Analysis of NVIDIA's Acquisition of Mellanox Tech-nologies, Ltd. Based on PEG and EVA Valuation Model

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Abstract. The docking of AI and industrial applications still requires software algorithm optimization and threshold lowering, the variety of real-world application scenarios is limited, and the maturity of new scenarios is still low. All of these issues still exist in the AI business in 2019. The globe started integrating technology and conducting chip research and development. Enterprises frequently run across obstacles in the areas of capital, technology, and management when they are trying to grow their operations. Businesses frequently opt for bond issuance, stock market listing, mergers & acquisitions, and other strategies to broaden the area of operations, modernize the management style, and boost competitiveness to address these issues. Based on PEG and EVA valuation models, this study examines the goals and outcomes of NVIDIA's M&A team for the largest M&A transaction in NVIDIA's history. It is determined that the M&A behavior was effective by comparing the valuation of NVIDIA's share price before and after it engaged in M&A activity. According to the PEG and EVA valuation models, it is discovered that NVIDIA's share price is marginally overvalued following the merger and acquisition.

Keywords: PEG model; EVA model; Acquisitions.

1. Introduction

NVIDIA (NASDAQ: NVDA) invented the Graphics Processing Unit (GPU) in 1999 with powerful floating-point computing capabilities by optimizing and restructuring the CPU architecture to increase the size of the AUL as shown in Fig. 1, which is responsible for performing arithmetic operations, shifts, address operations, and conversions. NVIDIA defines a GPU as "a single-chip processor with an integrated transform, illumination, triangulation/cropping, and dye engine that can process at least 10 million polygons per second". In 2012 NVIDIA GRID brought graphics to the cloud, and the first virtualized GPU appeared. In 2017 NVIDIA launched the NVIDIA Volta GPU architecture, which supports the DGXTM series of AI supercomputers with the help of the NVIDIA Tesla V100 GPU accelerator, further advancing the development of modern AI [1]. The global demand for semiconductors is statistically increasing dramatically, with China and the United States together accounting for nearly 50% of the global demand, and the remaining 50% spread across multiple countries, including South Korea, Japan, and European countries [2].

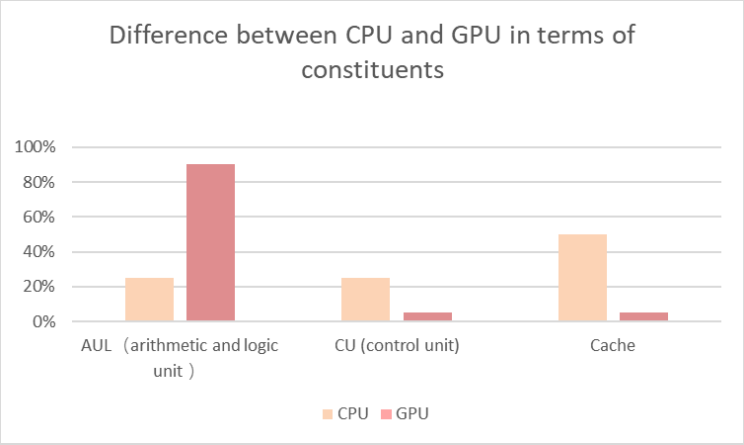

Fig 1. Difference between CPU and GPU in terms of constituents.

The AI industry in 2019 is still facing problems such as the docking of AI with industrial applications still awaiting optimization of software algorithms and lowering of thresholds, the range of practical application scenarios is not rich, and the maturity of new scenarios is still low. NVIDIA endeavors to avoid further deterioration of the competitive landscape dynamics by hoping to expand the accessible market through enterprise customers including machine learning, big data processing, and inference-end computing. Mellanox's core product in data center servers, InfiniBand network interconnect, is used for data transmission and network interconnect in data centers and supercomputers, including in the cooperation program with Microsoft data centers, offloading network stack processing from CPU to network, making it the best storage-demanding workloads for database processing, AI machine learning, and other high solutions. NVIDIA first announced on 11 March 2019 to 27 April 2020 the official completion of its largest-ever acquisition of Mellanox Technologies, Ltd. for a transaction price of $7 billion [3]. NVIDIA continues to innovate as the demand for tools to generate artificial intelligence (AI) continues to grow in 2023, NVIDIA became the first chip company to reach a market capitalization of $1 trillion, and the ninth company ever to enter the "Trillion Dollar Club" in terms of dollar market capitalization. It founded GlobalData, a leading data and analytics company, and has revolutionized its industry with breakthrough products and services, effective leadership, a global customer base, and a strong international presence that drives expansion and attracts investors. Between 2019 and 2023, NVIDIA has invested more than $4bn, outpacing its main competitor AMD's $3bn. This reduces the likelihood of NVIDIA being overtaken by its competitors [4].

