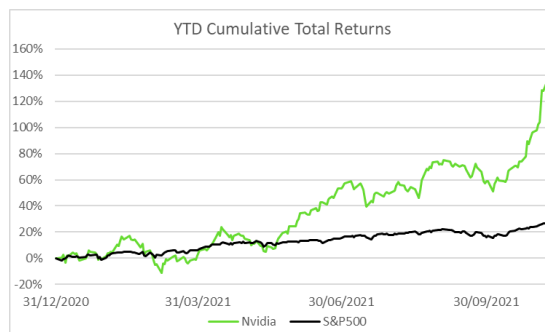
52-week range (\$) 115,67 - 346,47

Market Cap (\$m) 704.025

Outstanding Shares (m) 2500

Beta 1,31

Source: Bloomberg, Analysts Estimates



Source: Bloomberg

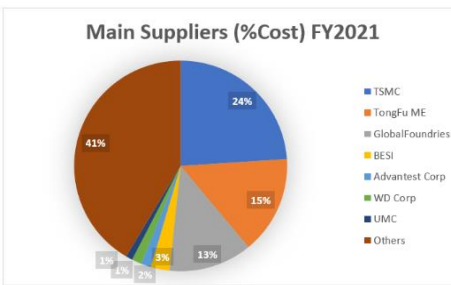
(Values in \$ millions)	FY2021	FY2022E	FY2023F
Revenues	16.675	25.994	36.643
Revenue Growth (%)	53%	56%	41%
EBITDA	5.630	10.040	12.357
EBITDA Margin (%)	34%	39%	34%
Net Profit	4.332	8.135	9.645
Net Profit Margin	26%	31%	26%
EPS	1,73	3,25	3,86
P/E	75x	87x	74x
ROE	27%	35%	32%
ROIC	32%	45%	40%

Source: Company Data, Analysts Estimates

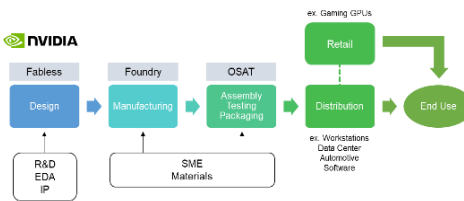
THIS REPORT WAS PREPARED EXCLUSIVELY FOR ACADEMIC PURPOSES BY GONALO MOITEIRO AND TOMÁS BORGES, MASTER IN FINANCE STUDENTS OF THE NOVA SCHOOL OF BUSINESS AND ECONOMICS. THE REPORT WAS SUPERVISED BY A NOVA SBE FACULTY MEMBER, ACTING IN A MERE ACADEMIC CAPACITY, WHO REVIEWED THE VALUATION METHODOLOGY AND THE FINANCIAL MODEL. (PLEASE REFER TO THE DISCLOSURES AND DISCLAIMERS AT END OF THE DOCUMENT)

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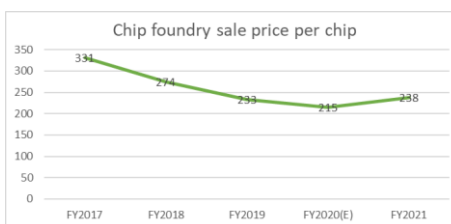
Exhibit 1:

Source: Bloomberg Data

Exhibit 2: Industry Supply Chain

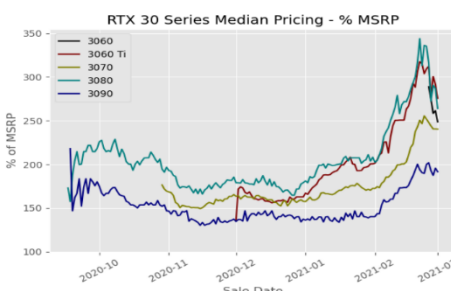
Source: Analysts' authorship

*R&D: Research & Development; EDA: Electronic Design Automation; IP: Intellectual Property; SME: Semiconductor Manufacturing Equipment

Exhibit 3:

Source: Khan, Saif

<https://cset.georgetown.edu/publication/ai-chips-what-they-are-and-why-they-matter>

Exhibit 4:

Source: Kan, Michael

<https://www.pcmag.com/news/prices-for-nvidia-rtx-3000-graphics-cards-are-getting-insane-on-ebay>

Company Overview

Supply chain analysis and Semiconductor shortage

Covid-19 triggered supply chain capacity issues, distribution difficulties, and an unexpected demand spike for Nvidia's products. The start of the pandemic originated a semiconductor shortage which had a strong impact in the supply chain and output levels, since these chips are vital in the production of products such as GPUs and SoCs¹.

Nvidia has a considerable supplier dependency, as most of its semiconductors are outsourced to third-party foundries (Exhibit 1). These foundries acquire raw material such as wafers, silicon, copper, etc. and manufacture the semiconductors, or chips, which are then shipped to Nvidia's independent subcontractors (OSAT²) who assemble, test, and package Nvidia's products³. Finally, the product is either sold to third party retailers, which serve the final customers (e.g., case of gaming GPUs), or directly to end customers, in the case of large volume products through partnerships, mostly for Data Center or Automotive products for companies (Exhibit 2).

Nvidia used to allow customers to buy products directly from them, but it was an inefficient process and, as an alternative, it opted for strong partnerships with trustful retailers. Therefore, Nvidia's production capacity of GPUs and other products ends up relying on foundry's production and is subject to supply disturbances. As of 2021, most foundries are located in Eastern Asia, which holds 75% of the global semiconductor manufacturing capacity, mainly in Taiwan, and then followed by China, South Korea and Japan. In terms of demand, the early 2020 lockdowns affected many companies relying on semiconductors, such as automakers, which were forced to suddenly decrease production due to shortages (also motivated by a sharp drop in demand on the buy-side). Nevertheless, the exponential rise of people working from home and sudden increase in indoor entertainment users led to a demand spike for hardware and IT products, consequently increasing the demand for semiconductors. With quarantine affecting production capacity (through semiconductor factory shutdowns) and distribution (case of large restrictions in the ports of Shanghai and Shenzhen, delaying Chinese supply), the semiconductor shortage kept worsening almost in a low supply-high demand loop. Naturally, semiconductor prices also increased (Exhibit 3).

Raw material shortages have also become a frequent occurrence. Wafers were the first raw material to vastly become unavailable to foundries, as the US-China 2019 trade war, growth in 5G and automotive demand hardened access to silicon and reactor tubes, weakening wafer supply to the point it maxed out its production capacity by late 2020.

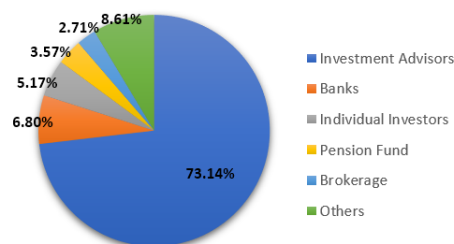
¹ SoC or System-on-a-chip refers to a chip that integrates all (or most) components of a computer or electronic system, including CPU, memory, input/output ports.

² OSAT: Outsourced Semiconductor Assembly and Test

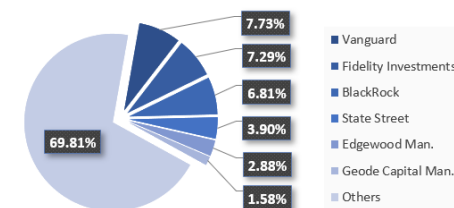
³ Source: <https://cset.georgetown.edu/wp-content/uploads/The-Semiconductor-Supply-Chain-Issue-Brief.pdf>

Aluminium hit a record high of \$3.200 per ton in October (2021) and copper has consistently risen in price up to \$10.000 per ton that same year. To further worsen the impacts of the shortage, Nvidia seems to have misaligned its forecasted demand with actual demand, with GPU models such as the recently released RTX 3070TI and RTX 3080TI being sold out on launch day at most US retailers, mostly due to highly under-priced MSRP (manufacturer's suggested retail price), later forcing retailers to increase their prices above the MSRP (2-3x above) to match the high demand (Exhibit 4).

Lastly, with piled up orders by manufacturers and lengthy waiting times for chips, reaching as long as 6 months (reported by Ford in Autumn 2021), there are new unexpected disruptions that could worsen this: In November, the Yantian port in China closed due to Covid-19 (this port consists of nearly 90% of world's electronic pathway), and political tensions are getting worse, with risks of an armed conflict between China and Taiwan, which could render the access to the semiconductor industry by Europe and US virtually impossible. Although a Taiwan-China war has a very low likelihood, for both economic and geopolitical reasons, tensions between the two could damage Nvidia's supply chain. We expect the shortage to end in Nvidia's FY2024, mainly due to new Intel, Samsung, and TSMC production facilities undergoing construction, which are expected to be completed in FY2023 and FY2024, together with potential new chip architectures under 7nm, which should allow for more production capacity and efficiency. As foundries catch up with delayed orders and the panic hoarding of inventories eases, demand slowdown pressures could also facilitate the end of the on-going shortage.

Exhibit 5:**Shareholder's Structure**

Source: Bloomberg Data

Exhibit 6:**Main Investment Advisors**

Source: Bloomberg Data

Shareholder Structure and Corporate Governance

Nvidia's management team is composed by 2 founders, Jensen Huang, CEO, and Chris Malachowsky, and 4 company officers: Colette Kress, Jay Puri, Debora Shoquist and Tim Teter. The Board, on the other hand, is composed by 12 independent directors and Jensen Huang, articulated in three different independent committees: the Audit, the Nominating & Corporate Governance, and the Compensation committees. This organization represents shareholders and serves their best interests by overseeing management performance and corporate practices. Mark Perry currently leads the board as elected Lead Independent Director.

Looking at the shareholder's structure in Exhibits 5 and 6, the fact that a very high portion of the company's shares are owned by a specific group, investment advisors (or institutional investors) can have its risks and downsides. Firstly, such influence can be leveraged to pressure the Board's decisions in the investors best interest, many times incompatible with the firm's or others shareholder's interest. Secondly, the high concentration of shares ownership, 73,1%, by institutional investors can dramatically impact the stock's performance, both positive and negatively, as these investment decisions are usually made upon analysts' reports which, more often than not, have

similar views on the companies they analyse for possible investments. A quick shift in sentiment by these institutions can create a large domino effect and generate volatility around the stock's price. Lastly, regarding insider investors, one could argue that too much insider ownership may indicate concentration of power and that it should also be worth noticing if these investors are selling their shares, which can trigger negative signals to capital markets about the firm. We believe Nvidia's current independent Board structure and committees, together with its governance policies and bylaws, are an effective way of mitigating the aforementioned capital structure related risks.

VRIN Analysis

Nvidia's competitive advantage, and respective sustainability, was assessed with resort to the VRIN (or VRIO) framework, a tool used to evaluate a firm's resources and capabilities. This is crucial for the valuation part, as it helps us understand and formulate a vision on the company's long-term performance, both compared to its industry peers, but also against the economy. VRIN evaluates a firm's resources and capabilities in 4 dimensions: value, rareness, inimitability, and non-substitutability. A total of 11 resources and capabilities were evaluated using this framework (Exhibit 7), which led us to conclude both customer experience/value proposition and technological advancement/integration are sources of sustainable competitive advantage for Nvidia.

Firstly, Nvidia's customer experience, which is a key element of the firm's value proposition, can be exemplified by the quality of support and services provided to their customers. GPU driver update offers are released almost weekly to provide the best possible performance to the consumer, even for holders of older generation GPUs. Nvidia's value proposition, which is laid on its platform strategy⁴, is what enables the firm to charge a premium price, but also a crucial source of competitive advantage, which is reflected in its market share (Exhibit 12), something we took into consideration in our forecasting assumptions.

Secondly, as for Nvidia's technological advancement and integration, the other source of sustainable competitive advantage, one can demonstrate this by showcasing the firm's ability to pursue a range of different opportunities and segments (from graphics cards for gaming to data center, automotive and AI), predicting technological trends, preferences and needs for the future, and making use of its robust R&D strategy to develop offerings that meet these new trends and demands. However, the constant rate of innovation and technological integration of Nvidia comes at a cost, reflected in the firm's R&D expenses, something we consider a key value driver for any firm in this sector. Nvidia's R&D expenses were, therefore, forecasted accordingly. A practical example of this capability is seen in Nvidia's ability to scale and use AI, more specifically on how, in roughly one

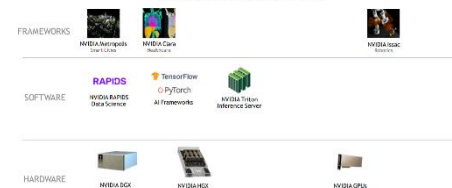
Exhibit 7: VRIN analysis of Nvidia's resources & capabilities

Resources and capabilities	V	R	I	N- S	Sustainable Competitive Advantage
Ability to raise capital	X				No
Adaptability to new markets	X	X			No
Quality of product offering	X		X		No
Financial strength	X			X	No
Investment in R&D	X			X	No
Distribution channels	X			X	No
Brand image	X		X	X	Can lead to
Corporate leadership & vision	X		X	X	Can lead to
Propensity for innovation	X		X	X	Can lead to
Tech advancement and integration	X	X	X	X	Yes
Customer experience / value proposition	X	X	X	X	Yes

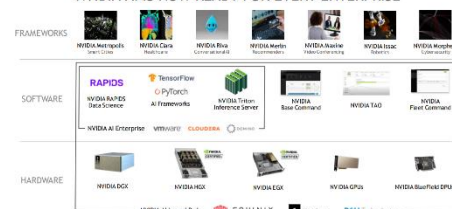
Source: Analysts' authorship

Exhibit 8: Nvidia's AI for enterprise solutions 2020 and 2021 evolution

AT THE START OF 2020...

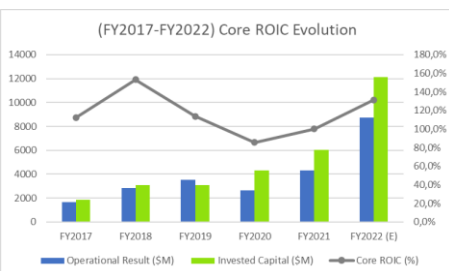


NVIDIA AI IS NOW READY FOR EVERY ENTERPRISE

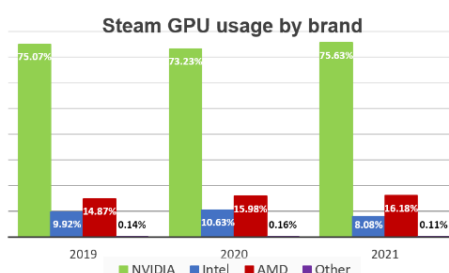


Source: Nvidia Investors Presentation

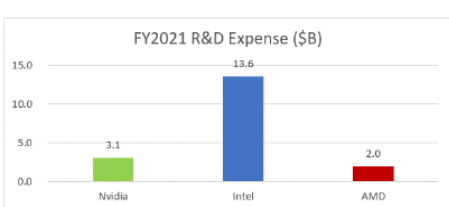
⁴ Platform strategy is considered the offer of an expanded level of services and enhanced performance by providing both hardware and software

Exhibit 9:

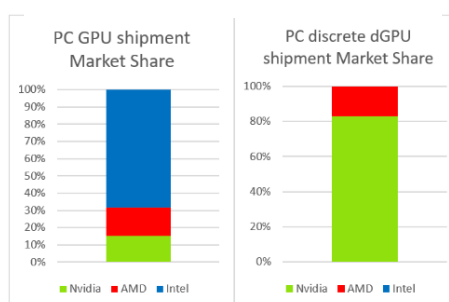
Source: Analysts Estimates

Exhibit 10:

Source: Steam Data

Exhibit 11:

Source: Companies' financial Data

Exhibit 12:

Source: Jon Peddie Research Data

Exhibit 13:

Source: Bloomberg Data

year, the firm was able to significantly increase its framework, software and hardware AI solutions applied to enterprises (Exhibit 8).

Other resources like brand image, corporate leadership and vision, and Nvidia's propensity for innovation can be sources of competitive advantage in the future if the company continues to further differentiate itself from its peers. The identified sources of sustainable competitive advantage led us to believe Nvidia's ROIC may be higher than its peers, with the ability of sustaining a higher ROIC than average in the steady state. Nvidia's FY21 Core ROIC stands at 100% and is expected to be 142% in FY22 (Exhibit 9). As for the steady state, based on the sustainable competitive advantages identified, we assumed a 40% long-term ROIC. The topic of ROIC will be more thoroughly discussed below.

Industry Overview

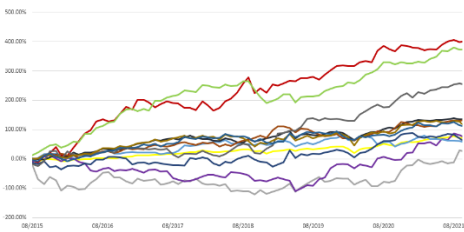
Main Competitors

Regarding Nvidia's GPU related products, from standalone discrete GPUs to solutions such as Accelerated Computing workstations, servers and platforms, the main competitor is AMD, followed by Intel and Xilinx. Main competition can be found in AMD's solid low to mid-range GPUs, which have been their main strength in the past years. It is extremely relevant to follow how these companies compete in capturing the increasing demand for gaming and data center services. Intel GPU offers are currently poor compared to Nvidia and AMD. Intel GPUs continue their trend of losing relevance in gaming (Exhibit 10) and even new offers of discrete GPUs for data center services, mobile products, and laptops offer little competition to Nvidia's GPUs. A potential risk, however, is Intel's upcoming higher-end GPU Intel Alchemist which, according to specialists, could pose a threat to Nvidia's discrete GPUs and, if successful, can be the start of a series of products that will compete with Nvidia in the high-end range. Intel's R&D expenses in the past year have been close to four times larger than Nvidia (Exhibit 11), a factor explained by Intel's larger size and maturity stage in the industry, as well as its much broader product offering.

Regarding Nvidia's SoC related products, as well as other semiconductor offers, including those used for Automotive hardware, there is a larger array of competitors, such as AMD, Broadcom, Intel, Qualcomm, Xilinx, NXP and Renesas.

Profitability-wise, Nvidia is the company with the best figures, both in terms of core operations, but profitability from investments as well. (Appendix 11). Finally, in terms of liquidity management, Nvidia is also ahead of its main competitors (Appendix 11).

In terms of Market share, Nvidia dominates in discrete GPU shipments with 80% of the total market in Q2 FY2022. Although Intel does not establish itself within the discrete GPU market, it is responsible for 64% of total PC GPU shipments, due to integrated GPUs (many CPUs come with integrated GPUs) (Exhibit 12).

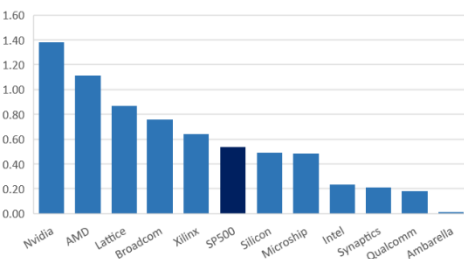
Exhibit 14: 2015-2021 Cumulative returns Nvidia and peers


Source: Bloomberg Data

Source: Bloomberg Data

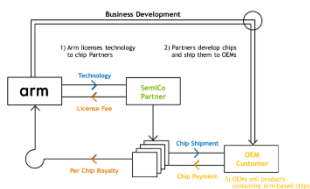
Exhibit 15:

Yearly Sharpe Ratios, Nvidia and Peers



Source: Bloomberg Data

Exhibit 16: Arm's business model and Nvidia opportunities
EXPAND ARM'S IP LICENSING PORTFOLIO
WITH NVIDIA'S TECHNOLOGY
 Arm's Successful IP Licensing Model...
 Leading energy-efficiency

 ...Turbocharged with NVIDIA IP and Scale
 Leading AI, HPC and graphics performance


Source: Nvidia Investors Presentations

Nvidia has a considerably larger market cap than Intel and AMD (Exhibit 13) and it has roughly doubled it in a 10-month period following the end of January. In terms of stock performance in the past 6 years, Nvidia has been the company with the second highest absolute returns among its competitors (Exhibit 14). Although AMD has the highest 6-year cumulative returns, with an impressive +399,68% (compared to Nvidia's +372,44%), a risk adjusted analysis of the Sharpe Ratios (SR) show Nvidia is the best performer, with a SR of 1,38, followed by AMD with 1,12 (by comparison the S&P500, our benchmark, had a SR of 0,54) (Exhibit 15). Intel, one of the oldest competitors and a very mature company, has the worst performing stock among the peers, with an IS of 0.24 and 6y cumulative return of +58.89%. Overall, Nvidia's stock has been a winner, not only when compared to its competitors, but also the broader market. Nevertheless, we observe extreme events such as the 2018 selloff, which caused a concerning drawdown, the trade war with China, rising interest rates, a temporary slowing demand for semiconductors following the cryptocurrency crash, and a poor earnings season that caused the stock to fall 52.5% in a 3-month period (by comparison S&P500 fell -14%). Therefore, despite long-term growth projections for the gaming, datacenter and automotive markets being very optimistic, one must not exclude the risk of potential drawdowns, which will be more thoroughly analyzed in the scenario analysis section at the end of the report.

ARM Acquisition

In September 2020, Nvidia entered a Share Purchase Agreement with Arm Limited and SoftBank (current conglomerate owners) in a transaction valued at \$40 billion. \$2 billion were paid in cash at signing, with the agreement of paying \$10 billion upon closing of the acquisition, also in cash, plus the issuance of 44,3 million shares of Nvidia's common stock to SoftBank, with an aggregate value of \$21,5 billion. The deal also envisions a potential earn out depending on certain financial performance targets, as well as the issuance of \$1,5 billion in restricted stock to Arm employees after closing.

This acquisition would enable Nvidia to position itself better to take advantage of the AI revolution. Furthermore, Arm has a vast ecosystem of CPUs, with an array from Data Centers to small portable devices (such as Smartphones). In terms of Data Center offers, Nvidia would no longer require licenses to access Arm's architecture, being then able to tailor Arm offers to its product needs, which could result in an increase in computing power (to better perform machine and deep learning tasks) and optimized energy efficiency. Similarly, access to Arm CPU products for SoCs would grant Nvidia an edge for the Automotive Segment, as Nvidia develops new products such as sensors, developer kits, and computer boards (which require Arm architecture) and could further optimize its products. On broad terms, Nvidia could benefit from Arm in all product lines that involve CPU architectures, even those such as cloud offers (e.g., GeForce NOW). Lastly, Nvidia could also use this acquisition as a strategic move to limit competition's

access to Arm offers and preserve, or even increase, its market share. However, it's our view as analysts that the probability of the Arm acquisition materializing is virtually null.

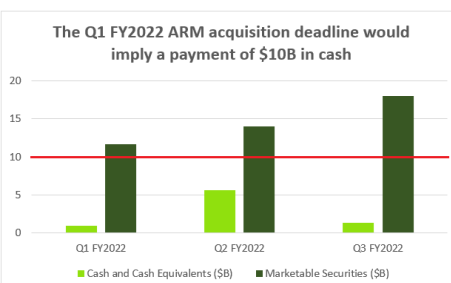
Firstly, regulators in the UK and the European Union rejected the acquisition on a first phase of reviews. Similarly, the US Federal Trade Commission (FTC) and China's antitrust authority are showing concerns regarding how the acquisition could reduce competition in the market for the supply of processors and limit the access of Nvidia's competitors to Arm's technology. As of December 2nd, 2021, the FTC sued to block Nvidia's acquisition of ARM, stating "The proposed vertical deal would give one of the largest chip companies control over the computing technology and designs that rival firms rely on to develop their own competing chips [...] the combined firm would have the means and incentive to stifle innovative next-generation technologies, including those used to run datacenters and driver-assistance systems in cars"⁵. Furthermore, Arm is based in the UK and regulators have voiced how the acquisition poses a national security threat, specially in a semiconductor shortage environment where the loss of Arm to an US based company would imply losing a national source of chips, and eventually losing processor technologies that are critical for defense technology.

Secondly, Nvidia has moved most of its cash and cash equivalents to Marketable Securities in Q3 FY2022 (cash outflow of \$16,020 million from the purchase of marketable securities), which by itself may signal the firm is not confident on the acquisition being approved, at least in the short-term. Upon the Mellanox acquisition's closing deadline at the start of Q2 FY2021, Nvidia had to pay \$7 billion in cash. In preparation to fund Mellanox, Nvidia liquidated more than 99% of its Marketable Securities, hoarding \$10,90 billion in FY2020. In the Quarter prior to the acquisition (Q1 FY2021) it held \$15,49 billion in Cash and Cash Equivalents with just \$0,86 billion in marketable securities. With the deadline for the Arm acquisition on Q1 FY2022, which involves a \$10 billion cash payment upon closing, it would be expected for Nvidia to follow a similar liquidity management strategy for the \$10 billion in cash for Q3 FY2022, instead of reducing it to \$1,29 billion, resulting in a 77,1% decrease from the last Quarter, and increasing marketable securities from \$14b to \$18b (Exhibit 17).

In conclusion, the acquisition is expected not to be approved both under competition grounds and national interest, in the case of the UK. This scenario hinders segment expansion plans, especially for the Gaming, Data Center, and Automotive segments. Nevertheless, as a very simple and merely hypothetical scenario exercise, with the very limited available public data on Arm, we tried conducting an analysis that aims at quantifying the impact on Nvidia's share price if the acquisition were approved.

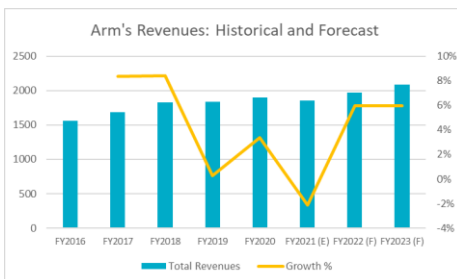
For starters, we would like to reiterate some assumptions. Firstly, since the deadline for the closing of the acquisition is set on March 2022, we are assuming the deal would close

Exhibit 17:



Source: Nvidia financial data

⁵ Source: <https://www.ftc.gov/news-events/press-releases/2021/12/ftc-sues-block-40-billion-semiconductor-chip-merger>

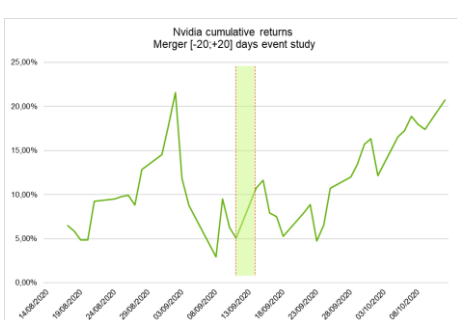
Exhibit 18:

Source: Analysts Forecasts

on January 2022 calendar year (end of Nvidia's FY2022). Therefore, considering the typical investor of this research, with a stock holding period of a year (during 2022), the investor would be exposed to the closing of the acquisition and to the first year of the new combined entity. This brings us to our second assumption, related to synergies: we do not expect synergies to occur in the first year following closing, as these tend to be realized after the "phase-in" period, which typically lasts up to two or three years after the transaction, even when a detailed time schedule is planned (Ficery et al., 2007⁶). Furthermore, it's often the case that, in the short-term, costs may increase during the integration process, like one-time expenses or due to short-term inefficiencies.

Lastly, for valuation purposes, we did not have sufficient data to perform a proper DCF model for Arm. We took, instead, a multiples path, more specifically using Price/Sales with FY2023 forecasted sales figures (Exhibit 18) and looked at the implicit relative valuation of Nvidia with and without Arm, to measure the difference in the stock price and give the investor an idea of how his investment would be affected.

We took this into consideration the transaction agreement of issuing to SoftBank \$21,5 billion worth of shares of common stock upon closing and added this to the number of shares outstanding for FY2023. The result was a difference of roughly +2,60% in the share price targets resultant from a P/S multiple analysis, considering FY2023 sales (Appendix 9). As expected, the difference is small because: **a)** FY2023 sales of the combined entity improved by a small amount due to the size differences between Nvidia and Arm (\$42,664 million vs \$2,085 million in forecasted revenues respectively); **b)** no synergies were assumed to be implement in just a time horizon of 1 year. This doesn't mean synergies wouldn't be implemented in the future but, for an investor to get achieve higher returns, it would need to be exposed and extend its holding period for longer, giving time for synergies to happen.

Exhibit 19:

Source: Bloomberg

To put it in perspective, at the day of the merger announcement, September 13th, 2020, Nvidia's share price went up by 5,66%. But if we look at a broader 20-days event study around the announcement day, a 5,66% increase (Exhibit 19) is nothing out of the ordinary when put in perspective with the trend the stock was following in the time horizon of the event study. With exception of a 9,74% decrease on the 3rd of September, which was the result of a broader market sell-off (Nvidia included), the trend was quite upwards, so the 5,66% merger market reaction doesn't stand out as much and, in our view, matches our estimated upside in share price of 2,60% for FY2023, if we consider no synergies were incorporated.

Valuation

⁶ Ficery, K., Herd, T., Pursche, B., Where has All the Synergy Gone? The M&A Puzzle, Journal of Business Strategy, volume 28, issue 5, 2007

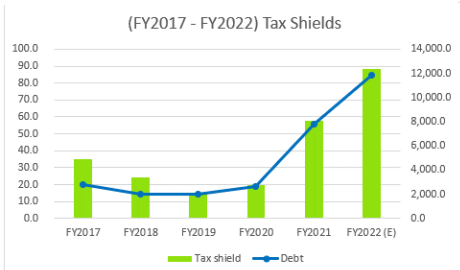
Adjusted Present Value model (APV)

The chosen valuation method used in this Equity Research was the Adjusted Present Value model (APV). The reason why this model was chosen in detriment of more popular models, such as the Discounted Cash-Flow model (DCF) or other WACC-based models, was its advantage in better accommodating changes in the capital structure of a firm. The main drawback associated with the WACC is that we are implicitly valuing the firm assuming a future constant capital structure, set at a predefined target D/E ratio, which doesn't match our assumption regarding Nvidia's capital structure. More specifically, we value the company as if it were 100% financed by equity, by discounting the free cash-flows with the unlevered cost of equity, and finally add any value created by financing-related effects, such as interest tax shields.

Reformulation and initial assumptions

The first step in the valuation process was to reformulate the company's financial statements since FY2017⁷ according to its core operational activities, non-core activities and financial items. Cash and cash equivalents were split between operating cash (assumed to be 5% of revenues) and excess cash (the remaining of the company's cash, together with its marketable securities, highly liquid instruments such as government debt securities, certificates of deposit and highly rated corporate bonds). This latter type of cash is to be used in M&A funding, capital assets purchases, debt repayments, dividends, etc. We allocated accounts like Goodwill, Acquisition-related intangibles, and Deferred tax assets⁸ to the non-core division of the firm, later on valued at book value. Financial obligations that the firm has, such as debt, capital and operating lease liabilities, and coupon interests on debt obligations were attributed to net financial assets, mechanisms the company uses to finance itself, other than through equity. Nvidia has no minority interest on other companies nor preferred equity issued, therefore no adjustments were made to total shareholder's equity. This initial reorganization of the company's financials is crucial for the upcoming forecasting and valuation processes.

