Financial Analysis of NVIDIA Enterprises Based on Harvard Analytical Framework

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Abstract. Based on the financial data of NVIDIA from 2018 to 2023, the Harvard analysis framework is used to analyze the enterprise from four perspectives: strategy, accounting, finance, and prospects. By constructing the model at the strategic level and studying the key indicators at the accounting and financial levels, it is found that the enterprise has good debt-paying ability, profitability, operation ability, and growth ability. As a technology-driven company, NVIDIA should continue to invest in the research and development of new technologies and products. Meanwhile, while NVIDIA has a leading position in the Graphics Processing Unit (GPU) market, it should consider further diversifying its product line to reduce its dependence on a single market and develop new revenue streams. In addition, NVIDIA should maintain and promote strong partnerships with other companies and actively enter emerging markets. This article helps to understand the company's operating status and future development trends and also provides a reference for investors, managers, and academia to promote further research and decision-making.

Keywords: NVIDIA, Harvard analytical framework, Financial analysis.

1. Introduction

NVIDIA, as a globally leading visual computing company, attracts significant attention for its influence and position in the graphics processor market. With the rapid development of artificial intelligence, data centers, and gaming, NVIDIA plays a crucial role in providing high-performance computing solutions. This paper aims to conduct a comprehensive financial analysis of NVIDIA to delve into its financial condition and operational performance, revealing the company's competitive advantages and challenges in an ever-changing market environment. In-depth analysis of NVIDIA's financial condition not only contributes to understanding the company's operational status and future development trends, but also provides references for investors, managers, and academia, promoting further research and decision-making.

NVIDIA Corporation, founded in 1993, is a global technology company renowned for its groundbreaking innovations in graphics processing units (GPUs) and artificial intelligence (AI). Pioneering advancements in GPU technology, NVIDIA has revolutionized industries ranging from gaming and entertainment to scientific research and autonomous vehicles. With a commitment to pushing the boundaries of computing performance and efficiency, NVIDIA continues to shape the future of technology through its relentless pursuit of excellence in GPU architecture and AI computing.

Currently, there is relatively limited research on the financial analysis of NVIDIA, especially within the Harvard analysis framework. Existing studies mostly concentrate on its technological innovation and market performance, with less in-depth analysis of its financial condition and performance. Additionally, there are limitations in the financial data of NVIDIA and the singularity of analysis methods in existing research, lacking a comprehensive and systematic exploration of its financial condition.

This study will adopt the Harvard analysis framework, comprehensively utilizing strategic analysis, accounting analysis, financial analysis, and prospective analysis to conduct an in-depth investigation into NVIDIA's financial condition. Specifically, it will evaluate aspects such as profitability, solvency,

and operational efficiency to reveal the strengths and challenges of its financial performance and provide reasonable recommendations for its future development.

Future research will further expand the depth and breadth of the analysis of NVIDIA's financial condition, including but not limited to research on the company's strategic transformation, risk management, and financial policies. What's more, it will incorporate the company's latest financial report data and industry dynamics, updating the analysis framework and research findings promptly to maintain the research's cutting-edge and practicality.

2. Harvard Analysis Framework and its Composition

The Harvard analysis framework was proposed by three scholars, Palepu, Healy, and Bernard in 2004. It mainly includes four parts: analysis of strategy, accounting analysis, financial analysis, and prospect analysis.

2.1. Analysis of Strategy

Strategic analysis is the starting point of Harvard's analytical framework, which analyzes the external environment of an enterprise, its advantages and disadvantages, and aims to identify business risks and find profit drivers. PEST model, SWOT model, and Porter's five forces model are generally used to study the macro environment and micro environment faced by enterprises. Strategic analysis adds qualitative analysis to the traditional analysis of financial statement data, which is a major feature of Harvard's analytical framework.