Silva has stated that by comparing NVIDIA's forward EV/EBITDA multiplier values with those of companies in the peer list, it can be concluded that on 30 January 2022, NVIDIA trades at a premium to the peer list companies, NVIDIA trades at a premium [2]. Luehrman argues that any valuation model has to take into account three main factors: cash, timing, and risk. Thus, the choice of how to perform the valuation becomes a question of how robust the model is in dealing with imperfect data. This is because, from a mathematical point of view, most models simply express the same basic model from different perspectives [5, 6]. As the demand for generative artificial intelligence (AI), tools continue to grow, NVIDIA continues to innovate 2023 NVIDIA became the first chip company to reach a market capitalization of $1 trillion, and the ninth company ever to enter the "trillion-dollar club" in terms of dollar market capitalization. It founded GlobalData, a leading data and analytics company, and has revolutionized its industry with breakthrough products and services, effective leadership, a global customer base, and a strong international presence that drives expansion and attracts investors. Between 2019 and 2023, NVIDIA has invested more than $4bn, outpacing its main competitor AMD's $3bn. This reduces the likelihood of NVIDIA being overtaken by its competitors [7]. NVIDIA's rapid growth in market value in just three years, GPU technology continues to mature, and the great achievements cannot be separated from the technical support of Mellanox, to fill the research gap of NVIDIA's acquisitions, this study uses the PEG and EVA valuation model to analyze whether the acquisition is successful or not.

2. Motivation Analysis

With the acquisition of Mellanox, NVIDIA is looking to further transform itself from a pure AI chip supplier to a more complete data center service provider, and the new NVIDIA will have the end-to-end technology from AI computing to net-working and the full stack of products from processors to software, with enough scale to advance the next generation of data center technology. Jen-Hsun Huang, founder, and CEO of NVIDIA, said. NVIDIA hopes that this acquisition will increase the adaptability and penetration of its AI chips in server systems, using a combination of expertise, supported by a rich ecosystem of partners, to help create more efficient and complete multi-node high-performance computing net-works and cloud computing services to meet the challenges of the surge in demand for global consumer Internet services, as well as AI and accelerated data science from the cloud to the edge to robotics applications. to robotics. Two of the world's leading high-

performance and data center computing companies have joined forces to combine NVIDIA's leading compute expertise and proven GPU manufacturing technology with Mellanox's high-performance networking technology to enable customers to achieve higher performance, higher compute re-source utilization, and lower operating costs, and to enable GPUs to decompose complex problems into thousands or millions of individual tasks, then enable completion of all tasks at once [8]. NVIDIA first announced on 11 March 2019 that it had officially completed its largest-ever acquisition of Mellanox Technologies, Ltd. by 27 April 2020 for a transaction price of $7 billion. Launching the NVIDIA Ampere GPU architecture, two of the preeminent companies in HPC merged into one.

3. Valuation Analysis Under the PEG Valuation Method

NVIDIA belongs to the global visual computing technology new industry that lacks industry cyclicality so this paper does not use the traditional valuation method of PE (TTM) and PB (LF), but adopts the PEG valuation which is relatively more suitable for IT and other high-growth enterprises as well as non-cyclical stocks, and conducts the research in terms of data and shape. The PEG index (the ratio of P/E ratio to profit growth) is a stock invented by Jim Slater. The PEG index is a stock valuation index invented by Jim Slater and developed based on PE (price-earnings ratio) valuation, which makes up for the shortcomings of PE in estimating the dynamic growth of enterprises and also expresses the enterprise's intrinsic value and the future growth of the stock more effectively. In this chapter, the PEG model is used to value NVIDIA's stock price in 2020 and 2021 to get a reasonable range of stock price before and after M&A. The formulae of PEG are as follows:

$$PE = \frac{\text{Price}}{\text{Earnings per share}} \tag{1}$$

$$PEG = \frac{\text{PE}}{Growth\ Rate\ of\ Expected\ Profit} \tag{2}$$

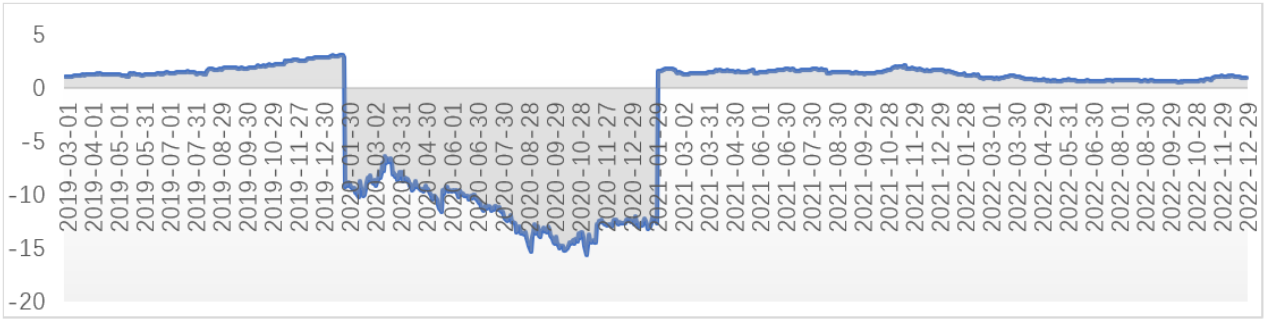

Fig 2. PEG value from 2019/3/1-2022/12/22.

Seen from Fig. 2, before the acquisition of PEG>1, and after the acquisition in a year PEG shows negative growth in constant fluctuations and PEG<1, indicating that NVIDIA in the acquisition of Mellanox after the stock price was seriously undervalued may be due to following reasons. By the impact of the epidemic, the economic pressures increase, the global freight volume has fallen sharply leading to the stock market shows a downward trend, the GPU and chip manufacturing Staged undervaluation. Instead, the focus will be on the medical and healthcare industry. Mellanox's customer base and channel partners have significant overlap with NVIDIA Acquisition was more costly, customers include cloud service providers and the world's largest supercomputing centers. Direct customers include many of the large IT infrastructure OEMs that will be bringing products to market. There is also a history of long-term cooperation for NVIDIA's own GPU acceleration performance and computing barriers to the actual enhancement of limited, more in the expansion of the accessible market at the same time to improve sales efficiency and edge utility. (3) Low liquidity following NVIDIA's acquisition of Mellanox could put NVIDIA at a disadvantage, and NVIDIA will need to fund any potential opportunities that arise in the market [9]. As of the end of FY 2021, the company's current ratio was 4.1 as compared to 7.7 in FY 2020. This is due to the increase in the company's current liabilities by 83.3 percent from $1,784 million in FY 2021 to $3,950 million in FY

2020. This is due to the increase in the current liabilities by 83.3 percent from $1,784 million in FY 2021 to $3,950 million in FY 2020. Due to the real calculation of PEG <1 and abnormal changes, in order to improve the accuracy of the analysis also draws on Yuan's calculation of the expected growth rate of the enterprise, through the use of composite indicators, reducing the uncertainty of a single indicator to circumvent the market fluctuations caused by the epidemic [10]. However, after analyzing the results of the calculation, the valuation at this point is only meaningful if the growth rate of operating income (G (s)) and the growth rate of net profit (G (r)) are both positive. Table 1 shows the expected growth rate of NVIDIA. The formula for this paper is as follows:

$$G=\sqrt{[1+G(r)]\times[1+G(s)]}-1 \quad (3)$$

Here, G(s) is the growth rate of revenue and G(r) is the growth rate of net profit. The price per share (P) period growth divided by the earnings per share (EPS) is the price-earnings ratio (PE). The P/E ratio is based on EPS and reflects the market premium multiple and heatedness. The share price per share generally refers to the current share corporate advance rate price, while the EPS is generally valued on the basis of the previous fiscal year's earnings per share. Table 1 shows the growth rate of NVIDIA's operating income. Based on the data, NVIDIA's expected operating income growth rate before the merger is 9%, and the expected growth rate after the merger is 10%, indicating that post-acquisition operating income will rise slightly in the short term, but not by much. The evolution of the PE value is given in Fig. 3.

Table 1. NVIDIA P/E ratio.