Exhibit 20:



Source: Analysts estimates

Tax shields

Tax shields are financing benefits originated from the use of debt in a firm's capital structure. Since the APV values the firm ignoring debt in a first stage, any financing effects associated with it must be valued separately and added back to the final value of the firm, as it is the case of tax shields. Since we are assuming a constant dollar level of debt, the present value of tax shield is a constant perpetuity⁹. Therefore, at a marginal

⁷ Nvidia's financial years go from January to January, meaning FY17 starts in January 2016 and ends in January 2017. The latest annual statements published are from FY21 (ended in January 2021).

⁸ We are assuming the company will be able to recover the full amount of Deferred Tax Assets (net), since Nvidia already adjusts this account according to the likelihood of realizing this gain through a valuation allowance.

⁹ Present value of tax shields is given by $PV(TS) = \frac{D \cdot k_d \cdot T}{k_d} = D \cdot T$ (Koller, Goedhart & Wessels, Valuation, McKinsey & Company, page 807)

tax rate of 21%, PV of tax shields will be roughly \$2492 million, which will be added to the value of the unlevered firm.

Cost of Capital

Beta

As a key parameter to estimate the final cost of capital, we conducted a detailed analysis on Nvidia's Beta. A regression of 5 years of monthly data of Nvidia's stock returns against the S&P500 was performed (Appendix 3): the regression indicated a coefficient (Beta) of 1,31 but, unfortunately, a wide 95% confidence interval of [0,76 ; 1,87], which made us perform an unlevered Beta analysis (Appendix 4) based on similar companies. Of a total of 10 industry peers, we found an average unlevered beta of 1,15, a median of 1,13 and Nvidia's unlevered beta of 1,32, reflecting a higher systematic risk than its peers.

By analyzing a 2-year rolling Beta within the 5-year time-window (Exhibit 21), we conclude the width of the 95% confidence interval of [0,76 ; 1,87] is explained by large variations of the Beta, with two distinct trends: **1)** From mid-2017 to late-2018, the 2-year rolling Beta had a growing trend marked by periods of stronger volatility than the broader market, reaching a peak of 3.08 by the late 2018 selloff. The fast-paced stock price growth until mid-2018 and subsequent tech stocks correction, together with crypto crash causing a strong fall in demand for GPUs making Nvidia's stock plunge, meant Nvidia was consistently more volatile than the overall market. The same pattern of volatility is observed for their most direct competitor AMD, but not Intel as it is mostly CPU focused and had a small impact from the crypto market (Exhibit 22); **2)** The second distinct trend starts when Nvidia's rolling Beta plunged at the start of the Covid-19 pandemic in early 2020: the tech industry suffered a smaller impact from the pandemic than other industries (the broad market initiated a downtrend), and Nvidia had favorable events such as the spontaneous rise in gaming GPUs demand during lockdowns, causing the firm's 2-year rolling Beta to decrease from 2.45 to 1.37 unit in just 2 months (AMD shows a similar pattern). Even after the market downtrend period, Nvidia was able to maintain consistent patterns of low volatility when compared to the overall market, leading its Beta to reach its lowest value of 0.54 by August 2021.

In conclusion, the volatility of the 2-year rolling Beta within the 5 years time horizon makes it clear why the regression had such a large confidence interval, and justifies the backing of a Beta peers' approach, which was able to corroborate the reliability of our initial regressed levered beta of 1,31, which was used as input in the next section.

Cost of Equity

The CAPM was used to estimate the cost of equity. The Beta was assumed to be 1,31. For the risk-free rate we used a 10-year US government bond yield, 1,57%. Lastly, for

Exhibit 21:

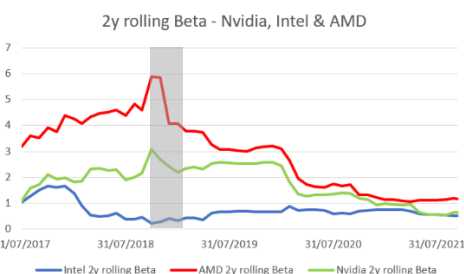


Exhibit 22:

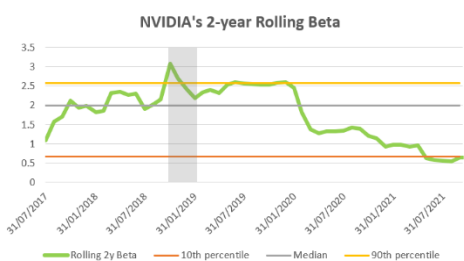


Exhibit 23: Cost of Equity inputs

Rf	1.57%
MRP	4.72%
Beta (Levered)	1.3128
rE	7.77%

Source: Analysts estimates

Exhibit 24: Cost of Debt inputs

Yield of representative debt note	3.54%
Debt note maturity	2050
Probability of default	0.080%
Expected loss rate given default	0.32%
Cost of debt (rD)	3.54%

Source: Analysts estimates

the market risk premium, we assumed Damodaran's US Equity risk premium of 4,72%¹⁰, estimated with a model that does not use historical data, therefore reflecting better current market perceptions. Based on these inputs for the CAPM equation¹¹, our resulting cost of equity (rE) was 7,77% (Exhibit 23).

Cost of Debt

Nvidia is currently rated A- by S&P and has issued multiple debt notes to finance itself. To calculate the firm's cost of debt we used the effective interest rate of a representative debt note, adjusted to the probability of default (Pd) times the expected loss given default (LGD). The chosen instrument was a 3,50% coupon Note due 2050, with effective yield of 3,54%. As for the Pd, we annualized the 10-year cumulative default rate for A-rated companies (0,08%), which was then multiplied by 0,32%, the estimated LDG for the sector based on S&P credit rating reports (Appendix 5, 6 and 7). The final cost of debt for this valuation is 3,54%, which reflects the current state and credit worthiness of Nvidia.

Cost of Unlevered Equity

The APV values the firm initially as if it were 100% equity financed, therefore we are discounting its cash-flows using the unlevered cost of equity (ku), rather than the WACC. In line with our assumptions of having a constant dollar level of debt and the tax shields having the same risk as debt, the cost of unlevered equity is equal to 7,78%¹² (Exhibit 25). In the sensitivity analysis chapter, we quantify the impact of ku in Nvidia's share price, driven by different values of Beta.

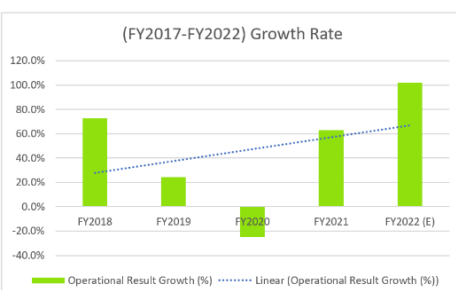
Long-term Value Drivers
Growth rate (g)

Even though Nvidia's historical growth figures are impressive (Exhibit 26), a high growth rate is very difficult to sustain in the long-run, and most companies will converge to average expected levels of economic growth. To sustain the current levels of growth, the firm would require to constantly keep innovating and gaining market share, or through substantial M&A activity (inorganic growth). Therefore, we assumed g to converge towards the nominal GDP growth rate of the most significant economies and regions Nvidia currently operates in: United States, China (including Taiwan and Hong Kong), Europe and Asia Pacific (Australia, India, Indonesia, Japan and Korea) (Exhibit 27). Using OECD data as source, the real "g" is computed with the weighted average of these regions' real GDP growth according to each geographies' contribution to the companies' current revenue. As for long-term inflation, we considered the US as a proxy since Nvidia reports in US dollars. Therefore, considering both real GDP growth and inflation, our

Exhibit 25: Cost of Unlevered Equity inputs

ke	7.77%
D	-2935
E	754950
kd	3.54%
T	21.00%
ku	7.78%

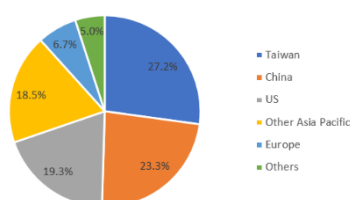
Source: Analysts estimates

Exhibit 26:


Source: Analysts forecasts

Exhibit 27:

Revenue per Geographical Area (FY2021)



Source: Nvidia's financial data

¹⁰ https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

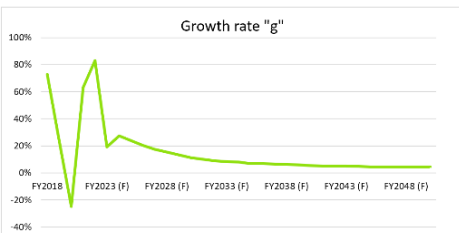
¹¹ CAPM: $rE = Rf + \text{Beta} * \text{MRP}$

¹² Cost of unlevered equity is given by $ku = \frac{D(1-T)}{D(1-T)+E} kd + \frac{E}{D(1-T)+E} ke$ (Koller, Goedhart & Wessels, Valuation, McKinsey & Company, page 807)

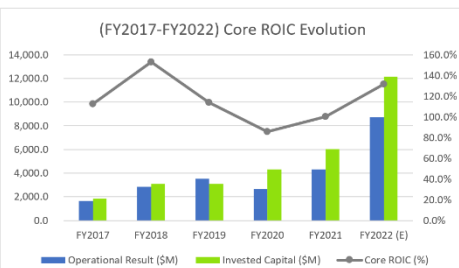
Exhibit 28:

Steady state "g" growth rate calculations:	
US Long-term Real GDP growth	2,10%
China long-term real GDP growth	1,89%
Euro-Area long-term real GDP growth	1,60%
Asia Pacific real GDP growth	3,46%
"Others" real GDP growth	2%
Weighted Average Real "g"	2,19%
US Long-term Inflation	2,30%
Weighted Average Nominal "g"	4,54%

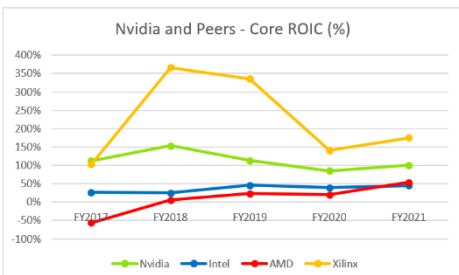
Source: Analysts estimates

Exhibit 29:

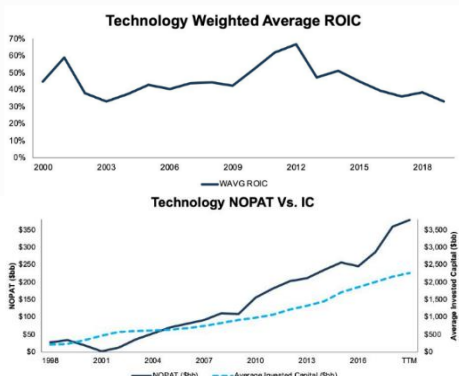
Source: Analysts estimates

Exhibit 30:

Source: Analysts forecasts

Exhibit 31:

Source: Analysts estimates

Exhibit 32:
¹³ Nominal GDP growth rate = (1 + Real GDP growth rate) * (1 + Inflation rate) - 1

computed nominal long-term GDP growth "g" stands at 4,54%¹³, the value assumed for the terminal growth rate of the firm (Exhibit 28).

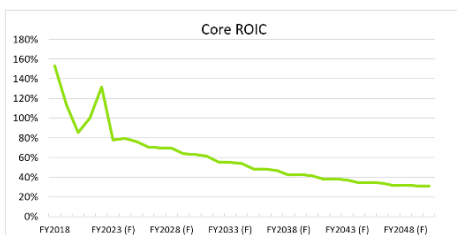
Return on Core Invested Capital (ROIC)

ROIC is possibly the most important metric to assess how much value a company is creating. Value creation for shareholders happens when the firm's return on invested capital is higher than the cost of capital for investors. If we look at Nvidia's historical Core ROIC, we can observe a staggering 113% 4-year average, higher than any minimum required return a typical investor would demand. Furthermore, Nvidia's Core ROIC has also been quite volatile due to considerable variations in Operational Result and Invested Capital (Exhibit 30).

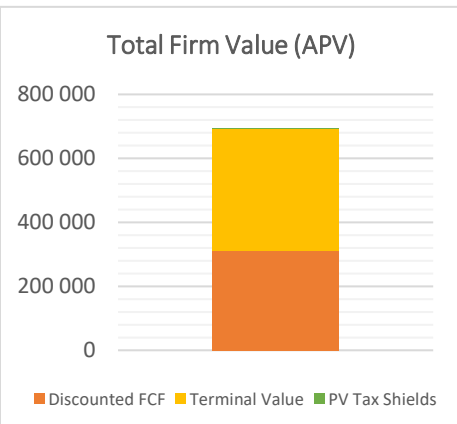
Similar companies like Intel and AMD have also shown high levels on historical Core ROIC, averaging 39% and 26% in the last 4 years respectively. Xilinx, in a different maturity stage of the previous companies, has displayed a 255% 4-year average Core ROIC, but significantly volatile across these years (Exhibit 31). These are all indications of the type of industry Nvidia and its peers operate in, technology, a sector characterized by above average ROIC figures and often low capital requirements (Exhibit 32): recall that Nvidia does not own any manufacturing facilities nor directly manufacture the semiconductors used in their products, which means most of its capital resides in central/HQ related PP&E, operational or R&D equipment and intangibles. An example of an opposed company would be a car manufacturer, whose business requires significant CAPEX to grow. Nvidia's "real" capital resides in intangibles such as brand, distribution capabilities, Intellectual-Property (IP), innovation, and these are difficult to capture using financial statements.

This brings us to the determinants of ROIC. Not only is ROIC dependent on the sector which the firm operates in, but also on its competitive advantage. Recall the VRIN analysis at the beginning of this report, where we concluded that Nvidia had sustainable competitive advantage from its customer experience/value proposition and technological advancement/integration. Other resources like brand image, corporate leadership and vision, and Nvidia's propensity for innovation could also be sources of competitive advantage in the future. It is often the case, in the long run, for industries to witness their ROIC converge to the cost of capital. This happens because the sector is new and attractive, which attracts new firms to join, consequently increasing competition, squeezing margins and ROIC accordingly. However, we expect Nvidia's sustainable competitive advantage to block the destruction of return by new entrants, therefore sustaining its ROIC above the cost of capital.

Source: <https://www.newconstructs.com/long-term-trends-revealed-by-our-research-on-sector-roics/>

Exhibit 33:

Source: Analysts estimates

Exhibit 34:

Source: Analysts estimates

Exhibit 35:

Total Shareholder's Return (TSR)	
Intrinsic Share Price	285,52
NVIDIA CORPORATION (XNAS:NVDA)	281,61
Net Cash Transactions w/ shareholders	0,77
Annualized TSR	1,14%

Source: Analysts estimates

Exhibit 36:

Beta sensitivity analysis:							
Beta	0,756	0,941	1,127	1,313	1,498	1,684	1,870
ku	5,14%	6,02%	6,90%	7,78%	8,66%	9,54%	10,42%
Share price	1737,72	677,47	407,53	285,52	216,68	172,89	142,79

Source: Analysts estimates

Exhibit 37:

Debt level and TS sensitivity analysis:				
Debt level on BS (\$ m)	0	11 864	50 000	100 000
PV Tax Shields (\$ m)	0	2 492	10 501	21 002
Share price	285,03	285,52	287,08	289,12

Source: Analysts estimates

As a result, we expect a steady state Core ROIC of 30% (Exhibit 33), a value we considered reasonable when accounting for both the type of sector, industry peers' core ROIC and Nvidia's competitive advantage in the long run.

Terminal Value (TV)

Upon reaching a steady state level, where Nvidia's growth rate and core ROIC were both constant and matching our long-term assumptions, a terminal value was applied for the year FY2050 onwards. The result was \$376.792 million (discounted to PV), which implies the TV for Nvidia accounts for 55% of the firm's estimated APV (Exhibit 34).

Intrinsic Share Price

Considering both PV of tax shields (\$2492 million) and the non-core value of the firm (book value of \$12.568 million), our estimated enterprise value (EV) stands at \$706.062 million. Adjusting for Net Debt and other claims, the resultant equity value is \$713.792 million. Nvidia currently has 2500 million shares outstanding, which gives us an intrinsic share price value of \$285,52, compared to the current \$281,61 (as of 13/12/2021). For a representative investor buying shares in January 2022, and holding them for one year, the total annualized shareholder return would be 1,14%, considering all net cash transactions between the firm and shareholder that took place in FY23 (Exhibit 35).

Sensitivity and Scenario Analysis

Sensitivity Analysis

As we referred previously in the report, a crucial element for the valuation is Nvidia's cost of unlevered equity, which is mainly driven by the Beta. Our previous analysis and procedures demonstrated that Nvidia's Beta has been quite volatile in recent past, which yielded a significantly wide confidence interval on our Beta regression. Therefore, we decided to perform a sensitivity analysis of Beta on our share price target, using that same regression confidence interval range (Exhibit 36).

We can observe that, the higher the beta, and consequently the cost of unlevered equity, the smaller will be the target share price. However, it's interesting to notice that the left-hand side seems to be a lot more sensitive, with smaller values of Beta causing a bigger impact on share price than the ones of the right side. Therefore, we expect that if the stock starts behaving more in tandem with the overall market (Beta near 1, or even below), a larger price target and shareholder's return can be expected in the future.

Lastly, to understand how critical and impactful our assumed debt level was on the valuation model, we performed a sensitivity analysis of the level of debt assumed, and its consequential impact of the tax shields on the target share price (Exhibit 37). As expected, the level of debt we assume for the future (even if arbitrary) has little to no impact on the valuation of the firm. The only impact debt has is reflected on the tax

shields, which will be valued separately. However, as we have shown in Exhibit 34, the weight of the tax shields on the firm's total value is marginal.

Scenario Analysis: Risk factors

In addition to the “standard scenario” share price target, we decided to identify some major risks for Nvidia and quantify their impact on the firm's price target, as well as the probability of those risks materializing, measured in low-medium-high (Exhibit 40).

Industry related risks:

Innovation

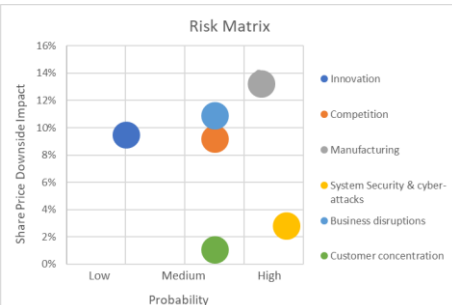
The semiconductor industry, like all technological-related industries, often experiences swift technological change, disruptions from new products, changes in customer needs and constant innovation, which makes current products quickly obsolete. Nvidia's success as a technological company depends on its ability to identify emerging market changes and develop new products and technologies that meet the needs of the market. Therefore, failing to meet these requirements will negatively impact revenues and financial results. That is the reason why Nvidia takes its innovation and R&D efforts so seriously, having spent over \$24 billion on R&D since inception, and making sure this leads to the development of innovative products and technology that provide value to customers. As comparison, Nvidia's R&D budget is more than twice of its closest competitor, AMD (\$3,92 billion Nvidia vs \$1,98 billion AMD last fiscal year). A scenario where Nvidia's products become technologically replaceable, for instance because a competitor comes up with a product capable of replacing GPUs, could easily draw clients away and deem Nvidia's R&D efforts worthless. On this bearish scenario, we estimate the company wide penetration rate could decrease¹⁴ by 10% and R&D-to-sales ratio increase 10%, which would imply an intrinsic share price of \$255,30 (original = \$285,52), equivalent to a downside of roughly 12%.

Competition

As mentioned in the Porter's Five Forces analysis, competitive forces in the industry are strong and Nvidia needs to remain at the vanguard of technological innovation, otherwise it'll lose ground to its competitors, whether because products/services by competitors become relatively less costly and/or offer superior performance and functionalities. The case of inferior products compared to competitors may jeopardize Nvidia's market share and revenue figures. On a bearish scenario we estimate an impact of a loss in Market share up to 10% cross-segment, which would imply an intrinsic share price of \$255,88 (original = \$285,52), equivalent to a downside of roughly 10%.

Supply Chain related risks:

Exhibit 40:



Source: Analysts estimates

¹⁴ 10% reduction relative to current value. i.e., if penetration rate is 30%, reduction of 10% means "new" penetration rate = 30% * (1 - 10%)

Manufacturing

Nvidia depends on third parties to manufacture, assemble, test, and package its products. This creates risks and uncertainty around product quantity and quality, lack of guaranteed supply and delivery, shortages, delays, etc. In fact, the firm is highly dependent on companies like TSMC and Samsung (foundries) to manufacture wafers, resulting in adverse effects on Nvidia's ability to meet customer demand and scale supply chain. In addition, low manufacturing yields could cause an increase of manufacturing costs and harm customer/partner, negatively impacting the firm's operations and financial results. Historically, there has been yield related issues in 2010 and, according to industry reporters Monica Chen, Daniel Nenni and Jessie Shen, last year, with Samsung's 8 nm processors, which caused a short supply of Nvidia's RTX30 series cards¹⁵. Non-optimal contracts with independent subcontractors could easily either increase Nvidia's COGS or cause a short supply due to delays and inefficiencies. In such a bearish scenario, we estimate Nvidia's Gross margins can decrease by 5%, which would imply an intrinsic share price of \$243,92 (a downside of 15%).

Operations related risks:

System security and cyber-attacks

Attacks on Nvidia's systems have occurred and are expected to occur in the future, despite the efforts to develop security measures. Currently the biggest threat related to this risk is Nvidia's CMP strategy being under fire: as hackers have been trying to find ways to bypass Nvidia's Hash rate limit strategy, the RTX30 series has already been successfully hacked to up 70% of Hash Rate effectiveness, making crypto miners flood to buy RTX30 GPUs instead of the dedicated CMPs, which directly causes shortages for gaming customers. To quantify the risk of Hash Rate hacks, we assume crypto miners do not rely on CMP offers but rather on the "potentially" hacked gaming GPUs, forcing gaming GPU shortages, which drive their gaming customer base away to competitors and would cause a permanent loss of 5% in gaming market share (absolute reduction). The revenue from crypto miners is somewhat transferred from the OEM & Others segment (where CMPs stand) to gaming, nevertheless we assume -15% CMP Sales due to unsold products. This bearish scenario implies an intrinsic share price of \$274,94 (a downside of 4% vs standard scenario).

Business disruptions

Nvidia's international operations are located in geographical areas, such as Asia-Pacific, historically exposed to events like earthquakes, power or water shortages, floods, fires, terrorist attacks, pandemics and other natural or man-made disasters. The occurrence of these disruptions can harm Nvidia's business and result in substantial losses for the firm.

¹⁵ Source: <https://www.digitimes.com/news/a20201211PD200.html>

Furthermore, geopolitical changes or changes in government regulation and policies, like the China-US trade war also pose significant risk of jeopardizing Nvidia's operations. Finally, it goes without saying that Covid-19 has impacted Nvidia's operations as well, as there is the risk of continuing to do so in case countries fail to contain the spread and increase of cases, possibly leading to further restrictions and lockdowns, together with supply chain disruptions and economic uncertainty. As seen from the case of the draught in Taiwan this past summer, natural disasters can disrupt the supply chain and lead to a decrease in Gross margins (due to higher COGS). To quantify these risks, we can fix Gross Margins to mid corona times and assume that a set of future disruptions limits cross-segment Gross Margins to 62,35%, the GM figure in FY21 (pandemic hit). As a result, this bearish scenario implies an intrinsic share price of \$252,23 (downside of 12% vs the standard scenario).

Customer concentration

A significant amount of Nvidia's revenue comes from a limited number of customers within their distribution and partner network, meaning sales can be highly affected if any of these customers is lost or prevented from selling to. Companies like Lenovo and Dell are responsible by roughly 17% of Nvidia's revenue stream. Nvidia's distribution and partners are critical because it is through their channels that the company sells to multiple target market platforms, making Nvidia's operating results dependent on its partners' ability to sell products that incorporate Nvidia's technology. On a bearish scenario we estimate Nvidia losing a main customer such as Dell, which consists of ~8% of Nvidia's revenues. Therefore, in a hypothetical scenario where Dell stops buying from Nvidia, we assume revenues will be reduced those same 8% for 5 years, and then 4% for another 5 years, as other companies progressively replace Dell in Nvidia's revenue stream. As a result, this bearish scenario implies an intrinsic share price of \$281,78. (minimal impact of -1,3% vs standard scenario).

Investment Thesis and Catalysts

We propose a Hold recommendation on Nvidia shares. Even though the outlook for the acquisition of Arm is negative, we still believe Nvidia alone holds a strong position as a technology company. The continuing popularity and increase in gaming population, the Metaverse opportunity, the increasing demand and worldwide adoption of AI, and the development of AVs are some of the catalysts that ground our thesis and will ensure the continuing expansion and success of the company. However, as the market seems to be already reflecting the expectations of growth for Nvidia, we see limited upside in the near term. Out of the risk scenarios, the only scenario that wouldn't imply a downgrade in our recommendation from Hold to Sell is the Customer concentration risk, which would still yield a marginal, but positive, annualized Total Shareholder Return of 0,20%.

Appendix

Appendix 1: Nvidia's Historical Financial Statements

	January 29, 2017	January 28, 2018	January 27, 2019	January 26, 2020	January 31, 2021
Revenue	6 910,0	9 714,0	11 716,0	10 918,0	16 675,0
Cost of revenue	2 847,0	3 892,0	4 545,0	4 150,0	6 279,0
Gross profit	4 063,0	5 822,0	7 171,0	6 768,0	10 396,0
Operating expenses					
Research and development	1 463,0	1 797,0	2 376,0	2 829,0	3 924,0
Sales, general and administrative	663,0	815,0	991,0	1 093,0	1 940,0
<i>D&A (not included in IS, auxiliary line)</i>	<i>187,0</i>	<i>199,0</i>	<i>262,0</i>	<i>381,0</i>	<i>1 098,0</i>
Restructuring and other charges	3,0	0,0			
Total operating expenses	2 129,0	2 612,0	3 367,0	3 922,0	5 864,0
Income from operations	1 934,0	3 210,0	3 804,0	2 846,0	4 532,0
Interest income	54,0	69,0	136,0	178,0	57,0
Interest expense	-58,0	-61,0	-58,0	-52,0	-184,0
Other, net	-25,0	-22,0	14,0	-2,0	4,0
Other income (expense), net	-29,0	-14,0	92,0	124,0	-123,0
Income before income tax	1 905,0	3 196,0	3 896,0	2 970,0	4 409,0
Income tax expense (benefit)	239,0	149,0	-245,0	174,0	77,0
Net income	1 666,0	3 047,0	4 141,0	2 796,0	4 332,0
Net income per share:					
Basic	3,1	5,1	6,8	4,6	7,0
Diluted	2,6	4,8	6,6	4,5	6,9
Weighted average shares used in per share computation:					
Basic	541,0	599,0	608,0	609,0	617,0
Diluted	649,0	632,0	625,0	618,0	628,0
Consolidated Statements of Comprehensive Inc RESULTS					
Available-for-sale debt securities, Net change in unrealized gain (loss)	-16,0	-4,0	11,0	8,0	0,0
Cash flow hedges, Net change in unrealized gain (loss)	4,0	2,0	-5,0	5,0	18,0
Other comprehensive income (loss), net of tax	-12,0	-2,0	6,0	13,0	18,0
Total comprehensive income	1 654,0	3 045,0	4 147,0	2 809,0	4 350,0

	January 29, 2017	January 28, 2018	January 27, 2019	January 26, 2020	January 31, 2021
ASSETS					
Current assets:					
Cash and cash equivalents	1 766,0	4 002,0	782,0	10 896,0	847,0
Marketable securities	5 032,0	3 106,0	6 640,0	1,0	10 714,0
Accounts receivable, net	826,0	1 265,0	1 424,0	1 657,0	2 429,0
Inventories	794,0	796,0	1 575,0	979,0	1 826,0
Prepaid expenses and other current assets	118,0	86,0	136,0	157,0	239,0
Total current assets	8 536,0	9 255,0	10 557,0	13 690,0	16 055,0
Property and equipment, net	521,0	997,0	1 404,0	1 674,0	2 149,0
Operating lease assets				618,0	707,0
Goodwill	618,0	618,0	618,0	618,0	4 193,0
Intangible assets, net	104,0	52,0	45,0	49,0	2 737,0
Deferred income tax assets			560,0	548,0	806,0
Other assets	62,0	319,0	108,0	118,0	2 144,0
Total assets	9 841,0	11 241,0	13 292,0	17 315,0	28 791,0
LIABILITIES AND SHAREHOLDERS' EQUITY					
Current liabilities:					
Accounts payable	485,0	596,0	511,0	687,0	1 201,0
Accrued and other current liabilities	507,0	542,0	818,0	1 097,0	1 725,0
Short-term debt	796,0	15,0	0,0	0,0	999,0
Total current liabilities	1 788,0	1 153,0	1 329,0	1 784,0	3 925,0
Long-term debt	1 983,0	1 985,0	1 988,0	1 991,0	5 964,0
Long-term operating lease liabilities				561,0	634,0
Capital lease obligations, long-term	6,0				
Other long-term liabilities	277,0	632,0	633,0	775,0	1 375,0
Total liabilities	4 048,0	3 770,0	3 950,0	5 111,0	11 898,0
Commitments and contingencies - see Note 13			0,0		
Convertible debt conversion obligation	31,0				
Shareholders' equity:					
Preferred stock, \$0.001 par value; 2 shares authorized; none issued				0,0	0,0
Common stock, \$0.001 par value; 2,000 shares authorized; 965 shares issued and 620 outstanding as of January 31, 2021; 955 shares issued and 612 outstanding as of January 26, 2020	1,0	1,0	1,0	1,0	1,0
Additional paid-in capital	4 708,0	5 351,0	6 051,0	7 045,0	8 721,0
Treasury stock, at cost (345 shares in 2021 and 342 shares in 2020)	-5 039,0	-6 650,0	-9 263,0	-9 814,0	-10 756,0
Accumulated other comprehensive income	-16,0	-18,0	-12,0	1,0	19,0
Retained earnings	6 108,0	8 787,0	12 565,0	14 971,0	18 908,0
Total shareholders' equity	5 762,0	7 471,0	9 342,0	12 204,0	16 893,0
Total liabilities and shareholders' equity	9 841,0	11 241,0	13 292,0	17 315,0	28 791,0