2.2. Accounting Analysis

Accounting analysis is the basis of financial analysis and belongs to quantitative analysis. This part starts from the most intuitive financial statement data and information, analyzes and judges whether the enterprise accounting information truly reflects the operating conditions of the enterprise, and its purpose is to ensure the integrity and accuracy of the financial data.

2.3. Financial Analysis

The goal of financial analysis is to use financial data to evaluate the current and past performance of an enterprise. This part involves the calculation and interpretation of financial ratios (such as current ratio, quick ratio, asset-liability ratio, profitability ratio, etc.), as well as cash flow analysis, cost structure analysis, etc. Financial analysis can reveal a firm's financial health, profitability, capital efficiency, and solvency, thereby helping managers make data-based decisions.

2.4. Prospect Analysis

Prospect analysis is based on the results of the above analysis, summarizes the existing problems of the enterprise, focuses on the future development of the enterprise from the qualitative and quantitative perspective of the future development direction and development potential of the enterprise, is conducive to internal operators to adjust the strategic plan, external investors reasonable decision-making.

3. NVIDIA Financial Analysis Based on Harvard Analysis Framework

3.1. Analysis of Strategy

3.1.1 Macro Environment Analysis -- PEST Analysis

(1) Political Factors That Affect NVIDIA

NVIDIA is a company that operates globally, so political stability is critical to NVIDIA's operations. Politically stable countries are suitable for NVIDIA because they are places where it can generate high sales. Conversely, politically unstable countries are not fit for NVIDIA because

NVIDIA's sales in those countries are low. There are several reasons for NVIDIA's poor sales in politically unstable regions. For example, when there is political instability, people tend to restrict consumption. Apart from this, the government's tax policy towards tech companies is also a reason. For example, if the government imposes a high tax rate on NVIDIA, its profits will decline. On the other hand, if NVIDIA can get a tax break, the business could make more money [1].

(2) Economic Factors That Affect NVIDIA

Domestic and international economic conditions have a significant impact on NVIDIA's operations. Suppose NVIDIA operates in a country with a booming economy, since people have more disposable income during boom times, NVIDIA is able to generate high sales. In the opposite scenario, NVIDIA's sales will decline in economically depressed regions because people have little disposable income. Furthermore, NVIDIA is impacted by macroeconomic factors like interest rates. NVIDIA's borrowing costs will rise if National Bank of America hikes interest rates, which suggests that NVIDIA would have trouble obtaining bank loans to grow its company. Additionally, because banks can offer higher returns on deposits during periods of high interest rates, people choose to deposit money there. Therefore, people are more inclined to preserve money than spend it when interest rates rise, which is detrimental to NVIDIA. What's more, high inflation is also bad for NVIDIA, because people will limit their spending in such a situation. As a result, there is a decrease in demand for NVIDIA products during periods of high inflation. Also, people demand higher wages during periods of high inflation, which raises NVIDIA's operational costs and lowers the company's profitability. Low inflation is, therefore, ideal for NVIDIA.

(3) Social Factors That Affect NVIDIA

Initially, NVIDIA concentrated on creating GPUs, and even now, GPUs still accounts for a sizable amount of its revenue. Nonetheless, the primary reason why gamers purchase GPUs is because they can use them to play games with excellent graphics. Thus, the amount of gamers in each location is correlated with GPU sales [2]. In areas where a lot of people like playing video games, there will be a strong demand for NVIDIA GPUs. On the other hand, in a society where a small percentage of people play video games, the demand for GPUs will be quite small, and NVIDIA's revenue from them will be very low. Furthermore, NVIDIA's products are in high demand in technologically advanced nations due to their association with computers. Lower technologically developed nations have lower product demand. Beyond that, NVIDIA's activities are significantly impacted by the demographics of society. The demand for NVIDIA products is stronger in densely populated societies than in less populated ones.