Data information (unit: USD 10,000)				Growth rate (before the merger)	Expected growth rate (before the merger)
Year	2,020	2,019	2,018		
Net profit	279,600	414,100	304,700	-4%	9%
Operating income	1,091,800	1,171,600	971,400	6%	
Data information (unit: RMB 10,000)				Growth rate (post-merger)	Expected growth rate (post-merger)
Year	2,021	2,020	2,019		
Net profit	433,200	279,600	414,100	2%	10%
Operating income	1,667,500	1,091,800	1,171,600	19%	

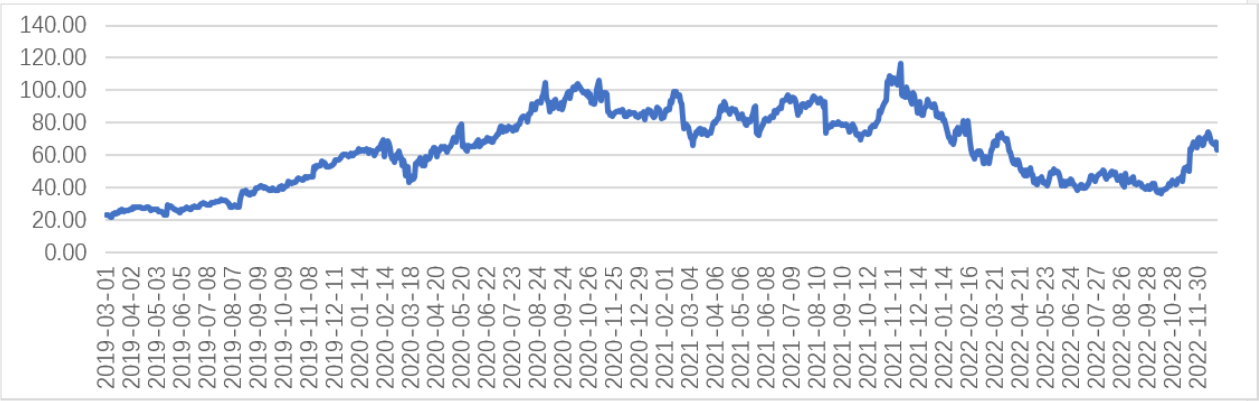

Fig 3. PE value

The benchmark PEG coefficient is calculated as:

$$\text{Benchmark PEG coefficient} = \text{P/E ratio}/(\text{expected growth rate} \times 100) \quad (4)$$

Benchmark PEG coefficient is the core of PEG valuation and can truly evaluate the forecast indirectly reflect. According to Peter Lynch's theory, if the company's price is reasonable, the reasonable ratio of PEG should be 1. When PEG=1, the market value reasonably reflects the intrinsic value of the enterprise's share price; when PEG>1, it indicates that the enterprise value is overvalued; when PEG<1, it indicates that the enterprise value is undervalued. Benchmark PEG coefficient is calculated as follows Benchmark PEG coefficient = P/E ratio / (expected growth rate x 100). The Table. 2 list the NVIDA total market value. As can be seen in Table 3, the PEG coefficient before and after the merger and acquisition of NVIDIA were 2.98 and 7.07, respectively, is greater than 1, suggesting that in the case of an epidemic and other special factors such as the impact of the maximum being circumvented, the value of the shares of NVIDIA is likely to be overestimated by the market or the market believes that NVIDIA's future performance growth will be higher than expected. Therefore, the acquisition measures are successful.

Table 2. NVIDIA Total market value

P/E ratio (before the merger) 2019/4/1	Capital stock (10, 000 shares)	Total market value (10,000 USD)
26.78	60,900	1,440,000
P/E ratio (post-merger) 2020/7/1	Capital stock (10, 000 shares)	Total market value (10,000 USD)
70.66	61,700	3,230,000

Table 3. NVIDIA benchmark PEG coefficient.

Price-earnings ratio	Expected growth rate	PEG coefficient (before the merger)
26.78	9%	2.98
Price-earnings ratio	Expected growth rate	PEG coefficient (post-merger)
70.66	10%	7.07