	January 29, 2017	January 28, 2018	January 27, 2019	January 26, 2020	January 31, 2021
Cash flows from operating activities:					
Net income	1 666,0	3 047,0	4 141,0	2 796,0	4 332,0
Adjustments to reconcile net income to net cash provided by operating activities:					
Stock-based compensation expense	247,0	391,0	557,0	844,0	1 397,0
Depreciation and amortization	187,0	199,0	262,0	381,0	1 098,0
Deferred income taxes	197,0	-359,0	-315,0	18,0	-282,0
Loss on early debt conversions	21,0	19,0			
Other	33,0	20,0	-45,0	5,0	-20,0
Changes in operating assets and liabilities, net of acquisitions:					
Accounts receivable	-321,0	-440,0	-149,0	-233,0	-550,0
Inventories	-375,0	0,0	-776,0	597,0	-524,0
Prepaid expenses and other assets	-18,0	21,0	-55,0	77,0	-394,0
Accounts payable	184,0	90,0	-135,0	194,0	363,0
Accrued and other current liabilities	-135,0	33,0	256,0	54,0	239,0
Other long-term liabilities	-14,0	481,0	2,0	28,0	163,0
Net cash provided by operating activities	1 672,0	3 502,0	3 743,0	4 761,0	5 822,0
Cash flows from investing activities:					
Proceeds from maturities of marketable securities	969,0	1 078,0	7 232,0	4 744,0	8 792,0
Proceeds from sales of marketable securities	1 546,0	863,0	428,0	3 365,0	527,0
Purchases of marketable securities	-3 134,0	-36,0	-11 148,0	-1 461,0	-19 308,0
Acquisitions, net of cash acquired			0,0	-4,0	-8 524,0
Purchases related to property and equipment and intangible assets	-176,0	-593,0	-600,0	-489,0	-1 128,0
Investments and other, net	-5,0	-36,0	-9,0	-10,0	-34,0
Proceeds from sale of long-lived assets and investments	7,0	2,0	0,0		
Net cash provided by (used in) investing activities	-793,0	1 278,0	-4 097,0	6 145,0	-19 675,0
Cash flows from financing activities:					
Issuance of debt, net of issuance costs	1 988,0	0,0	0,0	0,0	4 968,0
Proceeds related to employee stock plans	167,0	139,0	137,0	149,0	194,0
Payments related to tax on restricted stock units	-673,0	-812,0	-1 032,0	-551,0	-942,0
Dividends paid	-261,0	-341,0	-371,0	-390,0	-395,0
Principal payments on property and equipment			0,0	0,0	-17,0
Payments related to repurchases of common stock	-739,0	-909,0	-1 579,0	0,0	0,0
Repayment of Convertible Notes	-176,0	-612,0	-16,0	0,0	0,0
Other	-15,0	-9,0	-5,0	0,0	-4,0
Net cash provided by (used in) financing activities	291,0	-2 544,0	-2 866,0	-792,0	3 804,0
Change in cash and cash equivalents	1 170,0	2 236,0	-3 220,0	10 114,0	-10 049,0
Cash and cash equivalents at beginning of period	596,0	1 766,0	4 002,0	782,0	10 896,0
Cash and cash equivalents at end of period	1 766,0	4 002,0	782,0	10 896,0	847,0
Supplemental disclosures of cash flow information:					
Cash paid for income taxes, net			61,0	176,0	249,0
Cash paid for interest			55,0	54,0	138,0

	January 29, 2017	January 28, 2018	January 27, 2019	January 26, 2020	January 31, 2021
Net income	1 666,0	3 047,0	4 141,0	2 796,0	4 332,0
Other comprehensive income (loss), net of tax					
Available-for-sale debt securities:					
Net unrealized gain (loss)	-17,0	-5,0	10,0	8,0	2,0
Reclassification adjustments for net realized gain included in net income	1,0	1,0	1,0	0,0	-2,0
Net change in unrealized gain (loss)	-16,0	-4,0	11,0	8,0	0,0
Cash flow hedges:					
Net unrealized gain (loss)	2,0	-1,0	6,0	10,0	9,0
Reclassification adjustments for net realized gain (loss) included in net income	2,0	3,0	-11,0	-5,0	9,0
Net change in unrealized gain (loss)	4,0	2,0	-5,0	5,0	18,0
Other comprehensive income (loss), net of tax	-12,0	-2,0	6,0	13,0	18,0
Total comprehensive income	1 654,0	3 045,0	4 147,0	2 809,0	4 350,0

Appendix 2: Nvidia's Forecasted Financial Statements

Income Statement forecast

	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022 (E)	FY2023 (F)	FY2024 (F)	FY2025 (F)	FY2026 (F)	FY2027 (F)
Core operations:											
Gaming Revenues	4 060,0	5 513,0	6 246,0	5 518,0	7 759,0	11 790,9	15 749,3	20 818,1	26 334,9	31 387,2	36 252,2
Professional Visualization Revenues	835,0	934,0	1 130,0	1 212,0	1 053,0	1 817,7	1 858,4	2 378,6	2 892,5	3 414,2	3 909,3
Data Center Revenues	830,0	1 932,0	2 932,0	2 983,0	6 696,0	10 431,3	16 693,4	20 599,8	24 855,5	28 527,3	32 406,0
Total Automotive Revenues (1+2)	487,0	558,0	641,0	700,0	536,0	661,4	1 029,1	1 179,4	1 425,6	1 637,5	1 964,1
OEM & Others Revenues	698,0	777,0	767,0	505,0	631,0	1 293,0	1 313,3	1 335,6	1 360,2	1 387,1	1 412,0
Total Revenues	6 910,0	9 714,0	11 716,0	10 918,0	16 675,0	25 994,3	36 643,4	46 311,5	56 868,7	66 353,1	75 943,7
Total Cost of Revenues	2 847,0	3 892,0	4 545,0	4 150,0	6 279,0	9 707,1	13 831,5	16 926,6	20 269,2	23 097,4	25 865,8
Total Gross Profit	4 063,0	5 822,0	7 171,0	6 768,0	10 396,0	16 287,3	22 811,8	29 384,9	36 599,5	43 255,7	50 077,9
Operating expenses:											
Total R&D	1 463,0	1 797,0	2 376,0	2 829,0	3 924,0	5 246,6	8 897,6	11 981,7	15 174,0	17 704,6	20 263,7
Sales, general and administrative (excluding D&A)	476,0	616,0	729,0	712,0	842,0	999,9	1 557,1	1 967,9	2 416,5	2 819,5	3 227,1
D&A	187,0	199,0	262,0	381,0	1 098,0	1 188,5	1 754,0	2 161,0	2 593,0	2 957,5	3 326,1
Core Result before Taxes	1 937,0	3 210,0	3 804,0	2 846,0	4 532,0	8 852,4	10 603,2	13 274,3	16 415,9	19 774,0	23 261,0
Statutory Taxes	678,2	1 088,7	798,7	597,9	951,8	1 859,2	2 226,9	2 787,9	3 447,8	4 153,0	4 885,4
Tax adjustments (benefit):	-381,0	-716,0	-530,0	-399,0	-724,0	-919,6	-1 060,2	-1 543,9	-1 923,5	-2 294,0	-2 676,1
Foreign tax rate differential	-315,0	-545,0	-412,0	-301,0	-561,0	-709,7	-850,4	-1 064,6	-1 316,5	-1 585,9	-1 865,5
US federal R&D tax credit	-70,0	-181,0	-141,0	-110,0	-173,0	-209,9	-209,9	-479,3	-607,0	-708,2	-810,5
Cash flow hedges, net change in unrealized gain (loss)	4,0	2,0	-5,0	5,0	18,0	0,0	0,0	0,0	0,0	0,0	0,0
Core Result	1 643,8	2 839,3	3 530,3	2 652,1	4 322,2	7 912,7	9 436,5	12 030,2	14 891,7	17 915,0	21 051,6
Non Core Operations:											
Restructuring and other Charges	3,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Interest income	54,0	69,0	136,0	178,0	57,0	318,1	448,5	566,8	696,0	812,1	929,4
Other, net	-25,0	-22,0	14,0	-2,0	4,0	0,0	0,0	0,0	0,0	0,0	0,0
Non-core result before taxes	26,0	47,0	150,0	176,0	61,0	318,1	448,5	566,8	696,0	812,1	929,4
Statutory taxes	9,1	15,9	31,5	37,0	12,8	66,8	94,2	119,0	146,2	170,6	195,2
Tax Adjustments (benefit)	-47,0	-219,0	-533,0	-51,0	-125,0	-195,0	-195,0	-195,0	-195,0	-195,0	-195,0
Available-for-sale debt securities, net change in unrealized gain (loss)	-16,0	-4,0	11,0	8,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Non-core result	47,9	246,1	662,5	198,0	173,2	446,3	549,3	642,7	744,8	836,5	929,2
Financial Operations:											
Interest expense	-58,0	-61,0	-58,0	-52,0	-184,0	-283,1	-431,1	-431,1	-431,1	-431,1	-431,1
Financial Result before taxes	-58,0	-61,0	-58,0	-52,0	-184,0	-283,1	-431,1	-431,1	-431,1	-431,1	-431,1
Statutory taxes	-20,3	-20,7	-12,2	-10,9	-38,6	-59,5	-90,5	-90,5	-90,5	-90,5	-90,5
Tax Adjustments	0	0	0	0	0	0	0	0	0	0	0
Financial Result	-37,7	-40,3	-45,8	-41,1	-145,4	-223,7	-340,5	-340,5	-340,5	-340,5	-340,5
Total Comprehensive Income	1 654,0	3 045,0	4 147,0	2 809,0	4 350,0	8 135,4	9 645,2	12 332,4	15 295,9	18 410,9	21 640,3

Balance Sheet Forecast

*Forecasted values in blue	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022 (E)	FY2023 (F)	FY2024 (F)	FY2025 (F)	FY2026 (F)	FY2027 (F)
Core Business											
Operating Cash*	345,5	485,7	585,8	545,9	833,8	1 299,7	1 832,2	2 315,6	2 843,4	3 317,7	3 797,2
Accounts receivable, net	826,0	1 265,0	1 424,0	1 657,0	2 429,0	4 215,9	5 943,0	7 511,1	9 223,3	10 761,6	12 317,0
Inventories:	794,0	796,0	1 575,0	979,0	1 826,0	2 435,0	3 705,7	4 534,9	5 430,5	6 188,2	6 929,9
Property and equipment, net:	521,0	997,0	1 404,0	1 674,0	2 149,0	2 786,9	5 051,4	6 607,5	8 253,5	9 630,0	11 021,9
Central/HQ related PP&E, gross	513,0	902,0	1 024,0	1 245,0	1 588,0	2 764,1	3 896,4	4 924,4	6 047,0	7 055,5	8 075,3
Operational equipment, gross	678,0	835,0	1 147,0	1 440,0	1 969,0	2 632,6	4 464,7	6 012,2	7 614,1	8 883,9	10 168,0
Accumulated depreciation and amortization	-670,0	-740,0	-767,0	-1 011,0	-1 408,0	-2 136,2	-3 309,6	-4 329,2	-5 407,6	-6 309,5	-7 221,4
Operating lease assets	0,0	0,0	0,0	618,0	707,0	978,6	1 682,8	2 126,8	2 611,6	3 047,1	3 487,6
Intangible assets, net	78,0	37,0	38,0	46,0	231,0	306,3	268,0	338,7	415,9	485,3	555,4
Patents and licensed technology, gross	468,0	469,0	491,0	520,0	706,0	854,7	1 465,7	1 852,5	2 274,7	2 654,1	3 037,7
Accumulated amortization	-390,0	-432,0	-453,0	-474,0	-475,0	-548,4	-1 197,7	-1 513,8	-1 858,8	-2 168,9	-2 482,3
Accounts payable	-485,0	-596,0	-511,0	-687,0	-1 201,0	-2 349,0	-3 347,1	-4 173,7	-4 442,6	-4 429,6	-4 251,9
Accrued and other current liabilities:	-482,0	-517,0	-798,0	-986,0	-1 530,0	-2 050,5	-2 760,7	-3 489,1	-4 284,4	-4 999,0	-5 721,5
Other long-term liabilities:	-136,0	-614,0	-614,0	-746,0	-1 134,0	-1 604,5	-2 035,9	-2 573,0	-3 159,6	-3 686,5	-4 219,4
Cash available for M&A investment							1 799,8	1 959,4	2 619,4	5 019,9	6 190,0
Core Business Invested Capital	1 461,5	1 853,7	3 103,8	3 100,9	4 310,8	6 018,3	12 139,3	15 158,2	19 511,1	25 334,6	30 106,2
Non Core Business:											
Goodwill	618,0	618,0	618,0	618,0	4 193,0	4 302,0	4 302,0	4 302,0	4 302,0	4 302,0	4 302,0
Prepaid expenses and other current assets	118,0	86,0	136,0	157,0	239,0	1 557,0	1 557,0	1 557,0	1 557,0	1 557,0	1 557,0
Other assets	62,0	319,0	108,0	118,0	2 144,0	3 761,0	3 761,0	3 761,0	3 761,0	3 761,0	3 761,0
Deferred tax assets, net	-141,0	-18,0	541,0	519,0	565,0	718,0	718,0	718,0	718,0	718,0	718,0
Other adjustments	-25,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Acquisition related intangibles, net:	26,0	15,0	7,0	3,0	2 506,0	2 230,0	2 230,0	2 230,0	2 230,0	2 230,0	2 230,0
Acquisition related intangibles, gross	193,0	195,0	195,0	195,0	3 280,0	3 396,0	3 396,0	3 396,0	3 396,0	3 396,0	3 396,0
Accumulated amortization	-167,0	-180,0	-188,0	-192,0	-774,0	-1 166,0	-1 166,0	-1 166,0	-1 166,0	-1 166,0	-1 166,0
Non Core Business Invested Capital	658,0	1 020,0	1 410,0	1 415,0	9 647,0	12 568,0	12 568,0	12 568,0	12 568,0	12 568,0	12 568,0
Total Invested Capital	2 119,5	2 873,7	4 513,8	4 515,9	13 957,8	18 586,3	24 707,3	27 726,2	32 079,1	37 902,6	42 674,2
Financial:											
Excess cash	6 452,5	6 622,3	6 836,2	10 351,1	10 727,3	17 998,3	19 593,9	26 194,3	33 466,3	41 266,9	52 076,3
Debt:	-2 810,0	-2 025,0	-2 008,0	-2 663,0	-7 792,0	-11 864,0	-11 864,0	-11 864,0	-11 864,0	-11 864,0	-11 864,0
Net Financial Assets	3 642,5	4 597,3	4 828,2	7 688,1	2 935,3	6 134,3	7 729,9	14 330,3	21 602,3	29 402,9	40 212,3
Total Shareholder's Equity	5 762,0	7 471,0	9 342,0	12 204,0	16 893,0	24 721,0	32 437,2	42 056,5	53 681,4	67 305,5	82 886,5
D/E Ratio (BV)	-63%	-62%	-52%	-63%	-17%	-25%	-24%	-34%	-40%	-44%	-49%
Transactions with shareholders		-1 336,0	-2 276,0	53,0	339,0	-307,4	-1 929,0	-2 713,1	-3 671,0	-4 786,8	-6 059,3
Payout Ratio		44%	55%	-2%	-8%	4%	20%	22%	24%	26%	28%

Appendix 3: Nvidia's Beta Regression Output

Regression

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,4817705
R Square	0,2321028
Adjusted R Square	0,2215836
Standard Error	0,1027266
Observations	75

Estimate beta:

5y of monthly data (most used by practitioners)

Rf: 10y zero coupon Gov bond

Market proxy: S&P500 in USD

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0,232844373	0,232844	22,06481	1,20802E-05
Residual	73	0,770350729	0,010553		
Total	74	1,003195102			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	0,0369404	0,012166917	3,036139	0,003321	0,012691819	0,0611891	0,01269182	0,06118908
X Variable 1	1,3128262	0,279484149	4,697319	1,21E-05	0,7558151	1,8698373	0,7558151	1,86983731
	Raw Beta				95% CI			

Appendix 4: Unlevered Beta Multiples

Beta Multiples approach:

Company	Raw Beta	D/E	Unlevered Beta
AMD	2,064	-0,62%	2,074
Ambarella Inc	1,236	-5,85%	1,296
Synaptics Inc	1,192	1,28%	1,180
Intel Corp	0,650	15,94%	0,577
Broadcom Inc	0,886	13,91%	0,798
Qualcomm Inc	1,331	3,05%	1,299
Xilinx Inc	0,875	-2,72%	0,894
Lattice Semiconductor	1,093	0,81%	1,087
Microchip Technology	1,519	19,87%	1,313
Silicon Laboratories	1,094	-0,29%	1,097
Average	1,194		1,162
Median	1,143		1,138
Nvidia	1,3128	-0,42%	1,317

Appendix 5: Nvidia's Debt Notes

The carrying value of the Notes and the associated interest rates were as follows:

	Expected Remaining Term (years)	Effective Interest Rate	January 31, 2021	January 26, 2020
(In millions)				
2.20% Notes Due 2021	0.6	2.38%	\$ 1,000	\$ 1,000
3.20% Notes Due 2026	5.6	3.31%	1,000	1,000
2.85% Notes Due 2030	9.2	2.93%	1,500	—
3.50% Notes Due 2040	19.2	3.54%	1,000	—
3.50% Notes Due 2050	29.2	3.54%	2,000	—
3.70% Notes Due 2060	39.2	3.73%	500	—
Unamortized debt discount and issuance costs			(37)	(9)
Net carrying amount			6,963	1,991
Less short-term portion			(999)	—
Total long-term portion			\$ 5,964	\$ 1,991

Source: Nvidia's Annual Report FY21

Appendix 6: Nvidia's S&P credit rating

S&P Global Ratings affirms NVIDIA at "A-" (Local Currency LT credit rating); outlook stable

August 25, 2021 [Cbonds](#)

S&P Global Ratings affirmed the "A-" Local Currency LT credit rating of NVIDIA on August 24, 2021. The outlook is stable.

Company – [NVIDIA](#)



Full name NVIDIA Corporation
 Registration country USA
 Industry Semiconductors

Source: <https://cbonds.com/news/1440969/>

Appendix 7: Average Cumulative Default Rates for Information Technology sector

Global Corporate Average Cumulative Default Rates (1981-2020) (%)

Rating	--Time horizon (years)--														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AAA	0.00	0.03	0.13	0.24	0.34	0.45	0.51	0.59	0.64	0.70	0.72	0.75	0.78	0.84	0.90
AA	0.02	0.06	0.11	0.21	0.30	0.41	0.49	0.56	0.63	0.70	0.76	0.82	0.88	0.93	0.99
A	0.05	0.13	0.22	0.33	0.46	0.60	0.76	0.90	1.05	1.20	1.34	1.46	1.59	1.71	1.84
BBB	0.16	0.43	0.75	1.14	1.54	1.94	2.27	2.61	2.93	3.24	3.55	3.80	4.03	4.28	4.54
BB	0.63	1.93	3.46	4.99	6.43	7.75	8.89	9.90	10.82	11.64	12.33	12.99	13.59	14.09	14.65
B	3.34	7.80	11.75	14.89	17.35	19.36	20.99	22.31	23.50	24.62	25.58	26.31	26.99	27.63	28.24
CCC/C	28.30	38.33	43.42	46.36	48.58	49.61	50.75	51.49	52.16	52.76	53.21	53.68	54.23	54.69	54.76
Investment grade	0.09	0.24	0.41	0.63	0.86	1.09	1.30	1.50	1.69	1.88	2.05	2.20	2.35	2.49	2.65
Speculative grade	3.71	7.19	10.18	12.63	14.64	16.30	17.68	18.83	19.86	20.81	21.61	22.29	22.93	23.49	24.04
All rated	1.53	3.00	4.27	5.35	6.25	7.01	7.64	8.18	8.67	9.12	9.50	9.83	10.13	10.41	10.69

Sources: S&P Global Ratings Research and S&P Global Market Intelligence's CreditPro®.

Source: <https://www.maalot.co.il/Publications/TS20210408160139.PDF>

Appendix 8: Nvidia's Valuation Decomposition

Steady state value drivers:	
ROIC	30%
g	4,54%
Cost of Equity (unlevered)	7,80%
Sum of Discounted FCF	309 094,7
Terminal Value	2 657 514,0
Discounted TV	376 804,5
Core Unlevered Business Value	685 899,2
(1) Total Value Unlevered Firm	685 899,2
(2) PV Tax shields	2 491,7
APV (1+2)	688 390,9
Plus: Non-Core Value	12 568,0
Enterprise Value	700 958,9
Check	TRUE
Less: Net Debt & Other claims	-7 729,9
Equity Value	708 688,8
# Shares Outstanding (million)	2 500
Intrinsic Share Price	283,48

Appendix 9: Nvidia with vs without Arm share price difference according to P/S

Nvidia + Arm		Min	Mean	Median	Max	Nvidia
Sales (Forward - FY2023)	38 728,7					
P/S		2,6x	6,5x	6,5x	10,5x	27,1x
# Shares outstanding (million)	2 575,3					
Implicit Share price		39,21	98,45	98,45	157,69	407,30

Nvidia standalone		Min	Mean	Median	Max	Nvidia
Sales (Forward - FY2023)	36 643,4					
P/S		2,6x	6,5x	6,5x	10,5x	27,1x
# Shares outstanding (million)	2 500					
Implicit Share price		38,22	95,96	95,96	153,70	396,98

Share price difference with vs without Arm	2,60%	2,60%	2,60%	2,60%	2,60%
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Appendix 10: Nvidia, Intel, AMD and Xilinx Financial Ratios

Scenario Analysis		
Risk	Scenario Share Price	Downside
<u>Industry related risks</u>		
Innovation	255,30	-10,58%
Competition	255,88	-10,38%
<u>Supply Chain related risks</u>		
Manufacturing	243,92	-14,57%
<u>Operations related risks</u>		
System Security and Cyber-attacks	274,94	-3,70%
Business disruptions	252,23	-11,66%
Customer Concentration	281,78	-1,31%

Appendix 11: Nvidia, Intel, AMD and Xilinx Financial Ratios

Nvidia:

Activity Ratios	FY2017	FY2018	FY2019	FY2020	FY2021
Average Holding Period	101,8	74,7	126,5	86,1	106,1
Average Collection Period	43,6	47,5	44,4	55,4	53,2
Average Payable Period	62,2	55,9	41,0	60,4	69,8
Cash Conversion Cycle	83,2	66,3	129,8	81,1	89,5

Liquidity	FY2017	FY2018	FY2019	FY2020	FY2021
Current Ratio	4,8	8,0	7,9	7,7	4,1
Quick Ratio	4,3	7,3	6,8	7,1	3,6
Cash Ratio	1,0	3,5	0,6	6,1	0,2
NWC	6 748	8 102	9 228	11 906	12 130

Capital Structure	FY2017	FY2018	FY2019	FY2020	FY2021
Gearing Ratio	172%	160%	107%	170%	21%
D/E Ratio (BV)	-63%	-62%	-52%	-63%	-17%
Debt/EBITDA Ratio	-171%	-135%	-119%	-238%	-52%
Net PP&E/Total Assets	5%	9%	11%	10%	7%
Solvency Ratio	142%	198%	237%	239%	142%
Financial Autonomy Ratio	59%	66%	70%	70%	59%

Core Profitability Margins	FY2017	FY2018	FY2019	FY2020	FY2021
Gross Margin	59%	60%	61%	62%	62%
EBITDA Margin	31%	35%	35%	30%	34%
EBIT Margin	28%	33%	32%	26%	27%
Net Profit Margin	24%	29%	30%	24%	26%

Profitability from Investments	FY2017	FY2018	FY2019	FY2020	FY2021
Return on Assets (ROA)	17%	25%	27%	15%	15%
Core Asset Turnover	326%	338%	260%	242%	119%
Return on Invested Capital (ROIC)	80%	107%	93%	63%	32%
Return on Equity (ROE)	30%	42%	45%	24%	27%

AMD:

Activity Ratios	FY2016	FY2017	FY2018	FY2019	FY2020
Average Holding Period	86,1	76,3	79,9	98,4	100,0
Average Collection Period	26,3	31,5	69,6	100,8	77,2
Average Payable Period	50,5	42,2	50,0	99,0	33,5
Cash Conversion Cycle	61,9	65,6	99,6	100,2	143,8

Liquidity Ratios	FY2016	FY2017	FY2018	FY2019	FY2020
Current Ratio	1,9	1,7	1,8	1,9	2,5
Quick Ratio	1,3	1,3	1,4	1,5	2,0
Cash Ratio	0,9	0,8	0,5	0,6	0,7
NWC	1 184	1 121	1 556	2 238	3 726

Capital Structure	FY2016	FY2017	FY2018	FY2019	FY2020
Gearing Ratio	58%	53%	33%	-10%	-21%
D/E Ratio (BV)	139%	115%	50%	-9%	-17%
Debt/EBITDA Ratio	-155%	538%	141%	-40%	-74%
Net PP&E/Total Assets	5%	7%	8%	8%	7%
Solvency Ratio	14%	20%	38%	88%	187%
Financial Autonomy Ratio	13%	17%	28%	47%	65%

Core Profitability Margins	FY2016	FY2017	FY2018	FY2019	FY2020
Gross Margin	26%	37%	40%	46%	48%
EBITDA Margin	-8%	4%	10%	12%	17%
EBIT Margin	-11%	1%	7%	8%	14%
Net Profit Margin	-12%	1%	7%	7%	25%

Profitability from Investments	FY2016	FY2017	FY2018	FY2019	FY2020
Return on Assets (ROA)	-15%	2%	10%	8%	27%
Core Asset Turnover	434%	411%	341%	261%	203%
Return on Invested Capital (ROIC)	-40%	5%	22%	16%	50%
Return on Equity (ROE)	-70%	24%	41%	18%	40%

Intel:

Activity Ratios	FY2016	FY2017	FY2018	FY2019	FY2020
Average Holding Period	131,9	164,1	146,9	168,0	138,6
Average Collection Period	28,8	32,6	34,6	38,8	31,8
Average Payable Period	58,8	68,8	77,4	79,3	91,8
Cash Conversion Cycle	101,9	127,9	104,1	127,5	78,6

Liquidity Ratios	FY2016	FY2017	FY2018	FY2019	FY2020
Current Ratio	1,7	1,7	1,7	1,4	1,9
Quick Ratio	1,5	1,3	1,3	1,0	1,6
Cash Ratio	0,3	0,2	0,2	0,2	0,2
NWC	15 206	12 079	12 161	8 929	22 495

Capital Structure	FY2016	FY2017	FY2018	FY2019	FY2020
Gearing Ratio	24%	27%	25%	26%	28%
D/E Ratio (BV)	31%	37%	33%	35%	40%
Debt/EBITDA Ratio	89%	96%	76%	83%	89%
Net PP&E/Total Assets	32%	33%	38%	41%	37%
Solvency Ratio	143%	129%	141%	132%	112%
Financial Autonomy Ratio	58%	56%	58%	57%	53%

Core Profitability Margins	FY2016	FY2017	FY2018	FY2019	FY2020
Gross Margin	74%	75%	75%	74%	71%
EBITDA Margin	39%	43%	46%	46%	46%
EBIT Margin	26%	30%	33%	31%	31%
Net Profit Margin	19%	15%	30%	27%	27%

Profitability from Investments	FY2016	FY2017	FY2018	FY2019	FY2020
Return on Assets (ROA)	10%	8%	16%	14%	14%
Core Asset Turnover	69%	66%	72%	69%	69%
Return on Invested Capital (ROIC)	12%	11%	21%	20%	19%
Return on Equity (ROE)	17%	16%	28%	27%	27%

Xilinx:

Activity Ratios	FY2017	FY2018	FY2019	FY2020	FY2021
Average Holding Period	129,4	126,6	130,0	116,9	130,2
Average Collection Period	37,8	56,6	40,0	31,5	33,1
Average Payable Period	61,7	53,1	48,4	39,2	48,6
Cash Conversion Cycle	105,5	130,0	121,6	109,2	114,7

Liquidity Ratios	FY2017	FY2018	FY2019	FY2020	FY2021
Current Ratio	4,3	4,6	8,2	2,7	6,0
Quick Ratio	4,1	4,3	7,5	2,4	5,5
Cash Ratio	1,1	2,4	3,3	1,6	2,3
NWC	2 983	3 243	3 417	1 823	3 122

Capital Structure	FY2017	FY2018	FY2019	FY2020	FY2021
Gearing Ratio	-232%	-215%	-167%	-53%	-91%
D/E Ratio (BV)	-70%	-68%	-62%	-35%	-48%
Debt/EBITDA Ratio	-272%	-244%	-201%	-110%	-215%
Net PP&E/Total Assets	6%	6%	6%	8%	6%
Solvency Ratio	112%	87%	125%	97%	110%
Financial Autonomy Ratio	53%	47%	56%	49%	52%

Core Profitability Margins	FY2017	FY2018	FY2019	FY2020	FY2021
Gross Margin	73%	72%	71%	70%	72%
EBITDA Margin	33%	32%	34%	29%	28%
EBIT Margin	30%	29%	31%	26%	24%
Net Profit Margin	27%	29%	29%	24%	22%

Profitability from Investments	FY2017	FY2018	FY2019	FY2020	FY2021
Return on Assets (ROA)	13%	14%	17%	16%	12%
Core Asset Turnover	312%	329%	285%	209%	209%
Return on Invested Capital (ROIC)	103%	367%	336%	141%	175%
Return on Equity (ROE)	25%	19%	31%	34%	24%

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Report Recommendations

Buy	Expected total return (including expected capital gains and expected dividend yield) of more than 10% over a 12-month period.
Hold	Expected total return (including expected capital gains and expected dividend yield) between 0% and 10% over a 12-month period.
Sell	Expected negative total return (including expected capital gains and expected dividend yield) over a 12-month period.

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NVIDIA CORPORATION

SEMICONDUCTOR

STUDENTS: GONÇALO MOITEIRO | TOMÁS BORGES

COMPANY REPORT

17 DECEMBER 2021

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Nvidia: powering the next era of computing

Strong outlook but expensive price limits upside for FY2023

- Our APV valuation indicates a FY23 price target of **\$285,52 per share**, resulting in a HOLD recommendation and an upside potential of 1,39% from the market close share price of \$281,61 as of December 13, 2021.
- Nvidia's acquisition of Arm to SoftBank is pending approval.** Regulators with concerns over Nvidia creating barriers for their rivals to access key technology, but also due to national security concerns from the UK. FTC sued to block the acquisition.
- Fast-growing Gaming population and increasing popularity** over Nvidia's cloud-based gaming platform, e-sports, streaming and RTX improvements. **Facebook's Metaverse presents opportunities in Professional Visualization** through Nvidia's Omniverse platform developments.
- Strong sustainable demand from corporations for Data Center** applications such as AI, machine and deep learning, and data analytics. **\$8B design win pipeline expected until FY2028 in Automotive**, with over 370 partners on Nvidia DRIVE, and transition from Infotainment to AVs. **New CMP product offering for the OEM & Others segment**, directed at cryptominers, as an attempt to shift abnormal demand from gaming GPUs to CMPs.
- Solid Gross Margins during semiconductor shortage due to increasing ASPs**, however the continuation of a chip shortage could imply an accumulation of unmet demand and loss of potential revenues.

Company description

Nvidia is an American company operating in the semiconductor industry, specialized in the design and manufacturing of graphics processor units (GPUs), as well as system on a chip units (SoCs). Currently, Nvidia operates worldwide in four market segments: Gaming, Professional Visualization, Data Center and Automotive. Most recognizable product lines include the GPU GeForce series, Nvidia RTX / Quadro, DGX systems, and A series DC GPUs.