(4) Technological Factors That Affect NVIDIA

Since NVIDIA is one of the most well-known GPU producers, its business operations will be greatly impacted by advancements in GPU technology. NVIDIA will not be able to bring in new advanced GPUs in this case if developments in the GPU industry do not occur. Businesses have also started using business analytics as a result of technological advancements because it could help in making better choices. Business analytics techniques are also the tool that NVIDIA might utilize to find its lead customers. NVIDIA can design its own advertisements using the data as well. Furthermore, NVIDIA can forecast revenues in the upcoming periods and make wise selections by utilizing these business analytics solutions. AI may also be used by NVIDIA to automate processes and guide users. The competition in the technology industry has gotten fiercer as technology has advanced. NVIDIA needs to make sure that it continues to do research and development to stay ahead of its rivals. If not, its rivals will take its market share [3].

3.1.2 Micro-Environment Analysis -- SWOT Analysis

Based on the SWOT model, this paper analyzes the internal strengths and weaknesses of NVIDIA as well as external opportunities and threats.

(1) Strengths

Technological Innovation: Nvidia is a leader on many technology fronts [4]. Nvidia has been innovating in this area since they introduced their first GPU in 1999. Nvidia's GPU business has maintained a competitive edge as the industry's cutting edge.

Leadership in AI: Since NVIDIA's GPUs can significantly speed up computations, they have shown to be incredibly helpful for AI applications, particularly deep learning. NVIDIA has benefited from this by developing specialist software and hardware, such as the GPUs in the Tesla and Volta series.

Strong Brand and Market Position: In the realm of graphics cards, NVIDIA is a prominent participant. Professionals and gamers appreciate the performance and dependability of their GeForce series of GPUs. NVIDIA is a reputable and famous brand in its field [5].

Diversification: NVIDIA has expanded its lines of business into fast-growing areas such as gaming, professional visualization, automotive, and data centers. This business diversity not only reduces risk, but also creates profit growth [6].

Strategic Partnerships: NVIDIA has established a number of strategic alliances with other tech firms, automakers, and research establishments, which has helped to bolster its position across a range of industries.

Robust Ecosystem: Around its products, NVIDIA has created a robust ecosystem that includes a sizable developer community, software development kits, and application programming interfaces. This ecosystem helps retain consumers and increases the allure of NVIDIA goods.

Proposed Acquisition of ARM: The completion of NVIDIA's acquisition of ARM Holdings will greatly broaden the company's product portfolio and reach in the market, particularly in mobile and Internet of things devices.

(2) Weaknesses

Dependency on Few Markets: The gaming and data center industries are only two of the major segments that drive NVIDIA's operations. In this case, any volatility in these major markets would be a death blow to NVIDIA's earnings.

Regulatory Approval for ARM Acquisition: There is already a lot of criticism to the proposed acquisition of ARM Holdings, which is awaiting regulatory permission. The deal's collapse might have an effect on NVIDIA's long-term goals.

Competitive Market: GPU is a very competitive market. Although NVIDIA now dominates the GPU market, it is under constant pressure from competitors such as AMD and Intel. This peer competition can be bad for product pricing and profit margins.

Supply Chain Risks: A global pandemic or trade disputes could disrupt the semiconductor industry's complex supply chains. Supply chain disruptions could impact NVIDIA's production and delivery capabilities.

Technological Disruptions: The information technology (IT) industry is characterized by innovation and fast pace. If NVIDIA can't keep up the pace of updates, new technologies or architectural changes, such as developments in quantum computing, could lead to commercial disruptions.

Intellectual Property Disputes: Tech companies can easily get involved in intellectual property lawsuits, and NVIDIA has been involved several times. The lawsuits could be costly and destabilizing for NVIDIA.

(3) Opportunities

Growth in AI and Machine Learning: NVIDIA GPUs are well integrated with artificial intelligence and machine learning. Developments in these industries will bring a lot of opportunities for NVIDIA, including selling its outstanding GPUs and AI solutions.