Table 4. Net operating profit after taxes (NOPAT) US$ in millions

12 months ended:	2023	2022	2021	2020	2019	2018
Net income	4,368	9,752	4,332	2,796	4,141	3,047
Deferred income tax expense (benefit)	-2,164	-406	-282	18	-315	-359
Increase (decrease) in allowance for doubtful accounts	—	—	2	—	-2	1
Increase (decrease) in deferred revenue	70	51	250	63	70	-21
Increase (decrease) in accrual for product warranty liabilities	36	24	7	-3	3	7
Increase (decrease) in accrued restructuring and other charges	—	—	—	—	-7	-6
Increase (decrease) in equity equivalents	-2,058	-331	-23	78	-251	-378
Interest expense	262	236	184	52	58	61
Interest expense, operating lease liability	35	22	22	22	17	7
Adjusted interest expense	297	258	206	74	75	68
Tax benefit of interest expense	-62	-54	-43	-16	-16	-23
Adjusted interest expense, after taxes	234	204	162	59	59	45
(Gain) loss on marketable securities	1	—	-2	—	1	1
Interest income	-267	-29	-57	-178	-136	-69
Investment income, before taxes	-266	-29	-59	-178	-135	-68
Tax expense (benefit) of investment income	56	6	12	37	28	23
Investment income, after taxes	-210	-23	-47	-141	-107	-45
Net operating profit after taxes (NOPAT)	2,334	9,602	4,425	2,792	3,843	2,669

4. EVA Valuation

Economic Value Added (EVA) is a value analysis tool and performance evaluation index developed by Stern Stewart Consulting in 1991 and is a model for assessing the value of an enterprise based on the idea of residual income. The basic idea of EVA is that the return on capital must at least compensate for the risk borne by investors, i.e., Shareholders must earn a rate of return at least equal to the return on similar risky investments in the capital market. In a practical sense, choosing the EVA method to analyze the performance of NVIDIA's acquisition of Mellanox can not only help to understand the company's financial situation and provide advice to business operators but also determine whether the acquisition has been effective or not. The calculation for EVA is given as:

$$EVA = NOPAT – (WACC * capital\ invested) \quad (5)$$

Here, NOPAT is net operating profit after tax, WACC is weighted average cost of capital, invested capital = opening equity + long-term debt. The results are given in Table. 4. Weighted Average Cost of Capital Weighted Average Cost of Capital (WACC) is a method of calculating a company's cost of capital by weighting each type of capital as a proportion of total capital sources. The calculation formulae are as follows:

$$WACC= S\times RS/(S+B)RS + B\times RB/(S+B)(1-Tc) \quad (6)$$

$$Invested\ Capital\ (IC) = Fixed\ Assets + Net\ Working\ Capital\ (NWC) \quad (7)$$

Table 5. WACC

Year	23-Jan	22-Jan	21-Jan	20-Jan	19-Jan	18-Jan
WACC	12.99%	8.26%	8.79%	15.73%	16.01%	11.65%

Table 6. Invested capital US$ in millions

	2023	2022	2021	2020	2017	2018
Short-term debt	1,250	—	999	—	—	15
Long-term debt	9,703	10,946	5,964	1,991	1,988	1,985
Operating lease liability	1,078	885	755	652	600	228
Total reported debt & leases	12,031	11,831	7,718	2,643	2,588	2,228
Shareholders' equity	22,101	26,612	16,893	12,204	9,342	7,471
Net deferred tax (assets) liabilities	-3,148	-976	-565	-519	-541	-227
Allowance for doubtful accounts	4	4	4	2	2	4
Deferred revenue	572	502	451	201	138	68
Accrual for product warranty liabilities	82	46	22	15	18	15
Accrued restructuring and other charges	—	—	—	—	—	7
Equity equivalents	-2,490	-424	-88	-301	-383	-133
Accumulated other comprehensive (income) loss, net of tax	43	11	-19	-1	12	18
Adjusted shareholders' equity	19,654	26,199	16,786	11,902	8,971	7,356
Construction in process	-382	-737	-558	-320	-107	-31
Marketable securities	-9,907	-19,218	-10,714	-1	-6,640	-3,106
Invested capital	21,396	18,075	13,232	14,224	4,812	6,447

As can be seen from the Table. 5, Table. 6, Table. 7 and Fig. 3, before NVIDIA's acquisition of Mellanox EVA was around 2,000, and after the acquisition, although it fell sharply by 82% in 2020 compared to 2019, it rose by 488% in 2021 after the acquisition, and then by 153% in 2022 compared to 2021. Overall the overall acquisition picture is positive. This indicates that NVIDIA has achieved initial success by gradually restructuring its operations and developing new businesses after the acquisition.