Recommendation: **HOLD**

Price Target FY23*: **285,52 \$**

*Nvidia's FY23 goes from January 2022 to January 2023

Price (as of 13-Dec-21) **281,61 \$**

Reuters: NVDA.O, Bloomberg: NVDA:US

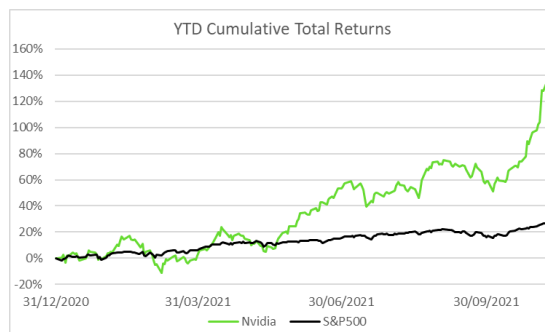
52-week range (\$) 115,67 - 346,47

Market Cap (\$m) 704.025

Outstanding Shares (m) 2500

Beta 1,31

Source: Bloomberg, Analysts Estimates



Source: Bloomberg

(Values in \$ millions)	FY2021	FY2022E	FY2023F
Revenues	16.675	25.994	36.643
Revenue Growth (%)	53%	56%	41%
EBITDA	5.630	10.040	12.357
EBITDA Margin (%)	34%	39%	34%
Net Profit	4.332	8.135	9.645
Net Profit Margin	26%	31%	26%
EPS	1,73	3,25	3,86
P/E	75x	87x	74x
ROE	27%	35%	32%
ROIC	32%	45%	40%

Source: Company Data, Analysts Estimates

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Company Overview

Brief History

Nvidia was founded in 1993 by current CEO Jensen Huang, Chris Malachowsky and Curtis Priem, three American electrical engineers, with the purpose of making microprocessors that would enhance full-motion video and generate better graphics for video games in PCs, a tool the founders believed to soon become a consumer device for enjoying games and multimedia.

Just 2 years after its foundation, Nvidia launched its first ever product, the NV1, a multimedia accelerator capable of handling both 2D and 3D video, together with audio processing hardware. By 1997, Nvidia became a major force in the PC gaming industry, with the launch of the RIVA series of video cards.

In 1999 Nvidia launched the industry's first GPU¹, the GeForce256, paving the way to an unprecedented growth of the PC gaming market. The GPU redefined modern computer graphics, and revolutionized parallel computing, offering superior 3D graphics quality. As one of the fastest growing companies, it would enter the S&P500 by 2001. More recently, GPU deep learning ignited modern Artificial Intelligence with the GPU acting as the brain of computers, robots, and self-driving cars that can perceive and understand the world.

Nowadays, located in offices across 28 countries, with its HQ in Santa Clara, California, Nvidia presents itself as a global leader in the high-end GPU market, not only dedicated to PC graphics, but also focusing on opportunities arising from digital transformation, such as AI, data science, deep learning, Augmented reality (AR) and Virtual Reality (VR), and autonomous driving. Nvidia takes advantage of its platform strategy, a combination of both hardware and software tools, to enhance and optimize its GPU's performance, a key element in its value proposition.

Innovation through research & development is crucial for the business model of the company, having invested over \$24B in this department since inception, far more than its closest GPU competitor, AMD. This enables Nvidia to adapt to new market trends, while also providing new and superior products, a key factor for the company's success.

Segments and Products

Nvidia specializes and addresses its computing platforms towards four main market segments: Gaming, Professional Visualization, Data Center, and Automotive. Additionally, the company also includes the OEM & Others as additional segment in its financial reports.

Gaming:

Exhibit 1: Nvidia's History timeline

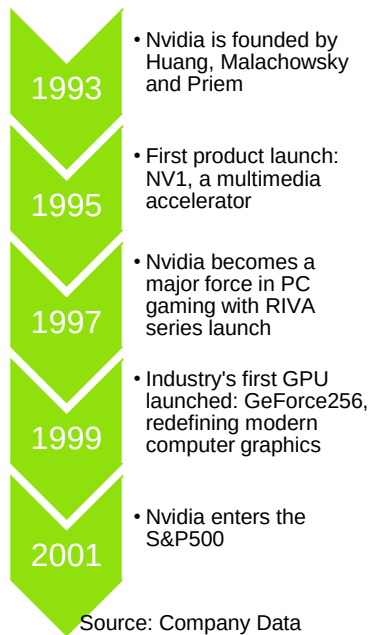
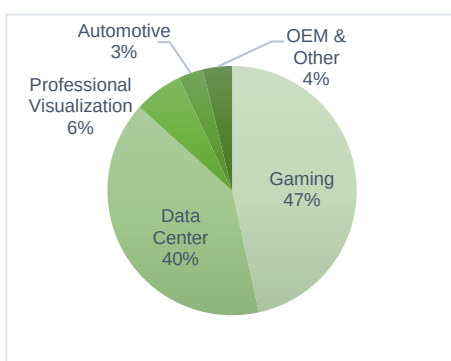
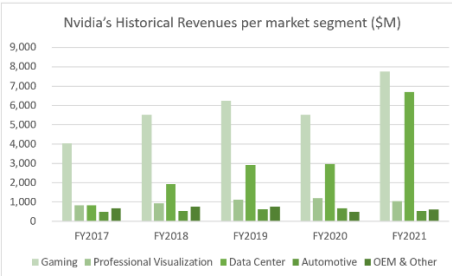


Exhibit 2: Nvidia's FY21 Revenue weight per market segment



Source: Company data

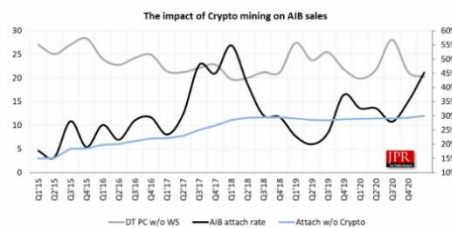
¹ Graphics Processing Unit

Exhibit 3

Source: Company Data

Exhibit 4: Nvidia GPU Architecture timeline

Source: Company Data

Exhibit 5:

The difference between DT PC w/o WS and AIB attach rate, represents the buying of GPUs by crypto miners.

*AIBs refer exclusively to graphics add-in boards which is the same as finished GPUs

Currently accounts for 46,5% of the company's total revenues (Exhibit 2), growing at a CAGR of 17,6% from 2017 to 2021 (Exhibit 3). The emergence of new gaming platforms, the popularity of eSports and changing demographics, together with the Covid-19 lockdowns, have all contributed to the growth of computer gaming, making it the largest entertainment industry. Nvidia serves this segment by providing GPUs that deliver the ultimate gaming experience for gamers with smoother and higher-quality graphics, together with a gaming application that optimizes the PC user's settings. Products offered include GeForce RTX and GTX GPUs for PC gaming, SHIELD devices for gaming and streaming and GeForce NOW for cloud gaming.

Nvidia's technological breakthroughs on GPU architectures have consistently been leading to improvements in processing power, allowing the company to continue excelling in the medium/high-end range. There is speculation on the next architecture line (Ada) using 5nm in its manufacturing process, versus the current 7nm and 8nm implemented architecture line (Ampere), which could imply up to 70% performance gain. While most information on this new architecture is still not made official by Nvidia, and it is not certain the release date will happen during 2022, it would result in a huge competitive advantage over its peers such as AMD, which uses a 7nm Navi architecture.

A great potential in this segment is cloud-based gaming, a type of online gaming that runs video games on remote servers and streams them directly to a user's device. This implies gamers no longer require a high-powered, expensive gaming PC to run games which, on one hand, could threaten Nvidia's retail physical GPU sales. On the other hand, this can increase the demand for Nvidia GPUs in data centers and server farms running the games, as well as allowing Nvidia to reach new consumers via its own cloud-based gaming platform. Currently Nvidia's 1 year old cloud-based gaming platform (GeForce NOW) is showing potential, with already more than 12 million users.

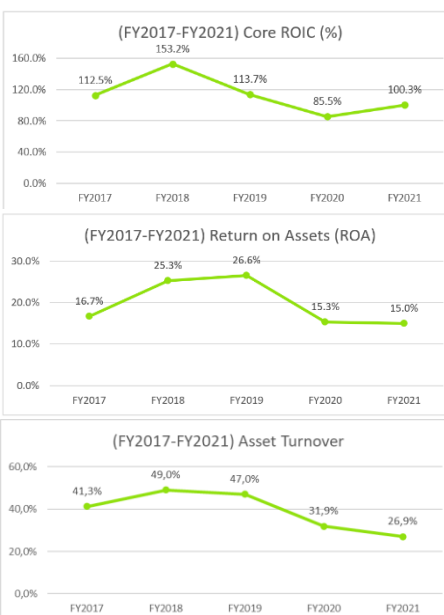
A relevant portion of the demand from this market currently comes from crypto miners (Exhibit 5). In the past years the portion of sales of gaming GPUs sold to crypto miners have been increasing, mostly fluctuating based on the performance of the cryptocurrency market (the crypto crash of 2018 put a stop to this trend until mid-2019), and now new highs of crypto prices are already being reflected in strong purchases of GPUs by cryptominers with 25% of GPUs sold in Q1 & Q2 of 2021 going to crypto². To avoid Gaming GPUs being absorbed by crypto miners and potential shortages for the core gamer customer base, Nvidia implemented a new strategy of limiting hash rates³ of its newest gaming GPUs (making them inefficient for cryptocurrency mining) and introducing a new line of CMPs⁴ exclusive for cryptocurrency miners.

² Source: <https://www.jonpeddie.com/blog/crypto-minings-half-a-billion-dollar-impact-on-aib-sales>

³ Hash rate is a measure of the computational power per second used when mining (the higher the hash rate level the more efficient mining is)

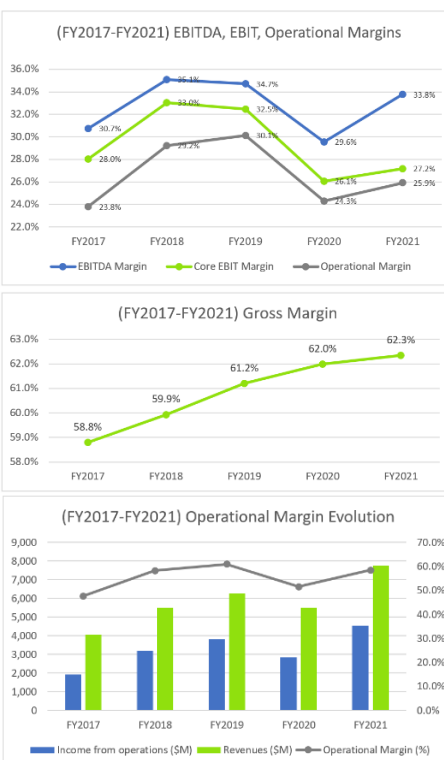
⁴ CMPs (Cryptocurrency Mining Processors) function similarly to GPUs and are designed and optimised for mining cryptocurrency

Exhibit 6: Nvidia's Profitability on Investments



Source: Analysts Estimates

Exhibit 7: Nvidia's Core Profitability Margins



Source: Analysts Estimates

Professional Visualization (PV):

With a representation of just 6,3% of the company's total revenues (Exhibit 2), growing at a meagre CAGR of 6% from 2017 to 2021 (Exhibit 3), the PV market segment consists mostly of partnerships with independent software vendors to optimize software offerings for Nvidia GPUs, aiming to enhance productivity and introduce new capabilities for critical parts of the workflow for industries such as automotive, media & entertainment, architectural engineering, oil & gas, and medical imaging.

With the main users of this segments' products being designers who build products that aim to mirror reality, professional visualization relies on the demand for the creation of professional graphics, advanced rendering, video processing, material design, 3D printing and virtual reality applications.

Currently, a great strength in this segment is the fact Nvidia is providing graphics for more than 90% of workstations, which are high-performance computers (HPC) set to run complex tasks. Products offered include DesignWorks (software), Nvidia RTX, Nvidia Omniverse (a platform oriented for rendering hyper-realistic objects and environments which is used by giants such as Pixar and Adobe), and Quadro (a GPU line dedicated for workstations able to perform heavy-load designer tasks).

Data Center:

Data Center is Nvidia's most promising and highest growth market segment, with a staggering CAGR of 68,5% in the past 5 years (Exhibit 2). Data Center currently weights 40,2% of the company's total revenues, the second highest, behind Gaming (Exhibit 3). Recent revenue growth can be attributed to the effect of the Mellanox acquisition in FY2021 and the ramp up of the Nvidia GPU Ampere architecture.

Nvidia provides data centers the ability, through its computing platform, to accelerate deep learning, machine learning and perform high-performance computing, while prioritizing energy efficiency. This platform consists not only of hardware but also software and service tools like libraries, development kits, CUDA programming model and APIs frameworks, which complement and enhance GPU performance.

Nvidia's customer base for this market segment includes large data cloud providers such as Google Cloud, Azure, AWS and Alibaba. (Exhibit 8). Products in this segment include "Ampere" architecture GPUs (using the same architecture as gaming GPUs but made for heavier workloads and, as such, bet in the most recent generations of RT and Tensor Cores⁵), DGX (line of workstations and servers able to run heavy and complex machine learning and deep learning workloads on GPUs), Nvidia HGX A100 (Accelerated

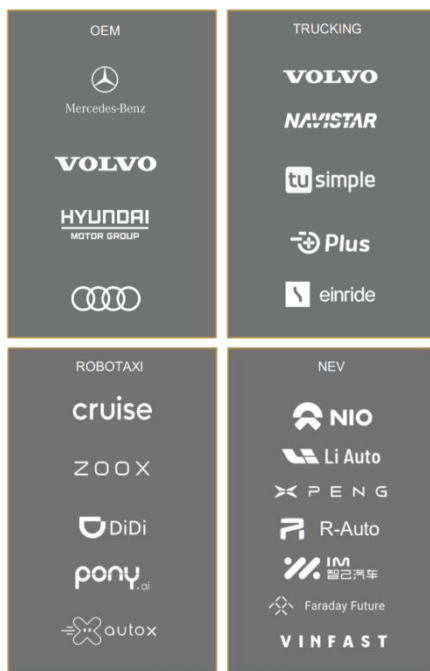
⁵ According to Nvidia RT Cores are accelerator units that are dedicated to performing ray-tracing operations with extraordinary efficiency. Tensor cores are processing units that accelerate the process of matrix multiplication (matrix multiplication is essential for graphics).

Exhibit 8: Nvidia's Data Center customer base



Source: Nvidia Investors Presentation

Exhibit 9: Nvidia's Automotive Partners



Source: Nvidia Investors Presentation

Computing Platform), Nvidia EGX (Cloud Platform), NGC (Hub of GPU accelerated software), Nvidia vGPU software.

Automotive:

This segment currently generates a humble 3,2% of total revenues (Exhibit 2), with a 5-year CAGR of 2,4% (Exhibit 3). Today, Automotive is largely a legacy infotainment business. However, the focus has been shifting towards AI cockpit and Autonomous Vehicles (AV). The company has been signing multiple partnerships with automakers, truck makers, suppliers, startups, etc. to develop AI systems for self-driving vehicles. Most noticeable names include Volvo, Mercedes-Benz, and Toyota (Exhibit 9). Nvidia has a design win pipeline for this segment of over \$8B for the next six years, and the firm expects it to ramp up in FY2023, reflecting the development of AV solutions.

Products in this segment include Nvidia DRIVE collection (AGX Pegasus, AGX Xavier, Atlan, Hyperion) which contains hardware offers able to process data from cameras, radars, and sensors, to perceive environments, locate a car on a map, plan and execute a safe path, and software products (Drive OS, DriveWorks, Drive AV, Drive IX).

OEM & Others:

A segment that includes all products outside the Gaming, Data Center, Professional Visualization, and Automotive segments, generates 3,8% of total revenues (Exhibit 2), with a 5-year CAGR of -2,5% (Exhibit 3).

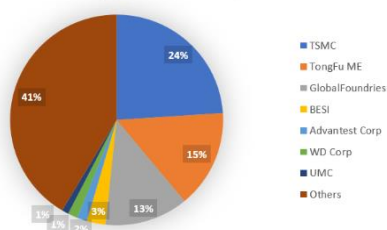
OEMs are products identical to GPUs, but they are designed for selling to equipment manufacturer: buyers of OEMs are computer builders (such as Dell or Lenovo) who sell operational computers to customers in versions. OEMs are unfinished products (in the sense they often lack accessories, boxes, or other features) and not suitable to sell directly to final customers. This product has been the core of the OEM & Others segment, but over the years Nvidia has been divesting on the OEM business leading to the segment's decrease in revenue.

A new product line in this segment that offers new opportunities for revenue growth are CMPs. Designed to meet cryptominers' needs and intended to segment them away from Gaming products, which are seen as substitutes for mining cryptocurrencies.

Supply chain analysis and Semiconductor shortage

Covid-19 triggered supply chain capacity issues, distribution difficulties, and an unexpected demand spike for Nvidia's products. The start of the pandemic originated a semiconductor shortage which had a strong impact in the supply chain and output levels, since these chips are vital in the production of products such as GPUs and SoCs⁶.

⁶ SoC or System-on-a-chip refers to a chip that integrates all (or most) components of a computer or electronic system, including CPU, memory, input/output ports.

Exhibit 10:**Main Suppliers (%Cost) FY2021**

Source: Bloomberg Data

Nvidia has a considerable supplier dependency, as most of its semiconductors are outsourced to third-party foundries (Exhibit 10). These foundries acquire raw material such as wafers, silicon, copper, etc. and manufacture the semiconductors, or chips, which are then shipped to Nvidia's independent subcontractors (OSAT⁷) who assemble, test, and package Nvidia's products⁸. Finally, the product is either sold to third party retailers, which serve the final customers (e.g., case of gaming GPUs), or directly to end customers, in the case of large volume products through partnerships, mostly for Data Center or Automotive products for companies (Exhibit 11).

Nvidia used to allow customers to buy products directly from them, but it was an inefficient process and, as an alternative, it opted for strong partnerships with trustful retailers.

Therefore, Nvidia's production capacity of GPUs and other products ends up relying on foundry's production and is subject to supply disturbances. As of 2021, most foundries are located in Eastern Asia, which holds 75% of the global semiconductor manufacturing capacity, mainly in Taiwan, and then followed by China, South Korea and Japan. In terms of demand, the early 2020 lockdowns affected many companies relying on semiconductors, such as automakers, which were forced to suddenly decrease production due to shortages (also motivated by a sharp drop in demand on the buy-side). Nevertheless, the exponential rise of people working from home and sudden increase in indoor entertainment users led to a demand spike for hardware and IT products, consequently increasing the demand for semiconductors. With quarantine affecting production capacity (through semiconductor factory shutdowns) and distribution (case of large restrictions in the ports of Shanghai and Shenzhen, delaying Chinese supply), the semiconductor shortage kept worsening almost in a low supply-high demand loop. Naturally, semiconductor prices also increased (Exhibit 12).

Raw material shortages have also become a frequent occurrence. Wafers were the first raw material to vastly become unavailable to foundries, as the US-China 2019 trade war, growth in 5G and automotive demand hardened access to silicon and reactor tubes, weakening wafer supply to the point it maxed out its production capacity by late 2020. Aluminium hit a record high of \$3.200 per ton in October (2021) and copper has consistently risen in price up to \$10.000 per ton that same year. To further worsen the impacts of the shortage, Nvidia seems to have misaligned its forecasted demand with actual demand, with GPU models such as the recently released RTX 3070TI and RTX 3080TI being sold out on launch day at most US retailers, mostly due to highly under-priced MSRP (manufacturer's suggested retail price), later forcing retailers to increase their prices above the MSRP (2-3x above) to match the high demand (Exhibit 13).

⁷ OSAT: Outsourced Semiconductor Assembly and Test

⁸ Source: <https://cset.georgetown.edu/wp-content/uploads/The-Semiconductor-Supply-Chain-Issue-Brief.pdf>

Lastly, with piled up orders by manufacturers and lengthy waiting times for chips, reaching as long as 6 months (reported by Ford in Autumn 2021), there are new unexpected disruptions that could worsen this: In November, the Yantian port in China closed due to Covid-19 (this port consists of nearly 90% of world's electronic pathway), and political tensions are getting worse, with risks of an armed conflict between China and Taiwan, which could render the access to the semiconductor industry by Europe and US virtually impossible. Although a Taiwan-China war has a very low likelihood, for both economic and geopolitical reasons, tensions between the two could damage Nvidia's supply chain. We expect the shortage to end in Nvidia's FY2024, mainly due to new Intel, Samsung, and TSMC production facilities undergoing construction, which are expected to be completed in FY2023 and FY2024, together with potential new chip architectures under 7nm, which should allow for more production capacity and efficiency. As foundries catch up with delayed orders and the panic hoarding of inventories eases, demand slowdown pressures could also facilitate the end of the on-going shortage.

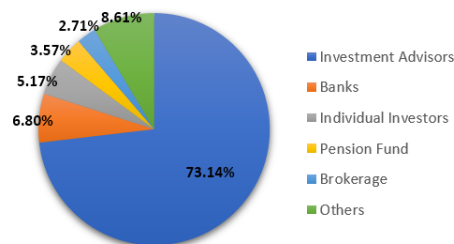
Shareholder Structure and Corporate Governance

Nvidia's management team is composed by 2 founders, Jensen Huang, CEO, and Chris Malachowsky, and 4 company officers: Colette Kress, Jay Puri, Debora Shoquist and Tim Teter. The Board, on the other hand, is composed by 12 independent directors and Jensen Huang, articulated in three different independent committees: the Audit, the Nominating & Corporate Governance, and the Compensation committees. This organization represents shareholders and serves their best interests by overseeing management performance and corporate practices. Mark Perry currently leads the board as elected Lead Independent Director.

Looking at the shareholder's structure in Exhibits 14 and 15, the fact that a very high portion of the company's shares are owned by a specific group, investment advisors (or institutional investors) can have its risks and downsides. Firstly, such influence can be leveraged to pressure the Board's decisions in the investors best interest, many times incompatible with the firm's or others shareholder's interest. Secondly, the high concentration of shares ownership, 73,1%, by institutional investors can dramatically impact the stock's performance, both positive and negatively, as these investment decisions are usually made upon analysts' reports which, more often than not, have similar views on the companies they analyse for possible investments. A quick shift in sentiment by these institutions can create a large domino effect and generate volatility around the stock's price. Lastly, regarding insider investors, one could argue that too much insider ownership may indicate concentration of power and that it should also be worth noticing if these investors are selling their shares, which can trigger negative signals to capital markets about the firm. We believe Nvidia's current independent Board

Exhibit 14:

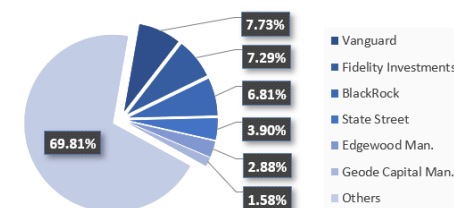
Shareholder's Structure



Source: Bloomberg Data

Exhibit 15:

Main Investment Advisors



Source: Bloomberg Data

Exhibit 16: VRIN analysis of Nvidia's resources & capabilities

Resources and capabilities	V	R	I	N-S	Sustainable Competitive Advantage
Ability to raise capital	X				No
Adaptability to new markets	X	X			No
Quality of product offering	X		X		No
Financial strength	X			X	No
Investment in R&D	X			X	No
Distribution channels	X			X	No
Brand image	X		X	X	Can lead to
Corporate leadership & vision	X		X	X	Can lead to
Propensity for innovation	X		X	X	Can lead to
Tech advancement and integration	X	X	X	X	Yes
Customer experience / value proposition	X	X	X	X	Yes

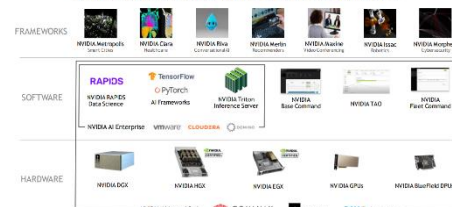
Source: Analysts' authorship

Exhibit 17: Nvidia's AI for enterprise solutions 2020 and 2021 evolution

AT THE START OF 2020...



NVIDIA AI IS NOW READY FOR EVERY ENTERPRISE



Source: Nvidia Investors Presentation

structure and committees, together with its governance policies and bylaws, are an effective way of mitigating the aforementioned capital structure related risks.

VRIN Analysis

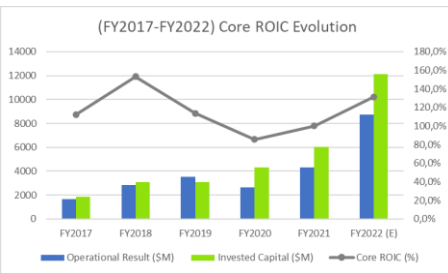
Nvidia's competitive advantage, and respective sustainability, was assessed with resort to the VRIN (or VRIO) framework, a tool used to evaluate a firm's resources and capabilities. This is crucial for the valuation part, as it helps us understand and formulate a vision on the company's long-term performance, both compared to its industry peers, but also against the economy. VRIN evaluates a firm's resources and capabilities in 4 dimensions: value, rareness, inimitability, and non-substitutability. A total of 11 resources and capabilities were evaluated using this framework (Exhibit 16), which led us to conclude both customer experience/value proposition and technological advancement/integration are sources of sustainable competitive advantage for Nvidia.

Firstly, Nvidia's customer experience, which is a key element of the firm's value proposition, can be exemplified by the quality of support and services provided to their customers. GPU driver update offers are released almost weekly to provide the best possible performance to the consumer, even for holders of older generation GPUs. Nvidia's value proposition, which is laid on its platform strategy⁹, is what enables the firm to charge a premium price, but also a crucial source of competitive advantage, which is reflected in its market share (Exhibit 23), something we took into consideration in our forecasting assumptions.

Secondly, as for Nvidia's technological advancement and integration, the other source of sustainable competitive advantage, one can demonstrate this by showcasing the firm's ability to pursue a range of different opportunities and segments (from graphics cards for gaming to data center, automotive and AI), predicting technological trends, preferences and needs for the future, and making use of its robust R&D strategy to develop offerings that meet these new trends and demands. However, the constant rate of innovation and technological integration of Nvidia comes at a cost, reflected in the firm's R&D expenses, something we consider a key value driver for any firm in this sector. Nvidia's R&D expenses were, therefore, forecasted accordingly. A practical example of this capability is seen in Nvidia's ability to scale and use AI, more specifically on how, in roughly one year, the firm was able to significantly increase its framework, software and hardware AI solutions applied to enterprises (Exhibit 17).

Other resources like brand image, corporate leadership and vision, and Nvidia's propensity for innovation can be sources of competitive advantage in the future if the company continues to further differentiate itself from its peers. The identified sources of sustainable competitive advantage led us to believe Nvidia's ROIC may be higher than

⁹ Platform strategy is considered the offer of an expanded level of services and enhanced performance by providing both hardware and software

Exhibit 18:

Source: Analysts estimates

its peers, with the ability of sustaining a higher ROIC than average in the steady state. Nvidia's FY21 Core ROIC stands at 100% and is expected to be 142% in FY22 (Exhibit 18). As for the steady state, based on the sustainable competitive advantages identified, we assumed a 40% long-term ROIC. The topic of ROIC will be more thoroughly discussed below.

Industry Overview

Porter's Five Forces Analysis

To analyze the semiconductor's industry profitability, and understand the main sources of competition and attractiveness, we conducted a Porter's Five Forces Analysis.

Threat of New Market Entrants: Low

This industry presents strong barriers to entry which make the threat of new entrants low. Firstly, a large amount of CAPEX is required to operate in this industry (except for fabless manufacturing such as Nvidia), not to mention the high R&D investments required and difficulty in obtaining economies of scale due to constant evolving technology. Other factors include product differentiation (even in products serving the same end), strong patents, licensing, and regulation.

Supplier Power: Medium

There are many suppliers in this industry. Despite a large share of TSMC (Taiwan Semiconductor Manufacturing Company) supplying the incumbents of the GPU industry, the products offered by suppliers are mostly standardized (low differentiation and low switching costs). It is unlikely suppliers could forward integrate. In the case of Nvidia, they are a strong customer, therefore making the bargaining power of suppliers lower and forcing them to compete in prices. Nevertheless, the recent semiconductor shortage is causing GPU manufacturers inability to produce as much as required to meet their demand, and the growing urgency for semiconductors is providing their suppliers with much more bargaining power than in pre-shortage times.

Buyer Power: Medium/High

Most buyers in this industry are retailers who will then sell the products to final customers, except in the case of software and products for companies, which are final customers. Overall, there is some differentiation in this industry: while most buyers can interchange between GPUs from different companies, there are often unique architectures and exclusive features that differentiate brands, e.g. the case of Nvidia GPUs with RTX providing exclusive access to DLSS 2.0 in videogames, unobtainable from other GPU brands. An important buyer power factor is price pressure from final consumers (households who have limited buying power to allocate in entertainment) as they aim to buy the best offerings available by paying the minimum possible price. Another factor that increases buyer power is the concentration of large portions of revenues in few

Exhibit 19.a: Porter's Five Forces' Impact on Valuation

Threat of New Market Entrants:	
Profitability	↑
- ARPU	↑ (Few incumbents)
- Gross margins	↑ (Economies of Scale)
- Market Share	↑ (Barriers to Entry)

Supplier Power:	
Profitability	→
- Switching Costs	↓ (Standardized Supplies)
- Cost of Sales	↑ (temporary supply shortage)

Buyer Power:	
Profitability	↓
- ARPU	↓ (price sensitivity)
- Market Share	↓ (Large Buyers lead to competitive action)
- Operating Expenses	↑ (Differentiation through R&D)

buyers. Even leaders such as Nvidia and AMD have at least 1 buyer who is responsible for more than 8% of revenues. Therefore, price pressures, order cancellations or main customers switching to competitors could pose a serious threat. Regarding potential backwards integration, it is highly unlikely. Nvidia's investment in innovation and differentiation will be a relevant factor to tackle buyer power threats.

Threat of Substitutes:

- Profitability ↑
- Penetration Rate ↑

Threat of Substitutes: Low

There are no substitutes to products such as GPUs. While a CPU can replace a GPU in theory, it is extremely limited and, in the modern day, GPUs are necessarily required to perform certain computational tasks (Exhibit 20). Nevertheless, we should not exclude the risk of emerging new technologies that could jeopardize GPUs and be protected by patents.

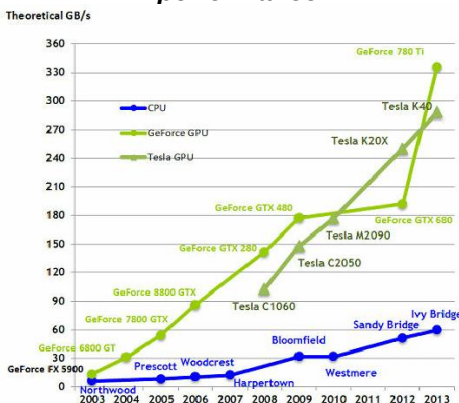
Competitive Rivalry:

- Profitability ↓
- Market Share ↓ (Higher Competitive Action Likelihood)
- Operating Expenses ↑ (Innovation driven rivalry)

Competitive Rivalry: Medium/High

There are few competitors in the industry Nvidia operates in, with most of them being large companies. The companies involved in this industry have historically competed to gain market share, but the fact this industry is growing at a fast pace means competitors are less likely to engage into competitive actions to take established market share from each other, instead focusing more in aggressively capturing the new portions of the market and expand to different segments. The somewhat differentiated products within the companies also make firms less prone to competitive actions. High fixed costs, such as the case of the factories, which are extremely expensive to build due to state-of-the-art technology, and short lifespan of equipment increases rivalry. Although companies like Nvidia outsource most operations but design and software development, the very specialized manufacturers they outsource to have capital-intensive production lines (in very specialized factories), and often forces GPU companies like Nvidia to increase capacity by large steps. Furthermore, events such as overproduction could force companies to take competitive action to adjust their supply-demand, as unsold products can quickly lose their attractiveness to more recently released models. Lastly, the vast exit barriers within this industry due to high amounts of "inadaptable" required capital and R&D and fixed costs, as well as exit legal implications, make competition fiercer.