Expansion in Data Centers: The need for fast computing in data centers has increased, and NVIDIA's GPUs have gone mainstream. Significant development potential are presented by expanding cloud services, growing computing workloads, and AI applications in data centers.

Autonomous Vehicles: NVIDIA has been making investments in self-driving car technology. The market's maturity presents NVIDIA with a number of possibilities, including the platforms, hardware and software that power autonomous driving systems.

Edge Computing: More processing is shifting to the edge of the network with the introduction of 5G and the Internet of Things (IoT). Since GPUs and AI technologies may power these edge devices, NVIDIA has a big opportunity as a result of this change.

Acquisition of ARM Holdings: In the event that NVIDIA's planned acquisition of ARM Holdings gets approved, NVIDIA will have access to ARM's vast ecosystem and be able to grow its company into new markets, including mobile computing and the IoTs.

Virtual Reality (VR) and Augmented Reality (AR): Emerging technologies like VR and AR have enormous development potential. GPUs of NVIDIA may be essential for producing the intricate images required for immersive VR and AR experiences.

Growth in Gaming: The need for real-time performance and high-quality visuals is growing as the gaming sector expands. NVIDIA has a long history of dominance in this sector.

High-Performance Computing (HPC): HPC is becoming more and more necessary for data processing, engineering, and scientific research. NVIDIA can meet these demands with its AI platforms and GPUs.

(4) Threats

Intense Competition: NVIDIA competes fiercely in the market against major rivals like AMD and Intel. These rivals could outpace them with attractive new products, such as one that beats NVIDIA in terms of price and product itself [7].

Regulatory Scrutiny: Regulatory authorities from all across the world are keeping a close eye on the potential purchase of ARM Holdings. If it fails, it can have an impact on NVIDIA's expansion plan and standing.

Economic Conditions: NVIDIA's gaming-focused business is closely tied to the economic environment. For instance, gamers and enterprises will spend less money on NVIDIA GPUs during a recession [8].

Technological Shifts: The technology industry has always been characterized by rapid updates and iterations. In the future, the emergence of new computing paradigms (such as quantum computing) or the abandonment of Moore's law will hit NVIDIA's business hard [9].

Supply Chain Disruptions: Supply chain interruptions resulting from geopolitical tensions, trade conflicts, natural calamities or pandemics might affect the semiconductor business. The incapacity to satisfy product demand might result from any disturbance in the supply chain.

Dependence on Manufacturing Partners: NVIDIA uses other foundries instead of producing chips by itself. The condition of the foundries will be directly tied to NVIDIA's productivity, which is not safe.

Intellectual Property Disputes: NVIDIA is susceptible to intellectual property conflicts that might lead to expensive legal action and could affect some areas of the company's operations.

Cybersecurity Threats: NVIDIA is a tech firm; thus it is facing issues related to cybersecurity. The occurrence of cybersecurity issues will hurt NVIDIA's performance and reputation.

3.2. Enterprises Accounting Analysis of NVIDIA

3.2.1 Revenue Growth

From the financial results announced by NVIDIA, the company's revenue and net profit have achieved significant growth (see Table 1). For example, the 2023 annual report shows revenue of $60.92 billion, an increase of 125.85% year-on-year. This shows that NVIDIA can not only quickly get out of the negative impact of the COVID-19 pandemic, but also the market demand is strong, and the company's products are very competitive in the market.

Table 1. NVIDIA's revenue for 2018-2023

	2023	2022	2021	2020	2019	2018
Revenue (USD) (billion)	609.2	269.7	269.1	166.8	109.2	117.2
Revenue growth	125.85%	0.22%	61.40%	52.73%	-6.81%	20.61%

3.2.2 Profit Margin

2023 financial results show that NVIDIA's gross margin and net profit margin are 72.72% and 48.85%, respectively, and net profit is $29.76 billion, an increase of 581.32% (see Table 2). This indicates that the company can earn a higher profit margin in the process of selling products or providing services.