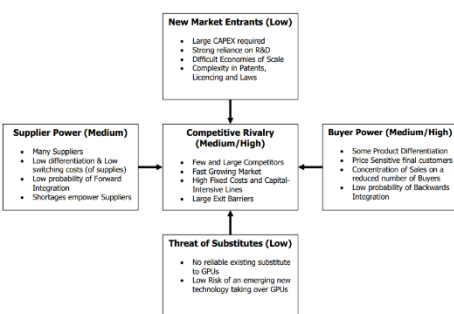
Exhibit 20: CPU vs GPU performance



Source: Ragel and Elkaduwe

https://www.researchgate.net/publication/270222593_To_Use_or_Not_to_Use_Graphics_Processing_Units_for_Pattern_Matching_Algorithms

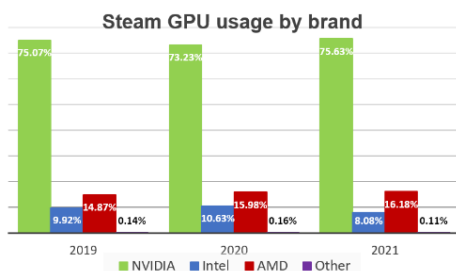
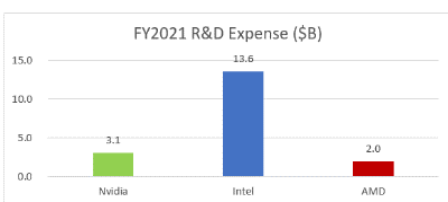
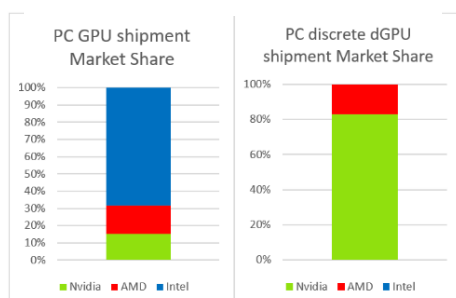
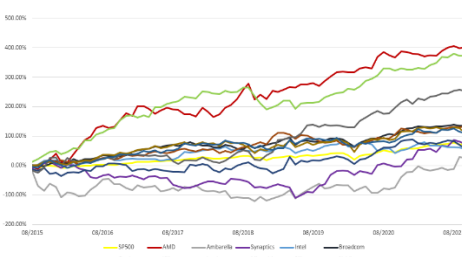
Exhibit 19.b: Porter's Five Forces' Diagram



Source: Analysts' authorship

Conclusion

Overall, the forces in this industry tend to be strong, which proves challenging for Nvidia to sustain greater levels of profitability. Nvidia must remain updated in technological innovation and be able to maintain consistent quality and competitive prices, otherwise a competitor who brings new products, with better affordability, better performance or additional features could undermine Nvidia and conquer market share. We believe Nvidia's best chance of maintaining its current competitiveness and profitability levels within this sector are by keeping their current platform strategy, a crucial piece for its value proposition, and continuing to innovate and exploring different markets. The

Exhibit 21:**Exhibit 22:****Exhibit 23:****Exhibit 24:****Exhibit 25.a: 2015-2021 Cumulative returns Nvidia and**

valuation impact of the forces was considered in our forecasts, especially in the Value Drivers and Forecasts assumptions, for which Market Share, Penetration Rate, and ARPU mostly reflect the impact of the forces, naturally other elements such as Operating Expenses (case of R&D) and Cost of Sales also consider P5Fs in their forecasts.

Main Competitors

Regarding Nvidia's GPU related products, from standalone discrete GPUs to solutions such as Accelerated Computing workstations, servers and platforms, the main competitor is AMD, followed by Intel and Xilinx. Main competition can be found in AMD's solid low to mid-range GPUs, which have been their main strength in the past years. It is extremely relevant to follow how these companies compete in capturing the increasing demand for gaming and data center services. Intel GPU offers are currently poor compared to Nvidia and AMD. Intel GPUs continue their trend of losing relevance in gaming (Exhibit 21) and even new offers of discrete GPUs for data center services, mobile products, and laptops offer little competition to Nvidia's GPUs. A potential risk, however, is Intel's upcoming higher-end GPU Intel Alchemist which, according to specialists, could pose a threat to Nvidia's discrete GPUs and, if successful, can be the start of a series of products that will compete with Nvidia in the high-end range. Intel's R&D expenses in the past year have been close to four times larger than Nvidia (Exhibit 22), a factor explained by Intel's larger size and maturity stage in the industry, as well as its much broader product offering.

Regarding Nvidia's SoC related products, as well as other semiconductor offers, including those used for Automotive hardware, there is a larger array of competitors, such as AMD, Broadcom, Intel, Qualcomm, Xilinx, NXP and Renesas.

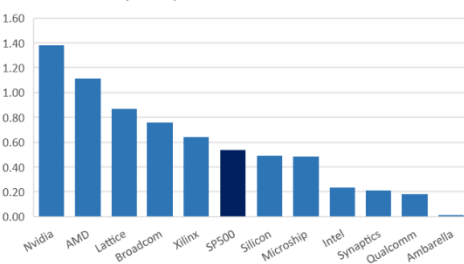
Profitability-wise, Nvidia is the company with the best figures, both in terms of core operations, but profitability from investments as well. (Appendix 13). Finally, in terms of liquidity management, Nvidia is also ahead of its main competitors (Appendix 13).

In terms of Market share, Nvidia dominates in discrete GPU shipments with 80% of the total market in Q2 FY2022. Although Intel does not establish itself within the discrete GPU market, it is responsible for 64% of total PC GPU shipments, due to integrated GPUs (many CPUs come with integrated GPUs) (Exhibit 23).

Nvidia has a considerably larger market cap than Intel and AMD (Exhibit 24) and it has roughly doubled it in a 10-month period following the end of January. In terms of stock performance in the past 6 years, Nvidia has been the company with the second highest absolute returns among its competitors (Exhibit 25.a). Although AMD has the highest 6-year cumulative returns, with an impressive +399,68% (compared to Nvidia's +372,44%), a risk adjusted analysis of the Sharpe Ratios (SR) show Nvidia is the best performer, with a SR of 1,38, followed by AMD with 1,12 (by comparison the S&P500, our benchmark, had a SR of 0,54) (Exhibit 25.b). Intel, one of the oldest competitors and a very mature company, has the worst performing stock among the peers, with an IS of 0.24 and 6y

Exhibit 25.b:

Yearly Sharpe Ratios, Nvidia and Peers



Source: Bloomberg Data

cumulative return of +58.89%. Overall, Nvidia's stock has been a winner, not only when compared to its competitors, but also the broader market. Nevertheless, we observe extreme events such as the 2018 selloff, which caused a concerning drawdown, the trade war with China, rising interest rates, a temporary slowing demand for semiconductors following the cryptocurrency crash, and a poor earnings season that caused the stock to fall 52.5% in a 3-month period (by comparison S&P500 fell -14%). Therefore, despite long-term growth projections for the gaming, datacenter and automotive markets being very optimistic, one must not exclude the risk of potential drawdowns, which will be more thoroughly analyzed in the scenario analysis section at the end of the report.

ARM Acquisition

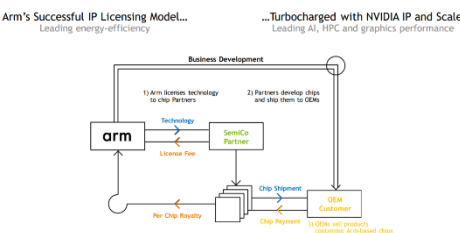
In September 2020, Nvidia entered a Share Purchase Agreement with Arm Limited and SoftBank (current conglomerate owners) in a transaction valued at \$40 billion. \$2 billion were paid in cash at signing, with the agreement of paying \$10 billion upon closing of the acquisition, also in cash, plus the issuance of 44,3 million shares of Nvidia's common stock to SoftBank, with an aggregate value of \$21,5 billion. The deal also envisions a potential earn out depending on certain financial performance targets, as well as the issuance of \$1,5 billion in restricted stock to Arm employees after closing.

This acquisition would enable Nvidia to position itself better to take advantage of the AI revolution. Furthermore, Arm has a vast ecosystem of CPUs, with an array from Data Centers to small portable devices (such as Smartphones). In terms of Data Center offers, Nvidia would no longer require licenses to access Arm's architecture, being then able to tailor Arm offers to its product needs, which could result in an increase in computing power (to better perform machine and deep learning tasks) and optimized energy efficiency. Similarly, access to Arm CPU products for SoCs would grant Nvidia an edge for the Automotive Segment, as Nvidia develops new products such as sensors, developer kits, and computer boards (which require Arm architecture) and could further optimize its products. On broad terms, Nvidia could benefit from Arm in all product lines that involve CPU architectures, even those such as cloud offers (e.g., GeForce NOW). Lastly, Nvidia could also use this acquisition as a strategic move to limit competition's access to Arm offers and preserve, or even increase, its market share. However, it's our view as analysts that the probability of the Arm acquisition materializing is virtually null.

Firstly, regulators in the UK and the European Union rejected the acquisition on a first phase of reviews. Similarly, the US Federal Trade Commission (FTC) and China's antitrust authority are showing concerns regarding how the acquisition could reduce competition in the market for the supply of processors and limit the access of Nvidia's competitors to Arm's technology. As of December 2nd, 2021, the FTC sued to block Nvidia's acquisition of ARM, stating "The proposed vertical deal would give one of the largest chip companies control over the computing technology and designs that rival firms

Exhibit 26: Arm's business model and Nvidia opportunities

EXPAND ARM'S IP LICENSING PORTFOLIO WITH NVIDIA'S TECHNOLOGY

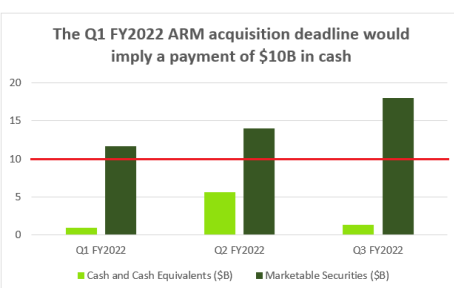


Source: Nvidia Investors Presentations

rely on to develop their own competing chips [...] the combined firm would have the means and incentive to stifle innovative next-generation technologies, including those used to run datacenters and driver-assistance systems in cars”¹⁰. Furthermore, Arm is based in the UK and regulators have voiced how the acquisition poses a national security threat, specially in a semiconductor shortage environment where the loss of Arm to an US based company would imply losing a national source of chips, and eventually losing processor technologies that are critical for defense technology.

Secondly, Nvidia has moved most of its cash and cash equivalents to Marketable Securities in Q3 FY2022 (cash outflow of \$16,020 million from the purchase of marketable securities), which by itself may signal the firm is not confident on the acquisition being approved, at least in the short-term. Upon the Mellanox acquisition’s closing deadline at the start of Q2 FY2021, Nvidia had to pay \$7 billion in cash. In preparation to fund Mellanox, Nvidia liquidated more than 99% of its Marketable Securities, hoarding \$10,90 billion in FY2020. In the Quarter prior to the acquisition (Q1 FY2021) it held \$15,49 billion in Cash and Cash Equivalents with just \$0,86 billion in marketable securities. With the deadline for the Arm acquisition on Q1 FY2022, which involves a \$10 billion cash payment upon closing, it would be expected for Nvidia to follow a similar liquidity management strategy for the \$10 billion in cash for Q3 FY2022, instead of reducing it to \$1,29 billion, resulting in a 77,1% decrease from the last Quarter, and increasing marketable securities from \$14b to \$18b (Exhibit 27).

Exhibit 27:



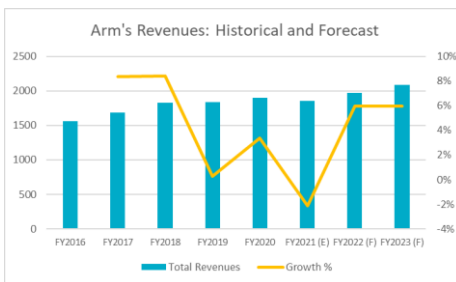
Source: Nvidia financial data

In conclusion, the acquisition is expected not to be approved both under competition grounds and national interest, in the case of the UK. This scenario hinders segment expansion plans, especially for the Gaming, Data Center, and Automotive segments. Nevertheless, as a very simple and merely hypothetical scenario exercise, with the very limited available public data on Arm, we tried conducting an analysis that aims at quantifying the impact on Nvidia’s share price if the acquisition were approved.

For starters, we would like to reiterate some assumptions. Firstly, since the deadline for the closing of the acquisition is set on March 2022, we are assuming the deal would close on January 2022 calendar year (end of Nvidia’s FY2022). Therefore, considering the typical investor of this research, with a stock holding period of a year (during 2022), the investor would be exposed to the closing of the acquisition and to the first year of the new combined entity. This brings us to our second assumption, related to synergies: we do not expect synergies to occur in the first year following closing, as these tend to be realized after the “phase-in” period, which typically lasts up to two or three years after the transaction, even when a detailed time schedule is planned (Ficery et al., 2007¹¹).

¹⁰ Source: <https://www.ftc.gov/news-events/press-releases/2021/12/ftc-sues-block-40-billion-semiconductor-chip-merger>

¹¹ Ficery, K., Herd, T., Pursche, B., Where has All the Synergy Gone? The M&A Puzzle, Journal of Business Strategy, volume 28, issue 5, 2007

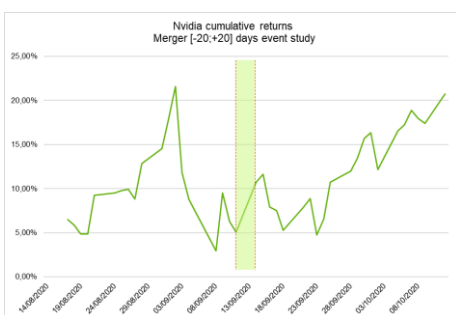
Exhibit 28:

Source: Analysts Forecasts

Furthermore, it's often the case that, in the short-term, costs may increase during the integration process, like one-time expenses or due to short-term inefficiencies.

Lastly, for valuation purposes, we did not have sufficient data to perform a proper DCF model for Arm. We took, instead, a multiples path, more specifically using Price/Sales with FY2023 forecasted sales figures (Exhibit 28) and looked at the implicit relative valuation of Nvidia with and without Arm, to measure the difference in the stock price and give the investor an idea of how his investment would be affected.

We took this into consideration the transaction agreement of issuing to SoftBank \$21,5 billion worth of shares of common stock upon closing and added this to the number of shares outstanding for FY2023. The result was a difference of roughly +2,60% in the share price targets resultant from a P/S multiple analysis, considering FY2023 sales (Appendix 11). As expected, the difference is small because: **a)** FY2023 sales of the combined entity improved by a small amount due to the size differences between Nvidia and Arm (\$42,664 million vs \$2,085 million in forecasted revenues respectively); **b)** no synergies were assumed to be implement in just a time horizon of 1 year. This doesn't mean synergies wouldn't be implemented in the future but, for an investor to get achieve higher returns, it would need to be exposed and extend its holding period for longer, giving time for synergies to happen.

Exhibit 29:

Source: Bloomberg

To put it in perspective, at the day of the merger announcement, September 13th, 2020, Nvidia's share price went up by 5,66%. But if we look at a broader 20-days event study around the announcement day, a 5,66% increase (Exhibit 29) is nothing out of the ordinary when put in perspective with the trend the stock was following in the time horizon of the event study. With exception of a 9,74% decrease on the 3rd of September, which was the result of a broader market sell-off (Nvidia included), the trend was quite upwards, so the 5,66% merger market reaction doesn't stand out as much and, in our view, matches our estimated upside in share price of 2,60% for FY2023, if we consider no synergies were incorporated.

Valuation

Adjusted Present Value model (APV)

The chosen valuation method used in this Equity Research was the Adjusted Present Value model (APV). The reason why this model was chosen in detriment of more popular models, such as the Discounted Cash-Flow model (DCF) or other WACC-based models, was its advantage in better accommodating changes in the capital structure of a firm. The main drawback associated with the WACC is that we are implicitly valuing the firm assuming a future constant capital structure, set at a predefined target D/E ratio, which doesn't match our assumption regarding Nvidia's capital structure. More specifically, we value the company as if it were 100% financed by equity, by discounting the free cash-

flows with the unlevered cost of equity, and finally add any value created by financing-related effects, such as interest tax shields.

Reformulation and initial assumptions

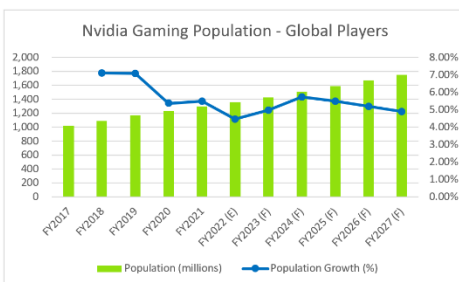
The first step in the valuation process was to reformulate the company's financial statements since FY2017¹² according to its core operational activities, non-core activities and financial items. Cash and cash equivalents were split between operating cash (assumed to be 5% of revenues) and excess cash (the remaining of the company's cash, together with its marketable securities, highly liquid instruments such as government debt securities, certificates of deposit and highly rated corporate bonds). This latter type of cash is to be used in M&A funding, capital assets purchases, debt repayments, dividends, etc. We allocated accounts like Goodwill, Acquisition-related intangibles, and Deferred tax assets¹³ to the non-core division of the firm, later on valued at book value. Financial obligations that the firm has, such as debt, capital and operating lease liabilities, and coupon interests on debt obligations were attributed to net financial assets, mechanisms the company uses to finance itself, other than through equity. Nvidia has no minority interest on other companies nor preferred equity issued, therefore no adjustments were made to total shareholder's equity. This initial reorganization of the company's financials is crucial for the upcoming forecasting and valuation processes.

Value Drivers and Forecast assumptions

To forecast revenues for each segment we rely on the method based on the equation:

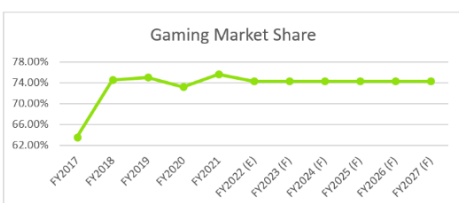
Revenues = Population x Penetration Rate x Market Share x Average Revenue per User (ARPU). We found this to be the best way of accurately estimating Nvidia's future revenues given the available data provided. For FY2022 estimate we took the liberty of incorporating actual quarterly data in our forecast. Nevertheless, even though 75% of this year's figures are based on real data, we still treated it as an estimate.

Exhibit 30:



Source: Analysts forecasts

Exhibit 31:



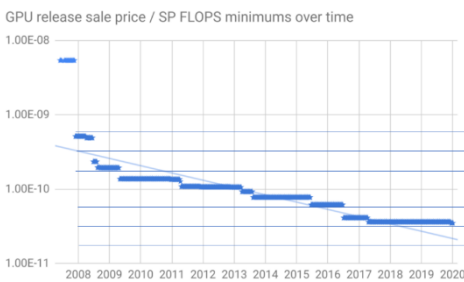
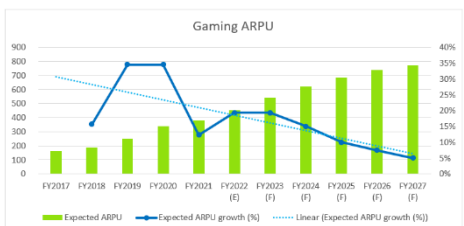
Source: Analysts forecasts

Gaming Segment

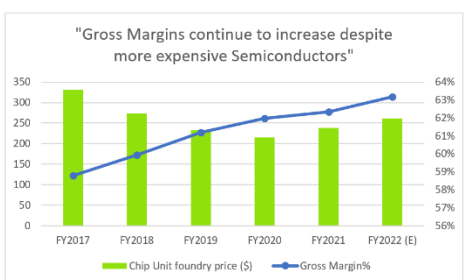
Gaming revenues are greatly driven by the rising gaming population numbers (CAGR of 5.74% expected until 2023F). Nvidia also demonstrates solid evidence of having capabilities to solidify its market share close to 75%, namely in gaming platforms such as Steam, Epic Games Store, and GOG, if it keeps leveraging its differentiating technologies such as RTX and DLSS 2.0. Furthermore, if it continues the trend for innovation in the long run, it will maintain its advantage over competitors' strategic advances, such as Intel's "Alchemist" upcoming GPU line to compete in gaming.

¹² Nvidia's financial years go from January to January, meaning FY17 starts in January 2016 and ends in January 2017. The latest annual statements published are from FY21 (ended in January 2021).

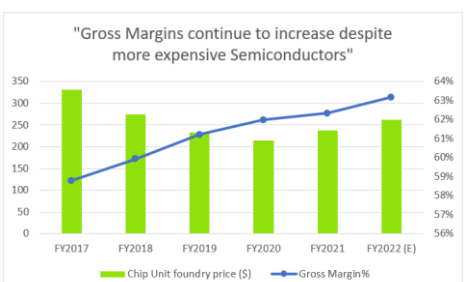
¹³ We are assuming the company will be able to recover the full amount of Deferred Tax Assets (net), since Nvidia already adjusts this account according to the likelihood of realizing this gain through a valuation allowance.

Exhibit 32:Source: <https://aiimpacts.org/2019-recent->**Exhibit 33:**

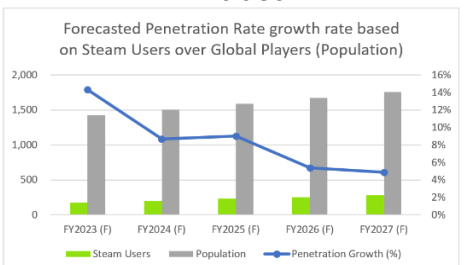
Source: Analysts forecasts

Exhibit 34:

Source: Analysts forecasts

Exhibit 35:

Source: Analysts forecasts

Exhibit 36:

Source: Analysts forecasts

ARPU is expected to evolve according to the market's most competitive GPU release price divided by its total flops¹⁴, allowing us to plot a cost metric (\$ per flop) against the evolution of total flops of Nvidia's most recent possible GPU line. While the dataset used has the limitation of relying on release prices (Nvidia's main sales come from selling to retailers and not to the final customer directly), we are assuming release prices are very much in conformity with the manufacturer's suggested retail price (MSRP). Furthermore, the dataset contains a high sample of GPUs and a single measure of performance which allows for comparisons: Flops at single precision¹⁵. Overall, we concluded that despite performance becoming cheaper over time for Nvidia GPUs (\$ per flop decreases), the computing speed improvement in GPUs has been even greater (flops per GPU grows faster than \$ per flop decrease), making GPUs indeed more expensive over time for customers (especially in the early 2010s). Besides assuming this trend into the future, we reinforce it with the belief that, as long as the semiconductor shortage lasts, Nvidia will be able to dictate demand from its supply by practicing higher prices, which so far has been one of the main reasons Gross Margins have kept increasing through the shortage (Exhibit 34). We assume an average user will change GPU every four years into the future, a variable mostly defined by factors such as innovation speed, retail prices changes, and consumers' buyer power. While GPU prices continue to soar amidst the semiconductor shortage, something which could push lower-purchasing power users away from replacing their GPU every 4 years on average, we reject this hypothesis because, on average, 71%¹⁶ of gamers increased their time spent playing games during the covid-19 pandemic, which contributes to the wear and tear of their GPUs in the medium-long term.

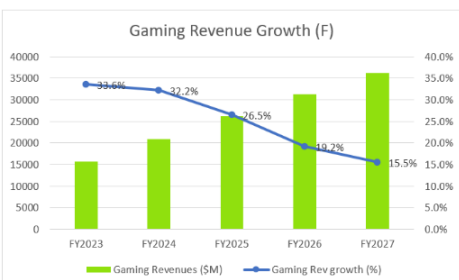
In terms of penetration rate, evidence suggests more global players use computer-based platforms (led by Steam, with an average of 120 million active users in FY2021) which involve the need of dedicated GPUs or a subscription to cloud-gaming platforms¹⁷. With the rise of cloud-gaming easing access to high graphics games, we expect a growth in penetration rate, given by steam users over total PC gamers, of +15.67% in FY2022 and +14.31% in FY2023. The growth rate is expected to steadily decrease towards +4.43% by FY2030, as cloud-gaming should shift from the Growth to Maturity product cycle by then. Lastly, this forecast also takes into account ongoing threats such as the Chinese Communist Party restricting gaming to 3 hours per week which negatively impacts the penetration rate. It is important to point out that China is the largest video-game market, responsible for 23.3% of total Nvidia sales (reported in FY2021) and is the most

¹⁴ A flop (floating point operations per second) is a measure of computing performance.

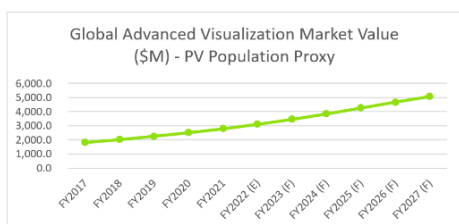
¹⁵ Single-precision floating-point format (known as FP32) is a computer number format, usually occupying 32 bits in computer memory.

¹⁶ Barr M, Copeland-Stewart A. Playing Video Games During the COVID-19 Pandemic and Effects on Players' Well-Being. Games and Culture.

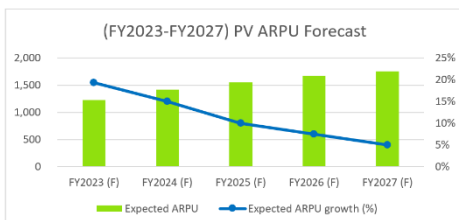
¹⁷ Users of Cloud-Gaming platforms do not require a dedicated GPU on their computers – the only requirement is solid internet connection as a server with all the necessary dedicated hardware (including GPUs) runs the videogames and streams to users in real time.

Exhibit 37:

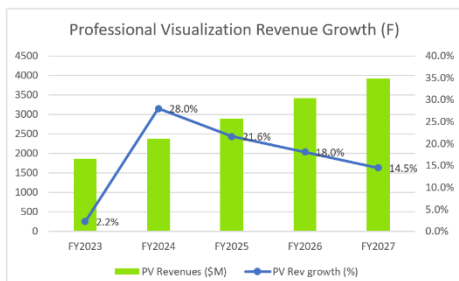
Source: Analysts forecasts

Exhibit 38:

Source: Analysts forecasts

Exhibit 39:

Source: Analysts forecasts

Exhibit 40:

Source: Analysts forecasts

populated country in Asia (a continent with 54% of worldwide gamers) with one of the fastest growing consumers purchasing power.

Professional Visualization Segment

PV revenues are highly driven by the size of the Global Advanced Visualization market, which is expected to grow at a CAGR of 11,3% until FY2024. As this market matures in the future, its growth will slowly deteriorate and converge to the real long-term GDP growth of 2,2% annually in the steady state.

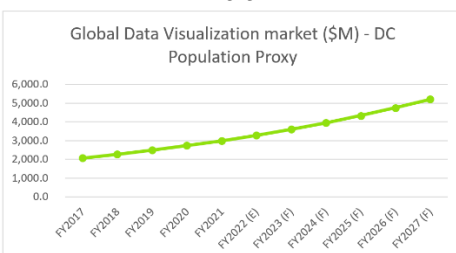
In terms of Market Share, we expect Nvidia to maintain its current 90% share. Competitors, and Nvidia alike, have solid expectations that the firm's current share in graphics for workstations will most likely continue in the future as they have a well-established line of GPUs (Quadro) and software in professional graphics, advanced rendering, video processing, material design, 3D printing and virtual reality applications, while showing capabilities of innovating and making strong new offerings. Furthermore, as mentioned, Nvidia is the company of choice for Metaverse which shows potential of becoming a key product in the Global Advanced Visualization market. Currently, AMD and Xilinx, the only apparent competitors in this market, seem to lack capabilities and have only been able to develop residual products to compete with Nvidia in this segment.

ARPU for this segment, similarly to Gaming, was based on the evolution of \$/flop against the number of flops for the new GPU lines. PV focuses on providing graphics mostly to workstations and HPCs set to run complex tasks. Therefore, we apply the evolution of our wider GPU ARPU growth on a higher-end range of GPUs and considered a lifespan of 3 years due to two main factors: **a)** Faster depreciation in complex and demanding professional environments for such GPUs; **b)** Higher reliance on top of the line technology by professionals, incentivizing them to upgrade GPUs more often.

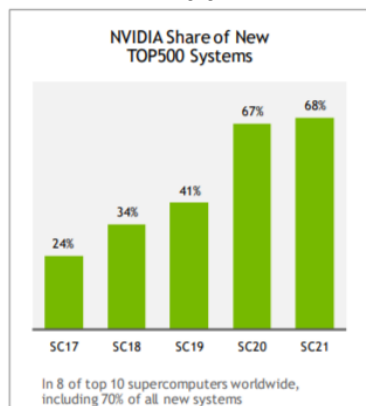
Since this segment serves a professional setting, users can't often delay GPU upgrades if they intended to keep performing the most innovative tasks, therefore we expect them to be little price sensitive and still buy on a regular frequency amidst higher prices caused by the semiconductor shortage. We expect an ARPU with a CAGR of +19.36% in FY2023, followed by a slowdown in 2024 to +15.0% (end of shortage expected).

We reinforce Metaverse as a key opportunity for revenue growth: as Facebook rebrands, they are going to adopt the Metaverse (a shared virtual platform through which people move through digital environments and can access anywhere from different devices). The size of the project¹⁸ should accelerate the Global Advanced Visualization market, hence the optimistic CAGR of 11,3% until FY2024. Nvidia's Omniverse has the right capabilities for implementing in Metaverse: it allows for projects like creating simulations of real-world buildings (e.g., houses) and assets such as avatars which are necessary to

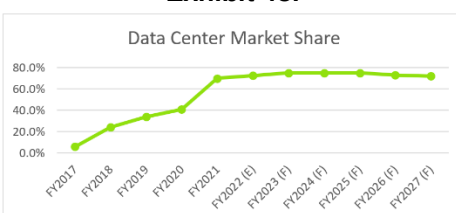
¹⁸ Source: <https://www.fool.com/investing/2021/12/14/question-determine-future-of-30-trillion-metaverse/>

Exhibit 41:

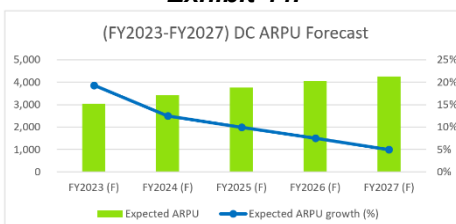
Source: Analysts forecasts

Exhibit 42:

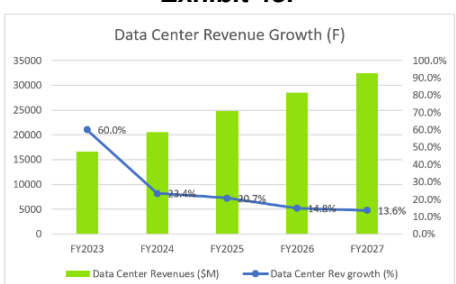
Source: Nvidia Investors Presentation

Exhibit 43:

Source: Analysts forecasts

Exhibit 44:

Source: Analysts forecasts

Exhibit 45:

Source: Analysts forecasts

build the core of metaverse. With the right infrastructure and capabilities Meta requires, it is almost certain Facebook's future Metaverse will rely on Nvidia's products¹⁹, and reinforce Nvidia's leadership in this market with the market share of 90%.