Table 2. NVIDIA's profits for 2018-2023

	2023	2022	2021	2020	2019	2018
Gross profit margin on sales	72.72%	56.93%	64.93%	62.34%	61.99%	61.21%
Net profit margin on sales	48.85%	16.19%	36.23%	25.98%	25.61%	35.34%
Net profit attributable to parent (USD) (billion)	297.6	43.68	97.52	43.32	27.96	41.41
Return to parent net profit growth	581.32%	-55.21%	125.12%	54.94%	-32.48%	35.90%

3.2.3 Cost Structure

The 2018-2023 financial report shows that NVIDIA's various costs show an increasing trend, including R&D investment and operating input costs, which increase the cost of enterprises, but also bring innovative products and technologies for enterprises, thus improving the market competitiveness, which is also one of the important means for the company to maintain a competitive advantage. In addition, it is worth noting that NVIDIA underwent a corporate restructuring in 2022, which generated a small cost (see Table 3).

Table 3. NVIDIA's cost structure for 2018-2023

	2023	2022	2021	2020	2019	2018
Research and development expenses (USD)(billion)	86.75	73.39	52.68	39.24	28.29	23.76
Marketing expenses (USD) (billion)	26.54	24.40	21.66	19.40	10.93	9.910
Other operating expenses	--	--	--	--	--	--
Restructuring charges (USD) (billion)	--	13.53	--	--	--	--
Operating expenses (USD) (billion)	113.3	111.3	74.34	58.64	39.22	33.67

3.3. Financial Analysis of NVIDIA

3.3.1 Solvency

As can be seen from Table 4, the reasons for NVIDIA's overall declining current ratio in the first six years do not exclude exchange rate fluctuations, changes in the market environment caused by the increase of competitors, etc. The main reason is that NVIDIA needs a large amount of capital for its business expansion, which leads to an increase in liabilities, and the expansion of business and the research and development of new products increase its market share. Thus accounts receivable increase. However, the current ratio is more than 2 times, indicating that the enterprise has strong liquidity. In 2023, the current ratio and quick ratio decreased significantly, mainly due to the slowdown in revenue growth in 2023 and the huge revenue-sharing cost, resulting in a rapid increase in current assets. The current debt ratio fluctuates steadily, indicating that the solvency of the enterprise fluctuates steadily in the short term, the solvency is adequately guaranteed, the net cash inflow generated by the business activities of the enterprise is large, and the cash reserves of the enterprise are large.

The overall asset-liability ratio is on the rise, and the long-term solvency of enterprises is weakened. In terms of property rights ratio, with the increase of equity investment after listing, the overall property rights ratio of enterprises remains at a high level.

Table 4. NVIDIA's solvency indicators for 2018-2023

	2023	2022	2021	2020	2019	2018
Current ratio	4.17	3.52	6.65	4.09	7.67	7.94
Quick ratio	3.67	2.73	6.05	3.63	7.13	6.76
Cash flow debt ratio	2.64	0.86	2.10	1.48	2.67	2.82
Asset-liability ratio	34.61%	46.33%	39.77%	41.33%	29.52%	29.72%
Equity ratio	52.93%	86.34%	66.04%	70.43%	41.88%	42.28%

3.3.2 Profitability

As can be seen from Table 5, gross profit margin and net profit margin on sales are generally stable and show an increasing trend in 2023, indicating that NVIDIA's profit situation is relatively stable. The return on equity has a large volatility and will increase sharply in 2023. On the one hand, due to the COVID-19 pandemic, business development and other aspects are affected; on the other hand, after the end of the COVID-19 pandemic, the progress and development of science and technology and the unprecedented demand of people provide a good market for NVIDIA.

In addition, NVIDIA's gross profit margin on sales, net profit margin on sales, and return on equity, which had been on an upward trend for the past six years, rebounded in 2022, mainly because the COVID-19 pandemic significantly worsened the market environment, but improved in 2023. It indicates that NVIDIA has strong profitability. Overall, NVIDIA is more profitable now.

Table 5. NVIDIA Profitability Indicators 2018-2023

	2023	2022	2021	2020	2019	2018
Gross profit margin on sales	72.72%	56.93%	64.93%	62.34%	61.99%	61.21%
Net profit margin on sales	48.85%	16.19%	36.23%	25.98%	25.61%	35.34%
Return on equity	91.46%	17.93%	44.83%	29.78%	25.95%	49.26%

3.3.3 Operation Capacity

It can be seen from Table 6 that the turnover days of accounts receivable continue to decrease, and the turnover rate of accounts receivable is generally stable and maintains a high level, which shows that NVIDIA has a strong realization ability of accounts receivable and high management efficiency. The turnover days of total assets showed a downward trend, and the turnover rate of total assets showed an increasing trend, indicating that NVIDIA's asset operation efficiency was high, and investment in assets could bring good revenue results. In addition, it was greatly affected by the COVID-19 epidemic in 2020-2022, but it can quickly recover the original business mode and speed level after the epidemic in 2023. In summary, NVIDIA's overall operating capacity is strong.

Table 6. NVIDIA's operating capacity indicators for 2018-2023

	2023	2022	2021	2020	2019	2018
Accounts receivable turnover (times)	8.81	6.36	7.60	8.16	7.09	8.71
Total asset turnover (times)	1.14	0.63	0.74	0.72	0.71	0.96
Accounts receivable turnover days	40.85	56.57	47.34	44.11	50.80	41.31
Total asset turnover days	315.88	569.68	488.07	497.70	504.60	376.92

3.4. Prospect Analysis

3.4.1 Market Leadership

As a leading enterprise in the GPU field, NVIDIA holds more than 80% market share in the independent GPU market [10]. Its products are widely used in gaming, high-performance computing, data centers, and autonomous driving. In addition, this leadership position allows NVIDIA to continue to drive technology innovation and gain significant market share and revenue from it.

3.4.2 Strong Technological Innovation Capabilities and Diversified Product Lines

NVIDIA has been committed to technological innovation, such as its breakthroughs in deep learning, artificial intelligence, and high-performance computing, and the establishment of "GPU+CUDA" has become the ticket to compete in AI, etc [11]. In addition, NVIDIA develops new applications and technologies, and its product line covers multiple areas, including gaming, professional visualization, data centers, autonomous driving, and more. This diversified product line helps NVIDIA reduce market risk and achieve steady revenue growth in different areas.

3.4.3 Global Layout

NVIDIA has established an extensive sales network and partnerships around the world, which helps the company better meet the needs of customers in different regions and expand overseas markets.

4. Conclusion

NVIDIA showed strong revenue growth, particularly in the data center and artificial intelligence markets. The company has a high-profit margin, reflecting its competitiveness in the market and effective cost management. NVIDIA performs well in asset management, with both asset turnover and inventory turnover demonstrating efficient operational capabilities. A sound financial structure, moderate levels of financial leverage, and appropriate cost of capital control provide the company with the flexibility to invest in future growth. NVIDIA has a strong cash flow, which protects the company's research and development investment, dividend payments, and debt service.

As a technology-driven company, NVIDIA should continue to invest in research and development of new technologies and products, especially in areas such as artificial intelligence, deep learning, autonomous driving, and cloud computing. While technology leads the progress of The Times, NVIDIA, as one of the pioneers of artificial intelligence, should pay more attention to the field of research and development.

While NVIDIA has a leading position in the GPU market, it should consider further diversifying its product line to reduce its dependence on a single market and develop new revenue streams. It also builds and maintains strong partnerships with software developers, cloud service providers, car manufacturers, and others to drive wider adoption of its technology. Actively enter emerging markets and developing countries, especially in Asia and Latin America, to achieve revenue and market share growth.

Authors Contribution

Each author made an equal contribution, and their names were listed alphabetically.

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