Datacenter Segment

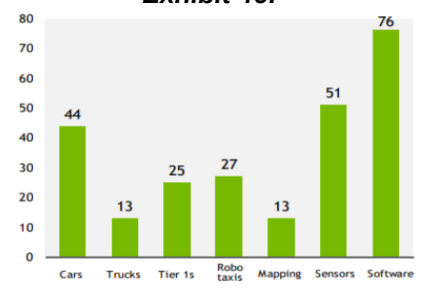
Data Center Revenue predictions were based on the Global Data Visualization market as proxy for population. Since most activities related to data centers (AI, data analytics, graphics, scientific computing, etc.) rely on data visualization to deliver what we could call the "end product", whether data visualization is used in the context of delivering results to customers or help professionals extract value from data, this market proxy reflects the growth in demand for this segment. With Artificial Intelligence quickly gaining a central role in society, we expect a CAGR of 9,69% until FY2027.

In terms of market share, we used the Nvidia share of New TOP500 systems (Exhibit 42). These systems are used for a wide range of computationally intensive tasks, and have grown in importance in data related tasks, especially since Machine Learning, and more recently Deep Learning, have been gaining popularity among companies with large amounts of data. Nvidia has made solid progress in gaining representation in TOP500 Systems, which are exclusive to high scale HPC and provide a good overview of the firm's Data Center (DC) segment presence for companies using top technology. Although Nvidia made it to 70% representation in mid-2021, capturing 36% of the share of TOP500 computers in just 2 years, with the aid of the Mellanox acquisition, competitors are hard to eliminate and market share difficult to hold, as we have proven in the P5F analysis. Therefore, we expect market share to reach a peak of 75% in FY2023, following the new Grace CPU release, but we consider that, as the market matures, competition will retract Nvidia's market share to a generous 65%. Limiting Market Share at 65% also comes in line with the ARM acquisition almost certainly being blocked: ARM possesses solid capabilities centered around Datacenter CPU technology and without the acquisition competitors can still have access to its technology and maintain their edge over Nvidia in CPU offers.

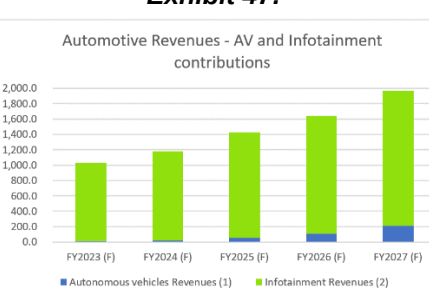
Just like in the Gaming and PV segments, the ARPU estimations are based on the evolution of \$ per flop against the number of flops for the new GPU lines. We apply that evolution to a price average of recent DC GPU offers (such as the A100, A10, A16, A30, among others), which are top of the line and carry more features than those used for PV workstations and HPCs, in order to perform DC specific tasks. We expect a CAGR of +19.36% in FY2023, followed by a slowdown in 2024 to +15.0% (end of shortage expected).

Automotive Segment

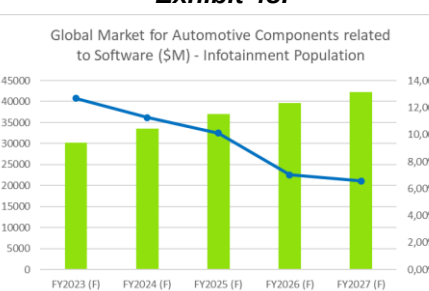
¹⁹ Sources: <https://www.marketwatch.com/story/this-is-how-nvidia-plans-to-make-lots-of-money-from-the-metaverse-11637246368>
<https://www.bloomberg.com/news/articles/2021-11-01/is-the-metaverse-really-going-to-happen-nvidia-nvda-says-yes>

Exhibit 46:**NVIDIA DRIVE Partners**

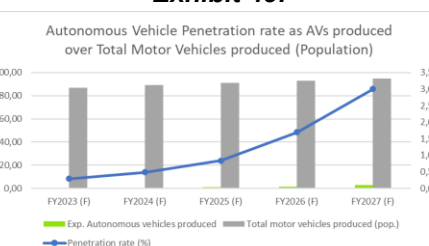
Source: Nvidia Investors Presentations

Exhibit 47:

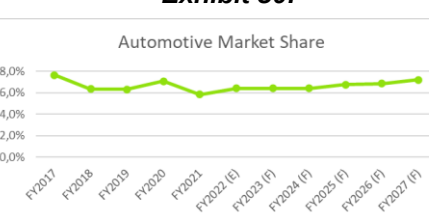
Source: Analysts Forecasts

Exhibit 48:

Source: Analysts forecasts

Exhibit 49:

Source: Analysts forecasts

Exhibit 50:

Source: Analysts forecasts

Automotive revenues are expected to grow in two fronts: Infotainment and Autonomous Vehicles (AV). Most of the segment's revenues come from infotainment: systems that run all the communication and entertainment functions of a car, from phone calls and navigation to music and sometimes even films. The current weight of AVs in this sector is barely relevant, but the future of autonomous chips and SoCs could prove a good revenue source for Nvidia if it steps up on its hardware and software offers, such as those included in the Nvidia DRIVE collection, which seems to be the case if we look at the rising number of Nvidia's partnerships with car manufacturers.

As the population proxy for infotainment, we rely on the Global Market for Automotive Components related to Software, which is expected to more than double until 2030, while for AVs we rely on total motor vehicles produced annually (87 million expected for 2027). Since we expect AV revenues to grow in line with the production of AV vehicles, which could reach an annual output of 12,16 million by 2030, and considering the total motor vehicles produced population, which we expect an annual production of 101 million by 2030, the penetration rate²⁰ of AVs should be 12% in that year.

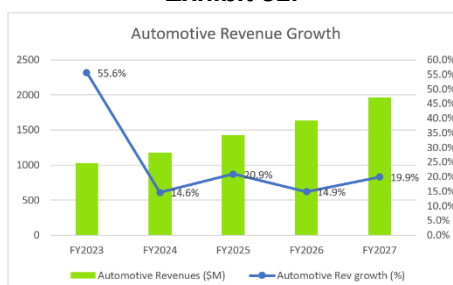
In terms of Market Share, Nvidia has struggled to grow in the past, with just 6,3% of the market's revenues in FY2020. Nevertheless, we expect this value to revert to the mean of the past years in our forecast (towards 6,7%) since, despite solid competition in the sector, Nvidia's increasing partnerships are working as a catalyst to improve its market share. Nevertheless, a pattern common to semiconductor producers in the automotive market is each having specific products for specific ends, and if Nvidia focuses on solidifying its position on niche offers for AVs (as it already did with infotainment), it could mitigate competitive pressure. As we said, Nvidia's acquisition of Arm Limited would be a determinant factor to consolidate market share, as it contains all the capabilities necessary regarding semiconductors used for automotive advanced driver-assistance systems and infotainment. Nevertheless, the likelihood of the acquisition is virtually null.

Although Nvidia expects the \$8b design-win pipeline for Nvidia Drive to ramp up in FY2023 until FY2027, our estimates show it will take until FY2028 for these \$8 billion to materialize in revenues for the automotive segment, due to our more conservative assumptions regarding the production level of AVs, and the neglecting of Arm's acquisition boosts for the segment.

OEM & Others Segment

OEM & Others reached its peak sales in FY2018 (with \$777 million), and since then it had the fastest decrease in weight contribution to total sales. As mentioned, Nvidia is divesting in OEMs and also plans to make CMPs the core product of this segment to better segmentate customers and control the demand shocks for gaming GPUs. Part of

²⁰ Penetration rate = Target population / Total population. In this case, AV output / Total motor vehicle output

Exhibit 51:

Source: Analysts forecasts

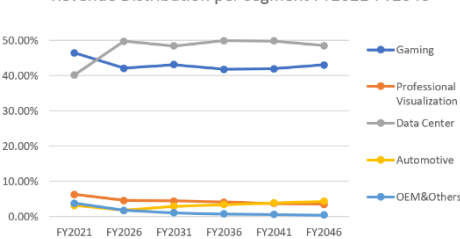
Exhibit 52:

NVIDIA Hardware Hash Rates			
AnandTech	Hash Rate	Power	Efficiency MH/a/W
RTX 3090	121 MH/s	290 W	0.42
RTX 3080	98 MH/s	224 W	0.44
90HX	86 MH/s	320 W	0.27
RTX 3070	62 MH/s	117 W	0.53
RTX 3060 Ti	60 MH/s	120 W	0.50
RTX 2080 Ti	49 MH/s	240 W	0.20
50HX	45 MH/s	250 W	0.18
40HX	36 MH/s	185 W	0.19
30HX	26 MH/s	125 W	0.21

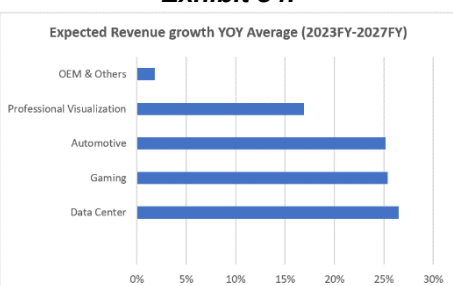
Source: Nvidia and Minerstat

Exhibit 53:

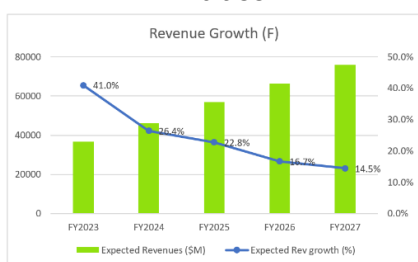
Revenue Distribution per segment FY2021-FY2046



Source: Analysts forecasts

Exhibit 54:

Source: Analysts forecasts

Exhibit 55:

the strategy consists in making CMPs more efficient at mining than gaming GPUs (such as having better power efficiency, smaller size, and better airflow) while also limiting Hash Rate capabilities of new Gaming GPUs to limit their mining efficiency (Exhibit 52).

In terms of CMPs, demand is expected to depend on the profitability of mining cryptos²¹ such as Bitcoin (BTC), which holds the #1 popularity and largest market cap of all digital currencies. Over time, computing power increases (measured in hash rates for cryptomining), and new systems mine more cryptocurrencies, which are important profitability factors, along with others such as electricity consumption costs, transaction fees, hardware costs (e.g., CMPs), and crypto prices, obviously. Given factors such as: **a)** rising popularity of mining pools; **b)** increasing number of product launches Nvidia aims to have in the context of global cryptocurrency mining hardware market; **c)** shift of cryptominers from gaming GPUs to CMPs; we assume CMP sales to grow at a CAGR of 5% until FY2026. Although, the market for CMPs has an interesting potential, we cannot exclude the fact other GPUs can still replace CMPs, and strategies such as hash rate limiting of gaming GPUs are still fallible, as seen by recent hash rate hacks, for which cryptominers are able to remove the imposed limits. For these reasons, we place Nvidia's CMP sales growth ~2,85% below the expected CAGR for the crypto mining hardware market for the period in question.

In terms of the remaining segment excluding CMPs, we expect Nvidia to continue divesting in OEMs, as stated by Nvidia itself. Overall, the segment should recover slightly from past years due to the CMP focus, nevertheless it should continue its trend of losing weight contribution to total sales when compared to other segments (Exhibit 53).

Summary

Overall, we believe the Data Center segment has the largest growth potential with an expected Year-on-Year (YoY) average revenue growth of (+26,5%) in the upcoming 5 years, followed by Gaming (+25,4%), Automotive (+25,2%), Professional Visualization (+16,9%), and finally OEM & Others (+1,8%) (Exhibit 54).

Total Revenues are expected to grow at a fast pace with \$36,64 billion in FY2023 and nearly double to \$75,94 billion by FY2027 (Exhibit 55). Nevertheless, growth is expected to slow down in the longer run, towards 10,38% by FY2030 and 6,74% by FY2035.

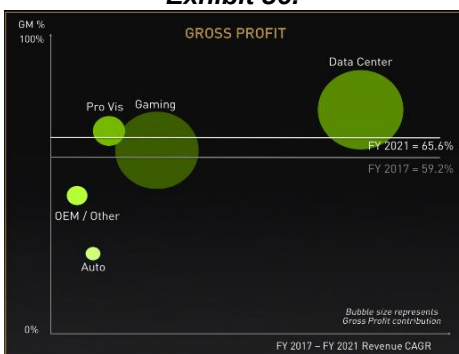
Cost of Revenues

Due to data constraints regarding Nvidia's input costs and quantities, cost of revenues (COGS) was forecasted implicitly using the Gross Margin as a value driver. With the Gross Margin (%) data for each segment in FY2021, and an intersegment CAGR of its evolution of 2.6% from FY2017 to FY2021 (Exhibit 56), we adjusted cost of sales across

Source: Analysts forecasts

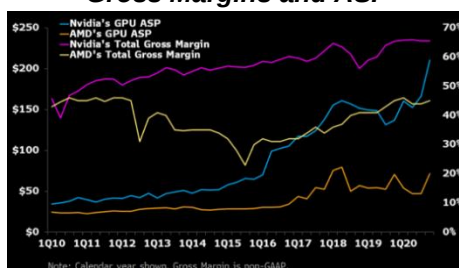
²¹ In short, crypto mining of BTC (bitcoin) is a process for which cryptominers verify transactions in the blockchain and receive BTC as a reward after solving a puzzle to ensure the authenticity of the transaction.

Exhibit 56:



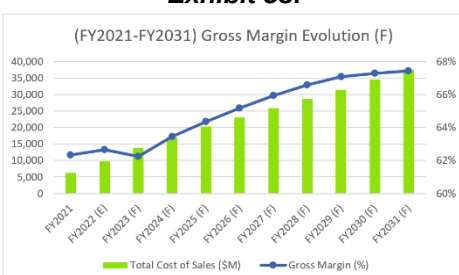
Source: Nvidia Investors Presentation

Exhibit 57: Nvidia and AMD's Gross Margins and ASP



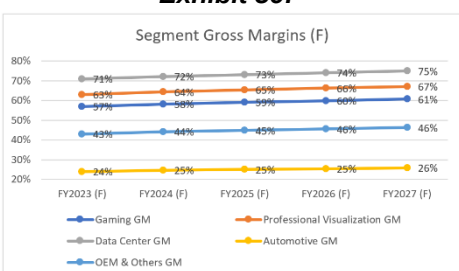
Source: IDC, Bloomberg

Exhibit 58:



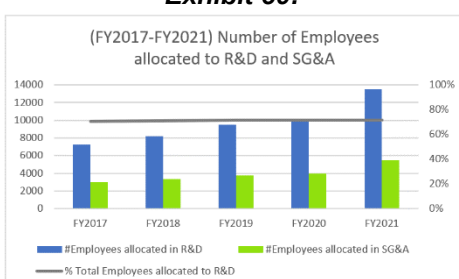
Source: Analysts forecasts

Exhibit 59:



Source: Analysts forecasts

Exhibit 60:



Source: Analysts forecasts

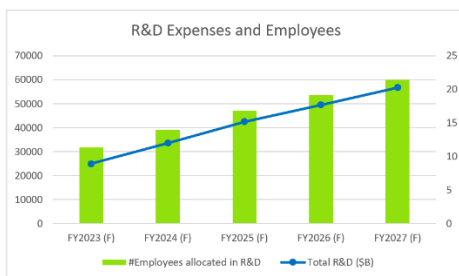
segments in the past to infer about the future, while also incorporating our own vision for gross margins.

Despite our general assumption of growing Gross Margins in the future, we expect the semiconductor shortage until FY2024 to be a strong barrier for increasing quantities sold (despite charging higher prices) and, consequently, limiting gross margins. One of the most relevant GPU inputs are chips provided by foundries like TSMC or Samsung. Chip unit foundry prices are likely to reach close to \$260 by the end of FY2022, contributing to higher input costs. Nevertheless, Nvidia has been increasing ASP (average selling prices) throughout this shortage, which partially offsets the cost increase and prevented Gross Margins from falling, something which we also expect to happen into FY2023. As explained in the “Supply chain analysis and Semiconductor shortage” section, our vision is that the shortage should end by FY2024. Evidently, the nature of innovation makes it difficult to estimate how Gross Margin will progress in the future. Nevertheless, factors such as the new GPU architecture (Ada), which points out to make production processes more efficient, justifies our assumption for gross margins to improve slightly from FY2024 onwards (Exhibit 58).

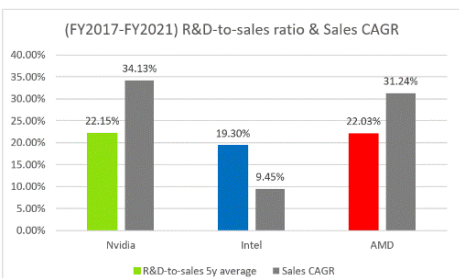
Lastly, as both company and industry mature, Gross Margins should reach its peak at 68% due to factors such as: **a)** The competitive advantages Nvidia holds seem to be sustainable, even in an industry marked by an environment of fast paced innovation; **b)** production of copper is expected to reach its peak by 2035, as some of the main copper reserves are expected to end by then, therefore it's expected electronic circuits will progressively become more expensive and the improvement of Gross Margins beyond 68% will become less attainable. As the industry decays through its maturity phase, we expect Nvidia's Gross Margins to stabilize towards 65%, a value that still assumes an edge above its competitors.

Operating Expenses – R&D and SG&A

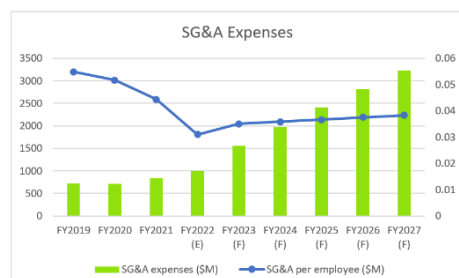
As already expressed, R&D is fundamental for a company like Nvidia to be able to keep innovating ahead of its peers and maintain a competitive advantage. For the past 5 years, Nvidia has targeted ~71% of its total employees for R&D ends, which we expect to persist (Exhibit 60). Revenues per numbers of employees has been stable, and R&D expenses per employee had low fluctuations in the period of analysis. Therefore, we expect Nvidia to increase its work force in line with revenue growth (adjusted to inflation) into the future. For FY2023 we expect a total of 31.727 employees allocated to R&D, and R&D expenses of \$8,90 billion (Exhibit 61). Competitors like AMD and Intel had a similar 5-year average R&D-to-sales ratio (+22,15%) to Nvidia, nevertheless Nvidia and AMD had more than thrice the Sales CAGR of Intel, which makes its R&D comparably less efficient at yielding sales figures (Exhibit 62).

Exhibit 61:

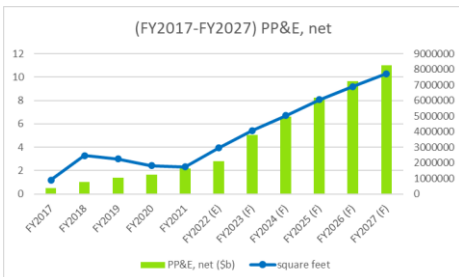
Source: Analysts estimates

Exhibit 62:

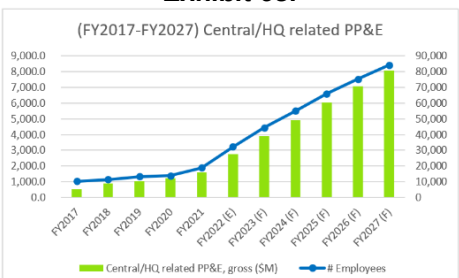
Source: Analysts forecasts

Exhibit 63:

Source: Analysts forecasts

Exhibit 64:

Source: Analysts forecasts

Exhibit 65:

Source: Analysts forecasts

The remainder of employees are allocated to SG&A at a ratio of 29% of total employees.

In terms of SG&A expenses per employee, FY2022 (E) had a considerable drop (with \$0,03M) due to remote-work savings, as compared to past years (with an average of \$0,05M). In FY2023 (F) we expect SG&A per employee to slightly mean revert (with a value of \$0,035M), as we do not expect harsh pandemic lockdowns as seen during FY2022 to happen, and from then onwards evolve according to inflation (Exhibit 63). This expectation goes with the assumption the pandemic gave the opportunity for Nvidia to establish an efficient model of “Remote Work”, which CEO Jensen Huang intends to keep, giving employees the possibility to work from home for some days of the week.

Invested Capital

The firm's PP&E has been increasing over the years (Exhibit 64), mainly driven by the construction of Nvidia's new HQ in Santa Clara, California. The new complex consists of two buildings, Endeavour (500.000 square feet, built in FY2018) and Voyager (750.000 square feet, to be completed), totaling an owned property of 1,25 million square feet. In addition, Nvidia owns a R&D center in India and leases office facilities in multiple international locations, to be used as either R&D centers and/or administrative offices, together with a leased data center space in California. As the firm continues to grow its operations, we expect Nvidia to increase its central/HQ related PP&E, reflective of the increase in labor force (Exhibit 65), as well as an increase in operational equipment (such as testing equipment), which is directly driven by R&D projects (Exhibit 66).

Another relevant driver of invested capital that we incorporated in our model was cash available for M&A, or more broadly called “firepower” (Exhibit 67). This item works as a forecast for Nvidia's future inorganic growth activity, and we assumed to be an increasing portion of the firm's previous year excess cash, as it is often the case for Nvidia to fund acquisitions using cash or cash equivalents. We expect that, as the firm matures, more inorganic growth will be needed to sustain the current levels of growth.

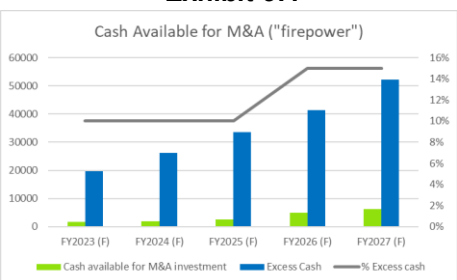
Net Financial Assets

Nvidia currently has outstanding roughly \$12 billion in debt notes, with under \$0,2 billion of it being short-term maturity (Exhibit 68). The firm also has a credit facility agreement, under which may borrow up to \$575 million for general corporate purposes and can obtain revolving loan commitments up to \$425 million. So far no amounts from these credit facilities were borrowed. Other significant debt-like items include operating lease obligations for the firm's HQ complex, domestic and international office facilities, and data center space.

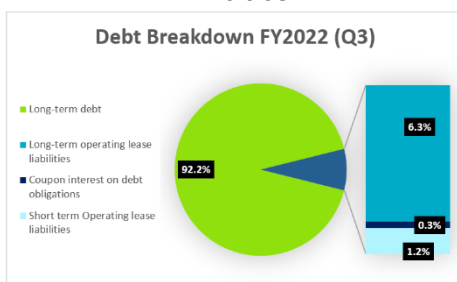
Firms in this sector, with Nvidia being no exception, are usually characterized by having considerably high levels of excess cash in relation to debt (Exhibit 69), resulting often in

Exhibit 66:

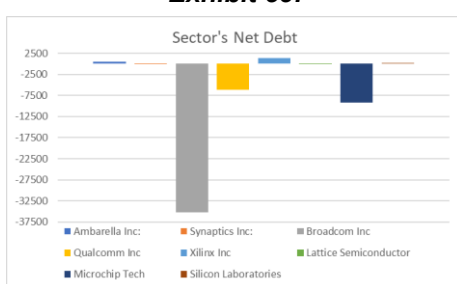
Source: Analysts forecasts

Exhibit 67:

Source: Analysts estimates

Exhibit 68:

Source: Company data

Exhibit 69:

Source: Analysts estimates

Exhibit 70:

Company	D/E (MV)
AMD	-0,63%
Ambarella Inc	-5,79%
Synaptics Inc	1,26%
Intel Corp	15,84%
Broadcom Inc	13,79%
Qualcomm Inc	3,02%
Xilinx Inc	-2,62%
Lattice Semiconductor	0,79%
Microchip Technology	19,58%
Silicon Laboratories	-0,28%
Nvidia	-0,42%

negative values of net debt²². Tech companies often prefer financing themselves with equity (or cash reserves) rather than with debt, due to their often-overvalued stock, resulting in considerably low (and negative, if cash > debt) D/E ratios. Furthermore, these companies often do not need substantial investments in tangible assets, so they tend to use less debt. Nvidia's current D/E ratio, in market values, stands at -0,41%. Companies like AMD, Ambarella, Synaptics, Xilinx, Silicon Labs, Qualcomm and Lattice Semiconductors all have D/E ratios between -6,16% and 19,45%. (Exhibit 70). As for the remaining companies identified (Intel, Broadcom and Microchip Tech), neither surpasses the 20% D/E threshold, once again proving our argument regarding the typical capital structure in this sector: low debt levels, preference for equity (or cash) investment financing, very low D/E ratios (often negative).

Historically, Nvidia's debt has been slightly increasing²³ but not at all to the point where it grows in tandem with the business (Exhibit 71). In fact, Nvidia usually refinances its debt on the same maturities and principal amounts as the original agreement, only choosing to issue more debt when necessary to partially fund M&A transactions or other type of investments, such as its new HQ. Still, historically speaking, most acquisitions were made using cash or cash equivalents, such as marketable securities, and sometimes paid partially in stock.

Therefore, in conformity with all this evidence, together with the firm's current intention of not having a target D/E, we kept a constant current level of debt (\$11.864 million) in our forecasted balance sheet, implicitly assuming Nvidia does not have a target capital structure for the future, which ultimately drove our reasoning for adopting the APV.

Tax shields

Tax shields are financing benefits originated from the use of debt in a firm's capital structure. Since the APV values the firm ignoring debt in a first stage, any financing effects associated with it must be valued separately and added back to the final value of the firm, as it is the case of tax shields. Since we are assuming a constant dollar level of debt, the present value of tax shield is a constant perpetuity²⁴. Therefore, at a marginal tax rate of 21%, PV of tax shields will be roughly \$2492 million, which will be added to the value of the unlevered firm.

Cost of Capital

Beta

As a key parameter to estimate the final cost of capital, we conducted a detailed analysis on Nvidia's Beta. A regression of 5 years of monthly data of Nvidia's stock returns against the S&P500 was performed (Appendix 3): the regression indicated a coefficient (Beta) of

Source: Analysts estimates

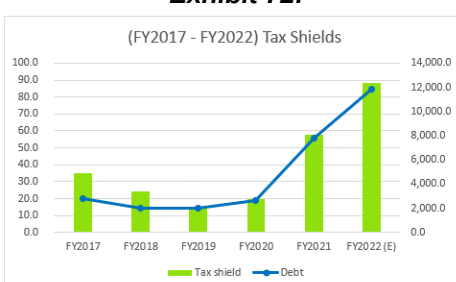
²² Net Debt = Debt (and Debt-like items) - Cash

²³ We don't see this as a worrying signal due to the large amount of cash in hand.

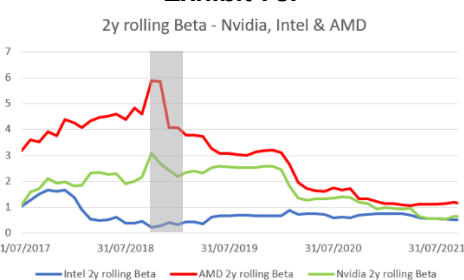
²⁴ Present value of tax shields is given by $PV(TS) = \frac{D \cdot k_d \cdot T}{k_d} = D \cdot T$ (Koller, Goedhart & Wessels, Valuation, McKinsey & Company, page 807)

Exhibit 71:

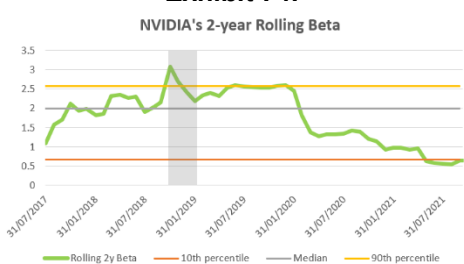
Source: Analysts estimates

Exhibit 72:

Source: Analysts estimates

Exhibit 73:

Source: Analysts estimates

Exhibit 74:

Source: Analysts estimates

Exhibit 75: Cost of Equity inputs

Rf	1.57%
MRP	4.72%
Beta (Levered)	1.3128
rE	7.77%

Source: Analysts estimates

1,31 but, unfortunately, a wide 95% confidence interval of [0,76 ; 1,87], which made us perform an unlevered Beta analysis (Appendix 4) based on similar companies. Of a total of 10 industry peers, we found an average unlevered beta of 1,15, a median of 1,13 and Nvidia's unlevered beta of 1,32, reflecting a higher systematic risk than its peers.

By analyzing a 2-year rolling Beta within the 5-year time-window (Exhibit 73), we conclude the width of the 95% confidence interval of [0,76 ; 1,87] is explained by large variations of the Beta, with two distinct trends: **1)** From mid-2017 to late-2018, the 2-year rolling Beta had a growing trend marked by periods of stronger volatility than the broader market, reaching a peak of 3.08 by the late 2018 selloff. The fast-paced stock price growth until mid-2018 and subsequent tech stocks correction, together with crypto crash causing a strong fall in demand for GPUs making Nvidia's stock plunge, meant Nvidia was consistently more volatile than the overall market. The same pattern of volatility is observed for their most direct competitor AMD, but not Intel as it is mostly CPU focused and had a small impact from the crypto market (Exhibit 73); **2)** The second distinct trend starts when Nvidia's rolling Beta plunged at the start of the Covid-19 pandemic in early 2020: the tech industry suffered a smaller impact from the pandemic than other industries (the broad market initiated a downtrend), and Nvidia had favorable events such as the spontaneous rise in gaming GPUs demand during lockdowns, causing the firm's 2-year rolling Beta to decrease from 2.45 to 1.37 unit in just 2 months (AMD shows a similar pattern). Even after the market downtrend period, Nvidia was able to maintain consistent patterns of low volatility when compared to the overall market, leading its Beta to reach its lowest value of 0.54 by August 2021.

In conclusion, the volatility of the 2-year rolling Beta within the 5 years time horizon makes it clear why the regression had such a large confidence interval, and justifies the backing of a Beta peers' approach, which was able to corroborate the reliability of our initial regressed levered beta of 1,31, which was used as input in the next section.

Cost of Equity

The CAPM was used to estimate the cost of equity. The Beta was assumed to be 1,31. For the risk-free rate we used a 10-year US government bond yield, 1,57%. Lastly, for the market risk premium, we assumed Damodaran's US Equity risk premium of 4,72%²⁵, estimated with a model that does not use historical data, therefore reflecting better current market perceptions. Based on these inputs for the CAPM equation²⁶, our resulting cost of equity (rE) was 7,77% (Exhibit 75).

Cost of Debt

Nvidia is currently rated A- by S&P and has issued multiple debt notes to finance itself. To calculate the firm's cost of debt we used the effective interest rate of a representative

²⁵ https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html

²⁶ CAPM: $rE = Rf + \text{Beta} * \text{MRP}$

Exhibit 76: Cost of Debt inputs

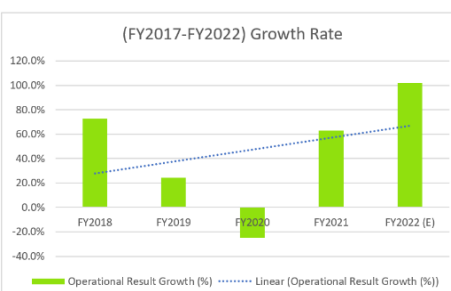
Yield of representative debt note	3.54%
Debt note maturity	2050
Probability of default	0.080%
Expected loss rate given default	0.32%
Cost of debt (rD)	3.54%

Source: Analysts estimates

Exhibit 77: Cost of Unlevered Equity inputs

ke	7.77%
D	-2935
E	754950
kd	3.54%
T	21.00%
ku	7.78%

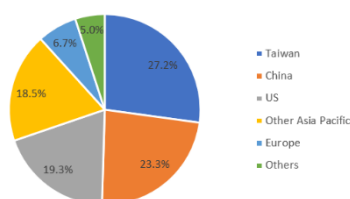
Source: Analysts estimates

Exhibit 78:

Source: Analysts forecasts

Exhibit 79:

Revenue per Geographical Area (FY2021)



Source: Nvidia's financial data

Exhibit 80:

Steady state "g" growth rate calculations:	
US Long-term Real GDP growth	2,10%
China long-term real GDP growth	1,89%
Euro-Area long-term real GDP growth	1,60%
Asia Pacific real GDP growth	3,46%
"Others" real GDP growth	2%
Weighted Average Real "g"	2,19%
US Long-term Inflation	2,30%
Weighted Average Nominal "g"	4,54%

Source: Analysts estimates

debt note, adjusted to the probability of default (Pd) times the expected loss given default (LGD). The chosen instrument was a 3,50% coupon Note due 2050, with effective yield of 3,54%. As for the Pd, we annualized the 10-year cumulative default rate for A-rated companies (0,08%), which was then multiplied by 0,32%, the estimated LDG for the sector based on S&P credit rating reports (Appendix 5, 6 and 7). The final cost of debt for this valuation is 3,54%, which reflects the current state and credit worthiness of Nvidia.

Cost of Unlevered Equity

The APV values the firm initially as if it were 100% equity financed, therefore we are discounting its cash-flows using the unlevered cost of equity (ku), rather than the WACC. In line with our assumptions of having a constant dollar level of debt and the tax shields having the same risk as debt, the cost of unlevered equity is equal to 7,78%²⁷ (Exhibit 77). In the sensitivity analysis chapter, we quantify the impact of ku in Nvidia's share price, driven by different values of Beta.

Long-term Value DriversGrowth rate (g)

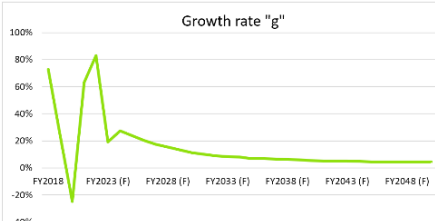
Even though Nvidia's historical growth figures are impressive (Exhibit 78), a high growth rate is very difficult to sustain in the long-run, and most companies will converge to average expected levels of economic growth. To sustain the current levels of growth, the firm would require to constantly keep innovating and gaining market share, or through substantial M&A activity (inorganic growth). Therefore, we assumed g to converge towards the nominal GDP growth rate of the most significant economies and regions Nvidia currently operates in: United States, China (including Taiwan and Hong Kong), Europe and Asia Pacific (Australia, India, Indonesia, Japan and Korea) (Exhibit 79). Using OECD data as source, the real "g" is computed with the weighted average of these regions' real GDP growth according to each geographies' contribution to the companies' current revenue. As for long-term inflation, we considered the US as a proxy since Nvidia reports in US dollars. Therefore, considering both real GDP growth and inflation, our computed nominal long-term GDP growth "g" stands at 4,54%²⁸, the value assumed for the terminal growth rate of the firm (Exhibit 80).

Return on Core Invested Capital (ROIC)

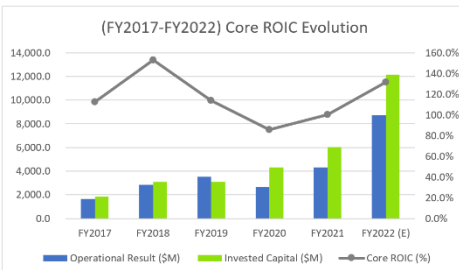
ROIC is possibly the most important metric to assess how much value a company is creating. Value creation for shareholders happens when the firm's return on invested capital is higher than the cost of capital for investors. If we look at Nvidia's historical Core ROIC, we can observe a staggering 113% 4-year average, higher than any minimum required return a typical investor would demand. Furthermore, Nvidia's Core ROIC has

²⁷ Cost of unlevered equity is given by $ku = \frac{D(1-T)}{D(1-T)+E}kd + \frac{E}{D(1-T)+E}ke$ (Koller, Goedhart & Wessels, Valuation, McKinsey & Company, page 807)

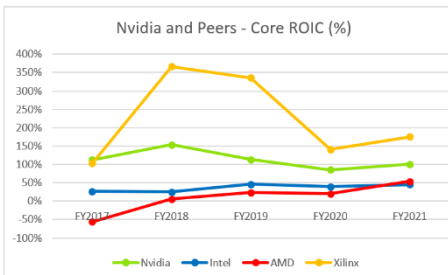
²⁸ Nominal GDP growth rate = $(1 + \text{Real GDP growth rate}) * (1 + \text{Inflation rate}) - 1$

Exhibit 81:

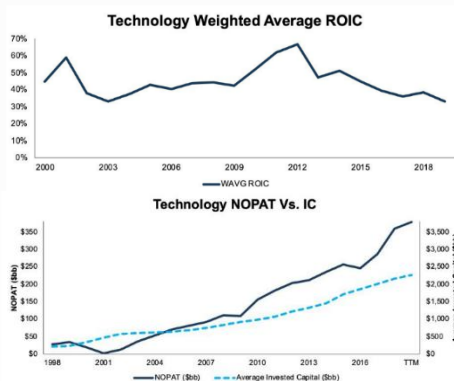
Source: Analysts estimates

Exhibit 82:

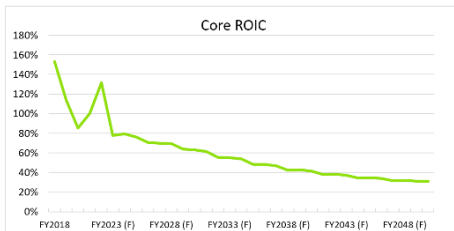
Source: Analysts forecasts

Exhibit 83:

Source: Analysts estimates

Exhibit 84:

Source:

<https://www.newconstructs.com/long-term-trends-revealed-by-our-research-on-sector->
Exhibit 85:

Source: Analysts estimates

also been quite volatile due to considerable variations in Operational Result and Invested Capital (Exhibit 82).

Similar companies like Intel and AMD have also shown high levels on historical Core ROIC, averaging 39% and 26% in the last 4 years respectively. Xilinx, in a different maturity stage of the previous companies, has displayed a 255% 4-year average Core ROIC, but significantly volatile across these years (Exhibit 83). These are all indications of the type of industry Nvidia and its peers operate in, technology, a sector characterized by above average ROIC figures and often low capital requirements (Exhibit 84): recall that Nvidia does not own any manufacturing facilities nor directly manufacture the semiconductors used in their products, which means most of its capital resides in central/HQ related PP&E, operational or R&D equipment and intangibles. An example of an opposed company would be a car manufacturer, whose business requires significant CAPEX to grow. Nvidia's "real" capital resides in intangibles such as brand, distribution capabilities, Intellectual-Property (IP), innovation, and these are difficult to capture using financial statements.

This brings us to the determinants of ROIC. Not only is ROIC dependent on the sector which the firm operates in, but also on its competitive advantage. Recall the VRIN analysis at the beginning of this report, where we concluded that Nvidia had sustainable competitive advantage from its customer experience/value proposition and technological advancement/integration. Other resources like brand image, corporate leadership and vision, and Nvidia's propensity for innovation could also be sources of competitive advantage in the future. It is often the case, in the long run, for industries to witness their ROIC converge to the cost of capital. This happens because the sector is new and attractive, which attracts new firms to join, consequently increasing competition, squeezing margins and ROIC accordingly. However, we expect Nvidia's sustainable competitive advantage to block the destruction of return by new entrants, therefore sustaining its ROIC above the cost of capital.

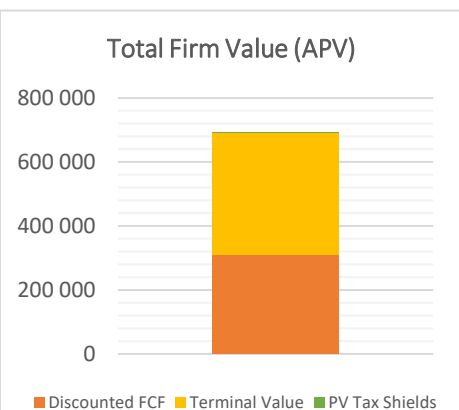
As a result, we expect a steady state Core ROIC of 30% (Exhibit 85), a value we considered reasonable when accounting for both the type of sector, industry peers' core ROIC and Nvidia's competitive advantage in the long run.

Terminal Value (TV)

Upon reaching a steady state level, where Nvidia's growth rate and core ROIC were both constant and matching our long-term assumptions, a terminal value was applied for the year FY2050 onwards. The result was \$376.792 million (discounted to PV), which implies the TV for Nvidia accounts for 55% of the firm's estimated APV (Exhibit 86).

Intrinsic Share Price

Considering both PV of tax shields (\$2492 million) and the non-core value of the firm (book value of \$12.568 million), our estimated enterprise value (EV) stands at \$706.062

Exhibit 86:

Source: Analysts estimates

Exhibit 87:

Total Shareholder's Return (TSR)	
Intrinsic Share Price	285,52
NVIDIA CORPORATION (XNAS:NVDA)	281,61
Net Cash Transactions w/ shareholders	0,77
Annualized TSR	1,14%

Source: Analysts estimates

Exhibit 88:

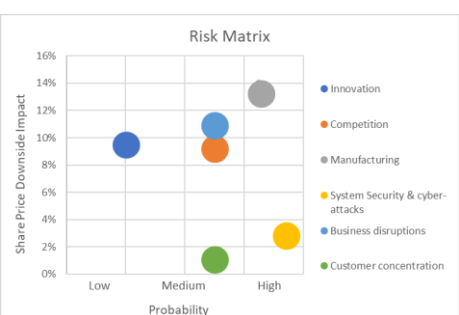
Beta sensitivity analysis:							
Beta	0,756	0,941	1,127	1,313	1,498	1,684	1,870
	5,14%	6,02%	6,90%	7,78%	8,66%	9,54%	10,42%
Share price	1737,72	677,47	407,53	285,52	216,68	172,89	142,79

Source: Analysts estimates

Exhibit 89:

Debt level and TS sensitivity analysis:				
Debt level on BS (\$ m)	0	11 864	50 000	100 000
PV Tax Shields (\$ m)	0	2 492	10 501	21 002
Share price	285,03	285,52	287,08	289,12

Source: Analysts estimates

Exhibit 90:

Source: Analysts estimates

million. Adjusting for Net Debt and other claims, the resultant equity value is \$713.792 million. Nvidia currently has 2500 million shares outstanding, which gives us an intrinsic share price value of \$285,52, compared to the current \$281,61 (as of 13/12/2021). For a representative investor buying shares in January 2022, and holding them for one year, the total annualized shareholder return would be 1,14%, considering all net cash transactions between the firm and shareholder that took place in FY23 (Exhibit 87).

Sensitivity and Scenario Analysis

Sensitivity Analysis

As we referred previously in the report, a crucial element for the valuation is Nvidia's cost of unlevered equity, which is mainly driven by the Beta. Our previous analysis and procedures demonstrated that Nvidia's Beta has been quite volatile in recent past, which yielded a significantly wide confidence interval on our Beta regression. Therefore, we decided to perform a sensitivity analysis of Beta on our share price target, using that same regression confidence interval range (Exhibit 88).

We can observe that, the higher the beta, and consequently the cost of unlevered equity, the smaller will be the target share price. However, it's interesting to notice that the left-hand side seems to be a lot more sensitive, with smaller values of Beta causing a bigger impact on share price than the ones of the right side. Therefore, we expect that if the stock starts behaving more in tandem with the overall market (Beta near 1, or even below), a larger price target and shareholder's return can be expected in the future.

Lastly, to understand how critical and impactful our assumed debt level was on the valuation model, we performed a sensitivity analysis of the level of debt assumed, and its consequential impact of the tax shields on the target share price (Exhibit 89). As expected, the level of debt we assume for the future (even if arbitrary) has little to no impact on the valuation of the firm. The only impact debt has is reflected on the tax shields, which will be valued separately. However, as we have shown in Exhibit 86, the weight of the tax shields on the firm's total value is marginal.

Scenario Analysis: Risk factors

In addition to the "standard scenario" share price target, we decided to identify some major risks for Nvidia and quantify their impact on the firm's price target, as well as the probability of those risks materializing, measured in low-medium-high (Exhibit 90).

Industry related risks:

Innovation

The semiconductor industry, like all technological-related industries, often experiences swift technological change, disruptions from new products, changes in customer needs and constant innovation, which makes current products quickly obsolete. Nvidia's

success as a technological company depends on its ability to identify emerging market changes and develop new products and technologies that meet the needs of the market. Therefore, failing to meet these requirements will negatively impact revenues and financial results. That is the reason why Nvidia takes its innovation and R&D efforts so seriously, having spent over \$24 billion on R&D since inception, and making sure this leads to the development of innovative products and technology that provide value to customers. As comparison, Nvidia's R&D budget is more than twice of its closest competitor, AMD (\$3,92 billion Nvidia vs \$1,98 billion AMD last fiscal year). A scenario where Nvidia's products become technologically replaceable, for instance because a competitor comes up with a product capable of replacing GPUs, could easily draw clients away and deem Nvidia's R&D efforts worthless. On this bearish scenario, we estimate the company wide penetration rate could decrease²⁹ by 10% and R&D-to-sales ratio increase²⁹ 10%, which would imply an intrinsic share price of \$255,30 (original = \$285,52), equivalent to a downside of roughly 11%.

Competition

As mentioned in the Porter's Five Forces analysis, competitive forces in the industry are strong and Nvidia needs to remain at the vanguard of technological innovation, otherwise it'll lose ground to its competitors, whether because products/services by competitors become relatively less costly and/or offer superior performance and functionalities. The case of inferior products compared to competitors may jeopardize Nvidia's market share and revenue figures. On a bearish scenario we estimate an impact of a loss in Market share up²⁹ to 10% cross-segment, which would imply an intrinsic share price of \$255,88 (original = \$285,52), equivalent to a downside of roughly 10%.

Supply Chain related risks:

Manufacturing

Nvidia depends on third parties to manufacture, assemble, test, and package its products. This creates risks and uncertainty around product quantity and quality, lack of guaranteed supply and delivery, shortages, delays, etc. In fact, the firm is highly dependent on companies like TSMC and Samsung (foundries) to manufacture wafers, resulting in adverse effects on Nvidia's ability to meet customer demand and scale supply chain. In addition, low manufacturing yields could cause an increase of manufacturing costs and harm customer/partner, negatively impacting the firm's operations and financial results. Historically, there has been yield related issues in 2010 and, according to industry reporters Monica Chen, Daniel Nenni and Jessie Shen, last year, with Samsung's 8 nm processors, which caused a short supply of Nvidia's RTX30 series cards³⁰. Non-optimal contracts with independent subcontractors could easily either increase Nvidia's COGS

²⁹ 10% reduction relative to current value. i.e., if penetration rate is 30%, reduction of 10% means "new" penetration rate = $30\% * (1 - 10\%)$

³⁰ Source: <https://www.digitimes.com/news/a20201211PD200.html>

or cause a short supply due to delays and inefficiencies. In such a bearish scenario, we estimate Nvidia's Gross margins can decrease²⁹ by 5%, which would imply an intrinsic share price of \$243,92 (a downside of 15%).

Operations related risks:

System security and cyber-attacks

Attacks on Nvidia's systems have occurred and are expected to occur in the future, despite the efforts to develop security measures. Currently the biggest threat related to this risk is Nvidia's CMP strategy being under fire: as hackers have been trying to find ways to bypass Nvidia's Hash rate limit strategy, the RTX30 series has already been successfully hacked to up 70% of Hash Rate effectiveness, making crypto miners flood to buy RTX30 GPUs instead of the dedicated CMPs, which directly causes shortages for gaming customers. To quantify the risk of Hash Rate hacks, we assume crypto miners do not rely on CMP offers but rather on the "potentially" hacked gaming GPUs, forcing gaming GPU shortages, which drive their gaming customer base away to competitors and would cause a permanent loss of 5% in gaming market share (absolute reduction). The revenue from crypto miners is somewhat transferred from the OEM & Others segment (where CMPs stand) to gaming, nevertheless we assume -15% CMP Sales due to unsold products. This bearish scenario implies an intrinsic share price of \$274,94 (a downside of 4% vs standard scenario).

Business disruptions

Nvidia's international operations are located in geographical areas, such as Asia-Pacific, historically exposed to events like earthquakes, power or water shortages, floods, fires, terrorist attacks, pandemics and other natural or man-made disasters. The occurrence of these disruptions can harm Nvidia's business and result in substantial losses for the firm. Furthermore, geopolitical changes or changes in government regulation and policies, like the China-US trade war also pose significant risk of jeopardizing Nvidia's operations. Finally, it goes without saying that Covid-19 has impacted Nvidia's operations as well, as there is the risk of continuing to do so in case countries fail to contain the spread and increase of cases, possibly leading to further restrictions and lockdowns, together with supply chain disruptions and economic uncertainty. As seen from the case of the draught in Taiwan this past summer, natural disasters can disrupt the supply chain and lead to a decrease in Gross margins (due to higher COGS). To quantify these risks, we can fix Gross Margins to mid corona times and assume that a set of future disruptions limits cross-segment Gross Margins to 62,35%, the GM figure in FY21 (pandemic hit). As a result, this bearish scenario implies an intrinsic share price of \$252,23 (downside of 12% vs the standard scenario).

Customer concentration

A significant amount of Nvidia's revenue comes from a limited number of customers within their distribution and partner network, meaning sales can be highly affected if any of these customers is lost or prevented from selling to. Companies like Lenovo and Dell are responsible by roughly 17% of Nvidia's revenue stream. Nvidia's distribution and partners are critical because it is through their channels that the company sells to multiple target market platforms, making Nvidia's operating results dependent on its partners' ability to sell products that incorporate Nvidia's technology. On a bearish scenario we estimate Nvidia losing a main customer such as Dell, which consists of ~8% of Nvidia's revenues. Therefore, in a hypothetical scenario where Dell stops buying from Nvidia, we assume revenues will be reduced those same 8% for 5 years, and then 4% for another 5 years, as other companies progressively replace Dell in Nvidia's revenue stream. As a result, this bearish scenario implies an intrinsic share price of \$281,78. (minimal impact of -1,3% vs standard scenario).

Relative Valuation

In addition to the APV model that we used to calculate Nvidia's intrinsic share price, a relative valuation was conducted to provide a different perspective on the firm's value. We opted to perform a comparables approach, starting with a framework to select peer companies that were similar enough to Nvidia to be used as a comparable, based on Market Cap, Unlevered Betas, Correlation with Nvidia's stock performance, and segment/market similarity.

The most similar companies overall were AMD, Intel and Xilinx (Exhibit 91), and while AMD and Intel were accepted as peers for the relative valuation, we rejected Xilinx on the basis of its small market cap, high likelihood of acquisition by AMD³¹ and its product mix differing significantly from Nvidia, despite participating in 4/5 of Nvidia's segments.

Exhibit 91:

	Market Cap (M\$)	Unlevered Beta	Correlation w/ NVIDIA	Equivalent Segments?						Comparable?
				Gaming	Professional Visualization	Data Center	Automotive	OEM&Others		
NVIDIA	754 950	1,32	1,00	Yes	Yes	Yes	Yes	Yes	-	-
AMD	167 314	2,07	0,43	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Amberella	7 619	1,29	0,15	No	No	No	No	Yes	Yes	No
Synaptics	11 061	1,18	0,32	No	No	No	Yes	Yes	Yes	No
Intel	205 244	0,58	0,32	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Broadcom	260 010	0,80	0,41	No	No	Yes	No	Yes	Yes	No
Qualcomm	205 946	1,30	0,37	No	No	No	Yes	Yes	Yes	No
Xilinx	53 835	0,89	0,36	No	Yes	Yes	Yes	Yes	Yes	No
Lattice	10 573	1,09	0,29	No	No	No	No	Yes	Yes	No
Microchip	48 346	1,32	0,41	No	No	No	No	Yes	Yes	No
Silicon	8 093	1,10	0,43	No	No	No	No	Yes	Yes	No

Source: Analysts estimates

Having both AMD and Intel as our relative valuation peers, the multiples we chose were the following: Price to Sales (P/S), Price to Earnings (P/E), EV to EBIT³² (EV/EBIT). These 3 multiples were calculated considering both FY22 estimated data and on a forward-looking data (FY23 forecast), to better match the time horizon in the APV.

³¹ Source: <https://www.amd.com/en/press-releases/2020-10-27-amd-to-acquire-xilinx-creating-the-industry-s-high-performance-computing>

³² We opted for EBIT rather than EBITDA because of the low CAPEX and tangible asset needs for these companies (fabless manufacturing).

Exhibit 92:**FY23 Price Target**

P/S (Forward)	95,96
EV/EBIT (Forward)	129,8
P/E (Forward)	126,8
APV @ 7,78%	285,5

Source: Analysts estimates

Exhibit 93:

Company	Multiples			
	P/S	EV/EBITDA	EV/EBIT	P/E
Nvidia	27,1x	78,0x	89,7x	86,5x
Intel	2,6x	4,1x	9,0x	10,0x
AMD	10,5x	41,0x	50,7x	55,8x

Source: Analysts estimates

Based on our relative valuation metrics, which can be graphically examined in the football field valuation charts (Appendix 10), it's fair to conclude that Nvidia's current share price is trading at a premium relative to its peers: it's current multiples are significantly above its comps, indicative of an extremely high growth assumption priced into the stock. It may not necessarily mean the stock is overvalued if the growth expectations of investors materialize going forward, as we have seen in recent years in the firm's financial results. Furthermore, if we compare the results from this approach with our APV model, the results gathered from both valuation methods do not seem to be in line: the APV is implying a higher share price target than the forward multiples valuation (Exhibit 92).

Although helpful to triangulate and give more reassurance to our price target estimate, this valuation technique is highly limited and has its flaws: **1)** The use of only 2 peers, based on company similarity, gives us a very limited pool of comparables and limited results for mean/median of relative multiples; **2)** Intel's multiples are significantly below its peers (Exhibit 93), acting as an outlier and causing distortions for the relative valuation, possibly understating Nvidia's relative share price. As we have said before, Intel is at a different maturity stage than the likes of Nvidia and AMD, with more modest growth figures for Sales, Earnings and EBIT, which may justify smaller multiples.

Therefore, based on the limitations of the relative valuation, we are prioritizing and sticking to our APV model to infer about the target share price.

Investment Thesis and Catalysts

We propose a Hold recommendation on Nvidia shares. Even though the outlook for the acquisition of Arm is negative, we still believe Nvidia alone holds a strong position as a technology company. The continuing popularity and increase in gaming population, the Metaverse opportunity, the increasing demand and worldwide adoption of AI, and the development of AVs are some of the catalysts that ground our thesis and will ensure the continuing expansion and success of the company. However, as the market seems to be already reflecting the expectations of growth for Nvidia, we see limited upside in the near term. Out of the risk scenarios, the only scenario that wouldn't imply a downgrade in our recommendation from Hold to Sell is the Customer concentration risk, which would still yield a marginal, but positive, annualized Total Shareholder Return of 0,20%.

Appendix

Appendix 1: Nvidia's Historical Financial Statements

	January 29, 2017	January 28, 2018	January 27, 2019	January 26, 2020	January 31, 2021
Revenue	6 910,0	9 714,0	11 716,0	10 918,0	16 675,0
Cost of revenue	2 847,0	3 892,0	4 545,0	4 150,0	6 279,0
Gross profit	4 063,0	5 822,0	7 171,0	6 768,0	10 396,0
Operating expenses					
Research and development	1 463,0	1 797,0	2 376,0	2 829,0	3 924,0
Sales, general and administrative	663,0	815,0	991,0	1 093,0	1 940,0
<i>D&A (not included in IS, auxiliary line)</i>	<i>187,0</i>	<i>199,0</i>	<i>262,0</i>	<i>381,0</i>	<i>1 098,0</i>
Restructuring and other charges	3,0	0,0			
Total operating expenses	2 129,0	2 612,0	3 367,0	3 922,0	5 864,0
Income from operations	1 934,0	3 210,0	3 804,0	2 846,0	4 532,0
Interest income	54,0	69,0	136,0	178,0	57,0
Interest expense	-58,0	-61,0	-58,0	-52,0	-184,0
Other, net	-25,0	-22,0	14,0	-2,0	4,0
Other income (expense), net	-29,0	-14,0	92,0	124,0	-123,0
Income before income tax	1 905,0	3 196,0	3 896,0	2 970,0	4 409,0
Income tax expense (benefit)	239,0	149,0	-245,0	174,0	77,0
Net income	1 666,0	3 047,0	4 141,0	2 796,0	4 332,0
Net income per share:					
Basic	3,1	5,1	6,8	4,6	7,0
Diluted	2,6	4,8	6,6	4,5	6,9
Weighted average shares used in per share computation:					
Basic	541,0	599,0	608,0	609,0	617,0
Diluted	649,0	632,0	625,0	618,0	628,0
Consolidated Statements of Comprehensive Inc RESULTS					
Available-for-sale debt securities, Net change in unrealized gain (loss)	-16,0	-4,0	11,0	8,0	0,0
Cash flow hedges, Net change in unrealized gain (loss)	4,0	2,0	-5,0	5,0	18,0
Other comprehensive income (loss), net of tax	-12,0	-2,0	6,0	13,0	18,0
Total comprehensive income	1 654,0	3 045,0	4 147,0	2 809,0	4 350,0

	January 29, 2017	January 28, 2018	January 27, 2019	January 26, 2020	January 31, 2021
ASSETS					
Current assets:					
Cash and cash equivalents	1 766,0	4 002,0	782,0	10 896,0	847,0
Marketable securities	5 032,0	3 106,0	6 640,0	1,0	10 714,0
Accounts receivable, net	826,0	1 265,0	1 424,0	1 657,0	2 429,0
Inventories	794,0	796,0	1 575,0	979,0	1 826,0
Prepaid expenses and other current assets	118,0	86,0	136,0	157,0	239,0
Total current assets	8 536,0	9 255,0	10 557,0	13 690,0	16 055,0
Property and equipment, net	521,0	997,0	1 404,0	1 674,0	2 149,0
Operating lease assets				618,0	707,0
Goodwill	618,0	618,0	618,0	618,0	4 193,0
Intangible assets, net	104,0	52,0	45,0	49,0	2 737,0
Deferred income tax assets			560,0	548,0	806,0
Other assets	62,0	319,0	108,0	118,0	2 144,0
Total assets	9 841,0	11 241,0	13 292,0	17 315,0	28 791,0
LIABILITIES AND SHAREHOLDERS' EQUITY					
Current liabilities:					
Accounts payable	485,0	596,0	511,0	687,0	1 201,0
Accrued and other current liabilities	507,0	542,0	818,0	1 097,0	1 725,0
Short-term debt	796,0	15,0	0,0	0,0	999,0
Total current liabilities	1 788,0	1 153,0	1 329,0	1 784,0	3 925,0
Long-term debt	1 983,0	1 985,0	1 988,0	1 991,0	5 964,0
Long-term operating lease liabilities				561,0	634,0
Capital lease obligations, long-term	6,0				
Other long-term liabilities	277,0	632,0	633,0	775,0	1 375,0
Total liabilities	4 048,0	3 770,0	3 950,0	5 111,0	11 898,0
Commitments and contingencies - see Note 13			0,0		
Convertible debt conversion obligation	31,0				
Shareholders' equity:					
Preferred stock, \$0.001 par value; 2 shares authorized; none issued				0,0	0,0
Common stock, \$0.001 par value; 2,000 shares authorized; 965 shares issued and 620 outstanding as of January 31, 2021; 955 shares issued and 612 outstanding as of January 26, 2020	1,0	1,0	1,0	1,0	1,0
Additional paid-in capital	4 708,0	5 351,0	6 051,0	7 045,0	8 721,0
Treasury stock, at cost (345 shares in 2021 and 342 shares in 2020)	-5 039,0	-6 650,0	-9 263,0	-9 814,0	-10 756,0
Accumulated other comprehensive income	-16,0	-18,0	-12,0	1,0	19,0
Retained earnings	6 108,0	8 787,0	12 565,0	14 971,0	18 908,0
Total shareholders' equity	5 762,0	7 471,0	9 342,0	12 204,0	16 893,0
Total liabilities and shareholders' equity	9 841,0	11 241,0	13 292,0	17 315,0	28 791,0

	January 29, 2017	January 28, 2018	January 27, 2019	January 26, 2020	January 31, 2021
Cash flows from operating activities:					
Net income	1 666,0	3 047,0	4 141,0	2 796,0	4 332,0
Adjustments to reconcile net income to net cash provided by operating activities:					
Stock-based compensation expense	247,0	391,0	557,0	844,0	1 397,0
Depreciation and amortization	187,0	199,0	262,0	381,0	1 098,0
Deferred income taxes	197,0	-359,0	-315,0	18,0	-282,0
Loss on early debt conversions	21,0	19,0			
Other	33,0	20,0	-45,0	5,0	-20,0
Changes in operating assets and liabilities, net of acquisitions:					
Accounts receivable	-321,0	-440,0	-149,0	-233,0	-550,0
Inventories	-375,0	0,0	-776,0	597,0	-524,0
Prepaid expenses and other assets	-18,0	21,0	-55,0	77,0	-394,0
Accounts payable	184,0	90,0	-135,0	194,0	363,0
Accrued and other current liabilities	-135,0	33,0	256,0	54,0	239,0
Other long-term liabilities	-14,0	481,0	2,0	28,0	163,0
Net cash provided by operating activities	1 672,0	3 502,0	3 743,0	4 761,0	5 822,0
Cash flows from investing activities:					
Proceeds from maturities of marketable securities	969,0	1 078,0	7 232,0	4 744,0	8 792,0
Proceeds from sales of marketable securities	1 546,0	863,0	428,0	3 365,0	527,0
Purchases of marketable securities	-3 134,0	-36,0	-11 148,0	-1 461,0	-19 308,0
Acquisitions, net of cash acquired			0,0	-4,0	-8 524,0
Purchases related to property and equipment and intangible assets	-176,0	-593,0	-600,0	-489,0	-1 128,0
Investments and other, net	-5,0	-36,0	-9,0	-10,0	-34,0
Proceeds from sale of long-lived assets and investments	7,0	2,0	0,0		
Net cash provided by (used in) investing activities	-793,0	1 278,0	-4 097,0	6 145,0	-19 675,0
Cash flows from financing activities:					
Issuance of debt, net of issuance costs	1 988,0	0,0	0,0	0,0	4 968,0
Proceeds related to employee stock plans	167,0	139,0	137,0	149,0	194,0
Payments related to tax on restricted stock units	-673,0	-812,0	-1 032,0	-551,0	-942,0
Dividends paid	-261,0	-341,0	-371,0	-390,0	-395,0
Principal payments on property and equipment			0,0	0,0	-17,0
Payments related to repurchases of common stock	-739,0	-909,0	-1 579,0	0,0	0,0
Repayment of Convertible Notes	-176,0	-612,0	-16,0	0,0	0,0
Other	-15,0	-9,0	-5,0	0,0	-4,0
Net cash provided by (used in) financing activities	291,0	-2 544,0	-2 866,0	-792,0	3 804,0
Change in cash and cash equivalents	1 170,0	2 236,0	-3 220,0	10 114,0	-10 049,0
Cash and cash equivalents at beginning of period	596,0	1 766,0	4 002,0	782,0	10 896,0
Cash and cash equivalents at end of period	1 766,0	4 002,0	782,0	10 896,0	847,0
Supplemental disclosures of cash flow information:					
Cash paid for income taxes, net			61,0	176,0	249,0
Cash paid for interest			55,0	54,0	138,0

	January 29, 2017	January 28, 2018	January 27, 2019	January 26, 2020	January 31, 2021
Net income	1 666,0	3 047,0	4 141,0	2 796,0	4 332,0
Other comprehensive income (loss), net of tax					
Available-for-sale debt securities:					
Net unrealized gain (loss)	-17,0	-5,0	10,0	8,0	2,0
Reclassification adjustments for net realized gain included in net income	1,0	1,0	1,0	0,0	-2,0
Net change in unrealized gain (loss)	-16,0	-4,0	11,0	8,0	0,0
Cash flow hedges:					
Net unrealized gain (loss)	2,0	-1,0	6,0	10,0	9,0
Reclassification adjustments for net realized gain (loss) included in net income	2,0	3,0	-11,0	-5,0	9,0
Net change in unrealized gain (loss)	4,0	2,0	-5,0	5,0	18,0
Other comprehensive income (loss), net of tax	-12,0	-2,0	6,0	13,0	18,0
Total comprehensive income	1 654,0	3 045,0	4 147,0	2 809,0	4 350,0

Appendix 2: Nvidia's Forecasted Financial Statements

Income Statement forecast

	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022 (E)	FY2023 (F)	FY2024 (F)	FY2025 (F)	FY2026 (F)	FY2027 (F)
Core operations:											
Gaming Revenues	4 060,0	5 513,0	6 246,0	5 518,0	7 759,0	11 790,9	15 749,3	20 818,1	26 334,9	31 387,2	36 252,2
Professional Visualization Revenues	835,0	934,0	1 130,0	1 212,0	1 053,0	1 817,7	1 858,4	2 378,6	2 892,5	3 414,2	3 909,3
Data Center Revenues	830,0	1 932,0	2 932,0	2 983,0	6 696,0	10 431,3	16 693,4	20 599,8	24 855,5	28 527,3	32 406,0
Total Automotive Revenues (1+2)	487,0	558,0	641,0	700,0	536,0	661,4	1 029,1	1 179,4	1 425,6	1 637,5	1 964,1
OEM & Others Revenues	698,0	777,0	767,0	505,0	631,0	1 293,0	1 313,3	1 335,6	1 360,2	1 387,1	1 412,0
Total Revenues	6 910,0	9 714,0	11 716,0	10 918,0	16 675,0	25 994,3	36 643,4	46 311,5	56 868,7	66 353,1	75 943,7
Total Cost of Revenues	2 847,0	3 892,0	4 545,0	4 150,0	6 279,0	9 707,1	13 831,5	16 926,6	20 269,2	23 097,4	25 865,8
Total Gross Profit	4 063,0	5 822,0	7 171,0	6 768,0	10 396,0	16 287,3	22 811,8	29 384,9	36 599,5	43 255,7	50 077,9
Operating expenses:											
Total R&D	1 463,0	1 797,0	2 376,0	2 829,0	3 924,0	5 246,6	8 897,6	11 981,7	15 174,0	17 704,6	20 263,7
Sales, general and administrative (excluding D&A)	476,0	616,0	729,0	712,0	842,0	999,9	1 557,1	1 967,9	2 416,5	2 819,5	3 227,1
D&A	187,0	199,0	262,0	381,0	1 098,0	1 188,5	1 754,0	2 161,0	2 593,0	2 957,5	3 326,1
Core Result before Taxes	1 937,0	3 210,0	3 804,0	2 846,0	4 532,0	8 852,4	10 603,2	13 274,3	16 415,9	19 774,0	23 261,0
Statutory Taxes	678,2	1 088,7	798,7	597,9	951,8	1 859,2	2 226,9	2 787,9	3 447,8	4 153,0	4 885,4
Tax adjustments (benefit):	-381,0	-716,0	-530,0	-399,0	-724,0	-919,6	-1 060,2	-1 543,9	-1 923,5	-2 294,0	-2 676,1
Foreign tax rate differential	-315,0	-545,0	-412,0	-301,0	-561,0	-709,7	-850,4	-1 064,6	-1 316,5	-1 585,9	-1 865,5
US federal R&D tax credit	-70,0	-181,0	-141,0	-110,0	-173,0	-209,9	-209,9	-479,3	-607,0	-708,2	-810,5
Cash flow hedges, net change in unrealized gain (loss)	4,0	2,0	-5,0	5,0	18,0	0,0	0,0	0,0	0,0	0,0	0,0
Core Result	1 643,8	2 839,3	3 530,3	2 652,1	4 322,2	7 912,7	9 436,5	12 030,2	14 891,7	17 915,0	21 051,6
Non Core Operations:											
Restructuring and other Charges	3,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Interest income	54,0	69,0	136,0	178,0	57,0	318,1	448,5	566,8	696,0	812,1	929,4
Other, net	-25,0	-22,0	14,0	-2,0	4,0	0,0	0,0	0,0	0,0	0,0	0,0
Non-core result before taxes	26,0	47,0	150,0	176,0	61,0	318,1	448,5	566,8	696,0	812,1	929,4
Statutory taxes	9,1	15,9	31,5	37,0	12,8	66,8	94,2	119,0	146,2	170,6	195,2
Tax Adjustments (benefit)	-47,0	-219,0	-533,0	-51,0	-125,0	-195,0	-195,0	-195,0	-195,0	-195,0	-195,0
Available-for-sale debt securities, net change in unrealized gain (loss)	-16,0	-4,0	11,0	8,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Non-core result	47,9	246,1	662,5	198,0	173,2	446,3	549,3	642,7	744,8	836,5	929,2
Financial Operations:											
Interest expense	-58,0	-61,0	-58,0	-52,0	-184,0	-283,1	-431,1	-431,1	-431,1	-431,1	-431,1
Financial Result before taxes	-58,0	-61,0	-58,0	-52,0	-184,0	-283,1	-431,1	-431,1	-431,1	-431,1	-431,1
Statutory taxes	-20,3	-20,7	-12,2	-10,9	-38,6	-59,5	-90,5	-90,5	-90,5	-90,5	-90,5
Tax Adjustments	0	0	0	0	0	0	0	0	0	0	0
Financial Result	-37,7	-40,3	-45,8	-41,1	-145,4	-223,7	-340,5	-340,5	-340,5	-340,5	-340,5
Total Comprehensive Income	1 654,0	3 045,0	4 147,0	2 809,0	4 350,0	8 135,4	9 645,2	12 332,4	15 295,9	18 410,9	21 640,3

Balance Sheet Forecast

*Forecasted values in blue	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022 (E)	FY2023 (F)	FY2024 (F)	FY2025 (F)	FY2026 (F)	FY2027 (F)
Core Business											
Operating Cash*	345,5	485,7	585,8	545,9	833,8	1 299,7	1 832,2	2 315,6	2 843,4	3 317,7	3 797,2
Accounts receivable, net	826,0	1 265,0	1 424,0	1 657,0	2 429,0	4 215,9	5 943,0	7 511,1	9 223,3	10 761,6	12 317,0
Inventories:	794,0	796,0	1 575,0	979,0	1 826,0	2 435,0	3 705,7	4 534,9	5 430,5	6 188,2	6 929,9
Property and equipment, net:	521,0	997,0	1 404,0	1 674,0	2 149,0	2 786,9	5 051,4	6 607,5	8 253,5	9 630,0	11 021,9
Central/HQ related PP&E, gross	513,0	902,0	1 024,0	1 245,0	1 588,0	2 764,1	3 896,4	4 924,4	6 047,0	7 055,5	8 075,3
Operational equipment, gross	678,0	835,0	1 147,0	1 440,0	1 969,0	2 632,6	4 464,7	6 012,2	7 614,1	8 883,9	10 168,0
Accumulated depreciation and amortization	-670,0	-740,0	-767,0	-1 011,0	-1 408,0	-2 136,2	-3 309,6	-4 329,2	-5 407,6	-6 309,5	-7 221,4
Operating lease assets	0,0	0,0	0,0	618,0	707,0	978,6	1 682,8	2 126,8	2 611,6	3 047,1	3 487,6
Intangible assets, net	78,0	37,0	38,0	46,0	231,0	306,3	268,0	338,7	415,9	485,3	555,4
Patents and licensed technology, gross	468,0	469,0	491,0	520,0	706,0	854,7	1 465,7	1 852,5	2 274,7	2 654,1	3 037,7
Accumulated amortization	-390,0	-432,0	-453,0	-474,0	-475,0	-548,4	-1 197,7	-1 513,8	-1 858,8	-2 168,9	-2 482,3
Accounts payable	-485,0	-596,0	-511,0	-687,0	-1 201,0	-2 349,0	-3 347,1	-4 173,7	-4 442,6	-4 429,6	-4 251,9
Accrued and other current liabilities:	-482,0	-517,0	-798,0	-986,0	-1 530,0	-2 050,5	-2 760,7	-3 489,1	-4 284,4	-4 999,0	-5 721,5
Other long-term liabilities:	-136,0	-614,0	-614,0	-746,0	-1 134,0	-1 604,5	-2 035,9	-2 573,0	-3 159,6	-3 686,5	-4 219,4
Cash available for M&A investment							1 799,8	1 959,4	2 619,4	5 019,9	6 190,0
Core Business Invested Capital	1 461,5	1 853,7	3 103,8	3 100,9	4 310,8	6 018,3	12 139,3	15 158,2	19 511,1	25 334,6	30 106,2
Non Core Business:											
Goodwill	618,0	618,0	618,0	618,0	4 193,0	4 302,0	4 302,0	4 302,0	4 302,0	4 302,0	4 302,0
Prepaid expenses and other current assets	118,0	86,0	136,0	157,0	239,0	1 557,0	1 557,0	1 557,0	1 557,0	1 557,0	1 557,0
Other assets	62,0	319,0	108,0	118,0	2 144,0	3 761,0	3 761,0	3 761,0	3 761,0	3 761,0	3 761,0
Deferred tax assets, net	-141,0	-18,0	541,0	519,0	565,0	718,0	718,0	718,0	718,0	718,0	718,0
Other adjustments	-25,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Acquisition related intangibles, net:	26,0	15,0	7,0	3,0	2 506,0	2 230,0	2 230,0	2 230,0	2 230,0	2 230,0	2 230,0
Acquisition related intangibles, gross	193,0	195,0	195,0	195,0	3 280,0	3 396,0	3 396,0	3 396,0	3 396,0	3 396,0	3 396,0
Accumulated amortization	-167,0	-180,0	-188,0	-192,0	-774,0	-1 166,0	-1 166,0	-1 166,0	-1 166,0	-1 166,0	-1 166,0
Non Core Business Invested Capital	658,0	1 020,0	1 410,0	1 415,0	9 647,0	12 568,0	12 568,0	12 568,0	12 568,0	12 568,0	12 568,0
Total Invested Capital	2 119,5	2 873,7	4 513,8	4 515,9	13 957,8	18 586,3	24 707,3	27 726,2	32 079,1	37 902,6	42 674,2
Financial:											
Excess cash	6 452,5	6 622,3	6 836,2	10 351,1	10 727,3	17 998,3	19 593,9	26 194,3	33 466,3	41 266,9	52 076,3
Debt:	-2 810,0	-2 025,0	-2 008,0	-2 663,0	-7 792,0	-11 864,0	-11 864,0	-11 864,0	-11 864,0	-11 864,0	-11 864,0
Net Financial Assets	3 642,5	4 597,3	4 828,2	7 688,1	2 935,3	6 134,3	7 729,9	14 330,3	21 602,3	29 402,9	40 212,3
Total Shareholder's Equity											
	5 762,0	7 471,0	9 342,0	12 204,0	16 893,0	24 721,0	32 437,2	42 056,5	53 681,4	67 305,5	82 886,5
D/E Ratio (BV)	-63%	-62%	-52%	-63%	-17%	-25%	-24%	-34%	-40%	-44%	-49%
Transactions with shareholders		-1 336,0	-2 276,0	53,0	339,0	-307,4	-1 929,0	-2 713,1	-3 671,0	-4 786,8	-6 059,3
Payout Ratio		44%	55%	-2%	-8%	4%	20%	22%	24%	26%	28%

Appendix 3: Nvidia's Beta Regression Output

Regression

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,4817705
R Square	0,2321028
Adjusted R Square	0,2215836
Standard Error	0,1027266
Observations	75

Estimate beta:

5y of monthly data (most used by practitioners)

Rf: 10y zero coupon Gov bond

Market proxy: S&P500 in USD

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0,232844373	0,232844	22,06481	1,20802E-05
Residual	73	0,770350729	0,010553		
Total	74	1,003195102			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	0,0369404	0,012166917	3,036139	0,003321	0,012691819	0,0611891	0,01269182	0,06118908
X Variable 1	1,3128262	0,279484149	4,697319	1,21E-05	0,7558151	1,8698373	0,7558151	1,86983731
	Raw Beta				95% CI			

Appendix 4: Unlevered Beta Multiples

Beta Multiples approach:

Company	Raw Beta	D/E	Unlevered Beta
AMD	2,064	-0,62%	2,074
Ambarella Inc	1,236	-5,85%	1,296
Synaptics Inc	1,192	1,28%	1,180
Intel Corp	0,650	15,94%	0,577
Broadcom Inc	0,886	13,91%	0,798
Qualcomm Inc	1,331	3,05%	1,299
Xilinx Inc	0,875	-2,72%	0,894
Lattice Semiconductor	1,093	0,81%	1,087
Microchip Technology	1,519	19,87%	1,313
Silicon Laboratories	1,094	-0,29%	1,097
Average	1,194		1,162
Median	1,143		1,138
Nvidia	1,3128	-0,42%	1,317

Appendix 5: Nvidia's Debt Notes

The carrying value of the Notes and the associated interest rates were as follows:

	Expected Remaining Term (years)	Effective Interest Rate	January 31, 2021	January 26, 2020
(In millions)				
2.20% Notes Due 2021	0.6	2.38%	\$ 1,000	\$ 1,000
3.20% Notes Due 2026	5.6	3.31%	1,000	1,000
2.85% Notes Due 2030	9.2	2.93%	1,500	—
3.50% Notes Due 2040	19.2	3.54%	1,000	—
3.50% Notes Due 2050	29.2	3.54%	2,000	—
3.70% Notes Due 2060	39.2	3.73%	500	—
Unamortized debt discount and issuance costs			(37)	(9)
Net carrying amount			6,963	1,991
Less short-term portion			(999)	—
Total long-term portion			\$ 5,964	\$ 1,991

Source: Nvidia's Annual Report FY21

Appendix 6: Nvidia's S&P credit rating

S&P Global Ratings affirms NVIDIA at "A-" (Local Currency LT credit rating); outlook stable

August 25, 2021 [Cbonds](#)

S&P Global Ratings affirmed the "A-" Local Currency LT credit rating of NVIDIA on August 24, 2021. The outlook is stable.

Company – [NVIDIA](#)



Full name NVIDIA Corporation
 Registration country USA
 Industry Semiconductors

Source: <https://cbonds.com/news/1440969/>

Appendix 7: Average Cumulative Default Rates for Information Technology sector

Global Corporate Average Cumulative Default Rates (1981-2020) (%)

Rating	--Time horizon (years)--														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AAA	0.00	0.03	0.13	0.24	0.34	0.45	0.51	0.59	0.64	0.70	0.72	0.75	0.78	0.84	0.90
AA	0.02	0.06	0.11	0.21	0.30	0.41	0.49	0.56	0.63	0.70	0.76	0.82	0.88	0.93	0.99
A	0.05	0.13	0.22	0.33	0.46	0.60	0.76	0.90	1.05	1.20	1.34	1.46	1.59	1.71	1.84
BBB	0.16	0.43	0.75	1.14	1.54	1.94	2.27	2.61	2.93	3.24	3.55	3.80	4.03	4.28	4.54
BB	0.63	1.93	3.46	4.99	6.43	7.75	8.89	9.90	10.82	11.64	12.33	12.99	13.59	14.09	14.65
B	3.34	7.80	11.75	14.89	17.35	19.36	20.99	22.31	23.50	24.62	25.58	26.31	26.99	27.63	28.24
CCC/C	28.30	38.33	43.42	46.36	48.58	49.61	50.75	51.49	52.16	52.76	53.21	53.68	54.23	54.69	54.76
Investment grade	0.09	0.24	0.41	0.63	0.86	1.09	1.30	1.50	1.69	1.88	2.05	2.20	2.35	2.49	2.65
Speculative grade	3.71	7.19	10.18	12.63	14.64	16.30	17.68	18.83	19.86	20.81	21.61	22.29	22.93	23.49	24.04
All rated	1.53	3.00	4.27	5.35	6.25	7.01	7.64	8.18	8.67	9.12	9.50	9.83	10.13	10.41	10.69

Sources: S&P Global Ratings Research and S&P Global Market Intelligence's CreditPro®.

Source: <https://www.maalot.co.il/Publications/TS20210408160139.PDF>

Appendix 8: Nvidia's Valuation Decomposition

Steady state value drivers:	
ROIC	30%
g	4,54%
Cost of Equity (unlevered)	7,80%
Sum of Discounted FCF	309 094,7
Terminal Value	2 657 514,0
Discounted TV	376 804,5
Core Unlevered Business Value	685 899,2
(1) Total Value Unlevered Firm	685 899,2
(2) PV Tax shields	2 491,7
APV (1+2)	688 390,9
Plus: Non-Core Value	12 568,0
Enterprise Value	700 958,9
Check	TRUE
Less: Net Debt & Other claims	-7 729,9
Equity Value	708 688,8
# Shares Outstanding (million)	2 500
Intrinsic Share Price	283,48

Appendix 9: Relative Valuation multiples

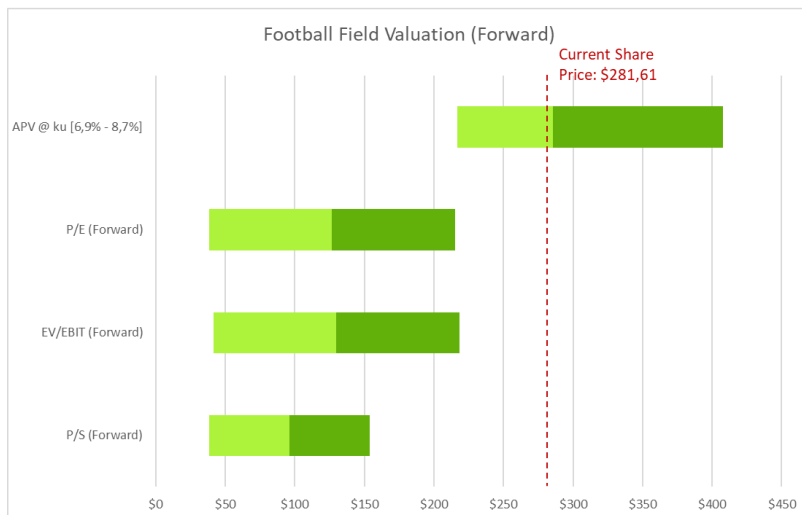
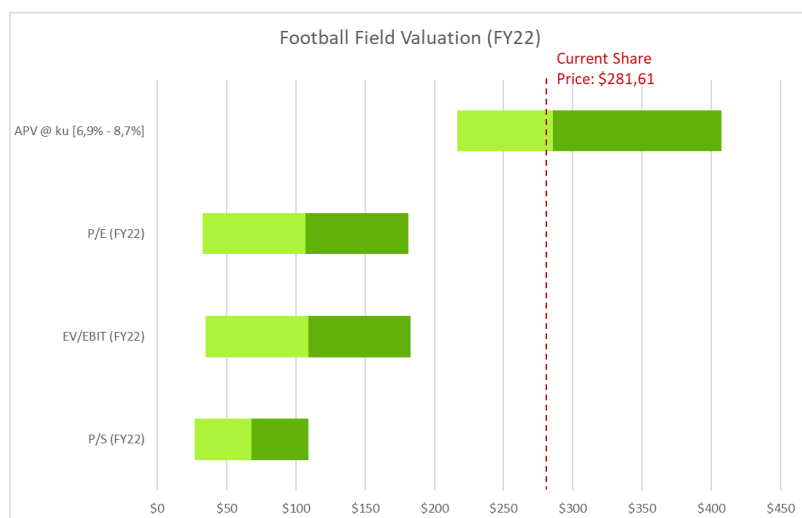
Market Data					
Company	Equity (MV)	Net Debt & Other Claims	Implicit Enterprise Value	Share price	Shares outstanding (mil)
Nvidia	704 025,0	-6 134,3	710 159,3	281,6	2 500
Intel	203 350,0	29 166,3	174 183,7	50,0	4067
AMD	162 295,4	-2 750,2	165 045,6	133,8	1213

Financial Data				Multiples			
Sales	EBITDA	EBIT	EPS	P/S	EV/EBITDA	EV/EBIT	P/E
25 994,3	9 101,2	7 912,7	3,25	27,1x	78,0x	89,7x	86,5x
77 994,7	42 461,3	19 289,3	5,01	2,6x	4,1x	9,0x	10,0x
15 477,3	4 022,7	3 254,7	2,40	10,5x	41,0x	50,7x	55,8x

*These two tables are the continuation of each other horizontally

	P/S	EV/EBITDA	EV/EBIT	P/E
Min	2,6x	4,1x	9,0x	10,0x
Mean	6,5x	22,6x	29,9x	32,9x
Median	6,5x	22,6x	29,9x	32,9x
Max	10,5x	41,0x	50,7x	55,8x

Appendix 10: Relative Valuation football field



Appendix 11: Nvidia with vs without Arm share price difference according to P/S

Nvidia + Arm		Min	Mean	Median	Max	Nvidia
Sales (Forward - FY2023)	38 728,7					
P/S		2,6x	6,5x	6,5x	10,5x	27,1x
# Shares outstanding (million)	2 575,3					
Implicit Share price		39,21	98,45	98,45	157,69	407,30

Nvidia standalone		Min	Mean	Median	Max	Nvidia
Sales (Forward - FY2023)	36 643,4					
P/S		2,6x	6,5x	6,5x	10,5x	27,1x
# Shares outstanding (million)	2 500					
Implicit Share price		38,22	95,96	95,96	153,70	396,98

Share price difference with vs without Arm	2,60%	2,60%	2,60%	2,60%	2,60%
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Appendix 12: Nvidia, Intel, AMD and Xilinx Financial Ratios

Scenario Analysis		
Risk	Scenario Share Price	Downside
<u>Industry related risks</u>		
Innovation	255,30	-10,58%
Competition	255,88	-10,38%
<u>Supply Chain related risks</u>		
Manufacturing	243,92	-14,57%
<u>Operations related risks</u>		
System Security and Cyber-attacks	274,94	-3,70%
Business disruptions	252,23	-11,66%
Customer Concentration	281,78	-1,31%

Appendix 13: Nvidia, Intel, AMD and Xilinx Financial Ratios

Nvidia:

Activity Ratios	FY2017	FY2018	FY2019	FY2020	FY2021
Average Holding Period	101,8	74,7	126,5	86,1	106,1
Average Collection Period	43,6	47,5	44,4	55,4	53,2
Average Payable Period	62,2	55,9	41,0	60,4	69,8
Cash Conversion Cycle	83,2	66,3	129,8	81,1	89,5

Liquidity	FY2017	FY2018	FY2019	FY2020	FY2021
Current Ratio	4,8	8,0	7,9	7,7	4,1
Quick Ratio	4,3	7,3	6,8	7,1	3,6
Cash Ratio	1,0	3,5	0,6	6,1	0,2
NWC	6 748	8 102	9 228	11 906	12 130

Capital Structure	FY2017	FY2018	FY2019	FY2020	FY2021
Gearing Ratio	172%	160%	107%	170%	21%
D/E Ratio (BV)	-63%	-62%	-52%	-63%	-17%
Debt/EBITDA Ratio	-171%	-135%	-119%	-238%	-52%
Net PP&E/Total Assets	5%	9%	11%	10%	7%
Solvency Ratio	142%	198%	237%	239%	142%
Financial Autonomy Ratio	59%	66%	70%	70%	59%

Core Profitability Margins	FY2017	FY2018	FY2019	FY2020	FY2021
Gross Margin	59%	60%	61%	62%	62%
EBITDA Margin	31%	35%	35%	30%	34%
EBIT Margin	28%	33%	32%	26%	27%
Net Profit Margin	24%	29%	30%	24%	26%

Profitability from Investments	FY2017	FY2018	FY2019	FY2020	FY2021
Return on Assets (ROA)	17%	25%	27%	15%	15%
Core Asset Turnover	326%	338%	260%	242%	119%
Return on Invested Capital (ROIC)	80%	107%	93%	63%	32%
Return on Equity (ROE)	30%	42%	45%	24%	27%

AMD:

Activity Ratios	FY2016	FY2017	FY2018	FY2019	FY2020
Average Holding Period	86,1	76,3	79,9	98,4	100,0
Average Collection Period	26,3	31,5	69,6	100,8	77,2
Average Payable Period	50,5	42,2	50,0	99,0	33,5
Cash Conversion Cycle	61,9	65,6	99,6	100,2	143,8

Liquidity Ratios	FY2016	FY2017	FY2018	FY2019	FY2020
Current Ratio	1,9	1,7	1,8	1,9	2,5
Quick Ratio	1,3	1,3	1,4	1,5	2,0
Cash Ratio	0,9	0,8	0,5	0,6	0,7
NWC	1 184	1 121	1 556	2 238	3 726

Capital Structure	FY2016	FY2017	FY2018	FY2019	FY2020
Gearing Ratio	58%	53%	33%	-10%	-21%
D/E Ratio (BV)	139%	115%	50%	-9%	-17%
Debt/EBITDA Ratio	-155%	538%	141%	-40%	-74%
Net PP&E/Total Assets	5%	7%	8%	8%	7%
Solvency Ratio	14%	20%	38%	88%	187%
Financial Autonomy Ratio	13%	17%	28%	47%	65%

Core Profitability Margins	FY2016	FY2017	FY2018	FY2019	FY2020
Gross Margin	26%	37%	40%	46%	48%
EBITDA Margin	-8%	4%	10%	12%	17%
EBIT Margin	-11%	1%	7%	8%	14%
Net Profit Margin	-12%	1%	7%	7%	25%

Profitability from Investments	FY2016	FY2017	FY2018	FY2019	FY2020
Return on Assets (ROA)	-15%	2%	10%	8%	27%
Core Asset Turnover	434%	411%	341%	261%	203%
Return on Invested Capital (ROIC)	-40%	5%	22%	16%	50%
Return on Equity (ROE)	-70%	24%	41%	18%	40%

Intel:

Activity Ratios	FY2016	FY2017	FY2018	FY2019	FY2020
Average Holding Period	131,9	164,1	146,9	168,0	138,6
Average Collection Period	28,8	32,6	34,6	38,8	31,8
Average Payable Period	58,8	68,8	77,4	79,3	91,8
Cash Conversion Cycle	101,9	127,9	104,1	127,5	78,6

Liquidity Ratios	FY2016	FY2017	FY2018	FY2019	FY2020
Current Ratio	1,7	1,7	1,7	1,4	1,9
Quick Ratio	1,5	1,3	1,3	1,0	1,6
Cash Ratio	0,3	0,2	0,2	0,2	0,2
NWC	15 206	12 079	12 161	8 929	22 495

Capital Structure	FY2016	FY2017	FY2018	FY2019	FY2020
Gearing Ratio	24%	27%	25%	26%	28%
D/E Ratio (BV)	31%	37%	33%	35%	40%
Debt/EBITDA Ratio	89%	96%	76%	83%	89%
Net PP&E/Total Assets	32%	33%	38%	41%	37%
Solvency Ratio	143%	129%	141%	132%	112%
Financial Autonomy Ratio	58%	56%	58%	57%	53%

Core Profitability Margins	FY2016	FY2017	FY2018	FY2019	FY2020
Gross Margin	74%	75%	75%	74%	71%
EBITDA Margin	39%	43%	46%	46%	46%
EBIT Margin	26%	30%	33%	31%	31%
Net Profit Margin	19%	15%	30%	27%	27%

Profitability from Investments	FY2016	FY2017	FY2018	FY2019	FY2020
Return on Assets (ROA)	10%	8%	16%	14%	14%
Core Asset Turnover	69%	66%	72%	69%	69%
Return on Invested Capital (ROIC)	12%	11%	21%	20%	19%
Return on Equity (ROE)	17%	16%	28%	27%	27%

Xilinx:

Activity Ratios	FY2017	FY2018	FY2019	FY2020	FY2021
Average Holding Period	129,4	126,6	130,0	116,9	130,2
Average Collection Period	37,8	56,6	40,0	31,5	33,1
Average Payable Period	61,7	53,1	48,4	39,2	48,6
Cash Conversion Cycle	105,5	130,0	121,6	109,2	114,7

Liquidity Ratios	FY2017	FY2018	FY2019	FY2020	FY2021
Current Ratio	4,3	4,6	8,2	2,7	6,0
Quick Ratio	4,1	4,3	7,5	2,4	5,5
Cash Ratio	1,1	2,4	3,3	1,6	2,3
NWC	2 983	3 243	3 417	1 823	3 122

Capital Structure	FY2017	FY2018	FY2019	FY2020	FY2021
Gearing Ratio	-232%	-215%	-167%	-53%	-91%
D/E Ratio (BV)	-70%	-68%	-62%	-35%	-48%
Debt/EBITDA Ratio	-272%	-244%	-201%	-110%	-215%
Net PP&E/Total Assets	6%	6%	6%	8%	6%
Solvency Ratio	112%	87%	125%	97%	110%
Financial Autonomy Ratio	53%	47%	56%	49%	52%

Core Profitability Margins	FY2017	FY2018	FY2019	FY2020	FY2021
Gross Margin	73%	72%	71%	70%	72%
EBITDA Margin	33%	32%	34%	29%	28%
EBIT Margin	30%	29%	31%	26%	24%
Net Profit Margin	27%	29%	29%	24%	22%

Profitability from Investments	FY2017	FY2018	FY2019	FY2020	FY2021
Return on Assets (ROA)	13%	14%	17%	16%	12%
Core Asset Turnover	312%	329%	285%	209%	209%
Return on Invested Capital (ROIC)	103%	367%	336%	141%	175%
Return on Equity (ROE)	25%	19%	31%	34%	24%

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Report Recommendations

Buy	Expected total return (including expected capital gains and expected dividend yield) of more than 10% over a 12-month period.
Hold	Expected total return (including expected capital gains and expected dividend yield) between 0% and 10% over a 12-month period.
Sell	Expected negative total return (including expected capital gains and expected dividend yield) over a 12-month period.

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