Table 7. Invested capital

year	2022	2021	2020	2019	2018
EVA	8109.005	3261.907	554.5648	3072.599	1917.9245

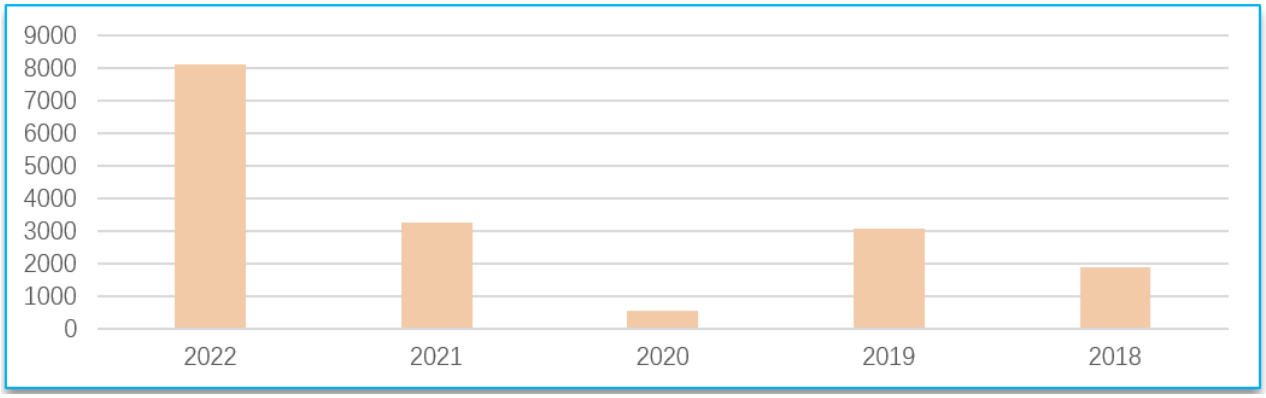

Fig 4. EVA value

To further confirm the success of the acquisition using data to make a comparison between NVIDIA before and after the acquisition was derived. Ifind database statistics, as of 27 January 2019, before the acquisition of Mellanox by NVIDIA NVIDIA's per share metrics for the total common share capital of 60,585.54 million shares. 2019 NVIDIA stock price is 154.53 USD per share. Operating income per share 19.3379 USD, net assets per share BPS 15.4195 USD. Earnings before taxes per dividend 6.3018 USD. NVIDIA's data center business accounted for approximately 25% of total revenue in 2019, and the acquisition on 27 April 2020 rounds out NVIDIA's data center and HPC product lines, further increasing NVIDIA's dominance in the data center market and contributing 14% of revenue in the quarter. NVIDIA's data center business revenue reached $1.75 billion, more than double the revenue in the same quarter last year and exceeding analysts' average estimate of $1.71 billion. NVIDIA's data center business accounted for 45 percent of total revenue, surpassing its core gaming business for the first time in its history. its share price was $246.47 at the date of the announcement on 11 March 2020, and as of 17 April 2020, the share price was $292.32, an increase of $45.85 per share, or 18.6 percent, in just over a month. In the first quarter of 2020, NVIDIA's data center business reached $1 billion in revenue for the first time. 19 August 2020, GPU maker NVIDIA announced its financial results for the second quarter ending 26 July 2020. q2 NVIDIA's revenue was $3.866 billion, up 50% from the same period last year, with a net profit of $622 million, an increase of 13% from the same period last year. With the GPU gradually becoming indispensable infrastructure, in May released a new ampere architecture GPU A100 and the Israeli company Mellanox helped, the data center business in the revenue accounted for a gradual increase in the proportion of NVIDIA revenue proportion of the largest business segments. 2020 fiscal year Q3 has become an important node. In that quarter, Nvidia's performance suffered a setback, by the enterprise in the data center spending reduction, and directly under the influence of fierce competition in the market, NVIDIA's data center business only achieved $726 million, lower than the expected $754.2 million. Only in Q4 of fiscal 2020 did the data center business turn around, bucking the trend and boosting revenue to $968 million. In that quarter NVIDIA said in its earnings report that the business grew because hyper-scale customer demand drove growth in data center sales [11].

5. Conclusion

To sum up, COVID-19 has a more significant impact on the valuation analysis, based on the PEG valuation, suggesting that NVIDIA's acquisition of Mellanox was successful. However, the actual PEG image and the calculated benchmark PEG coefficients still do not accurately reflect the situation, and the conclusion is further con-firmed at the same time after the EVA valuation is performed to more accurately represent the acquisition. NVIDIA's acquisition is a long-term view of the artificial

intelligence field, and NVIDIA has become an early leader in the AI revolution. Competitors large and small are trying to find ways to close the gap, with chip industry stalwart heavy-weights such as AMD and Intel spending billions of dollars to bolster their AI offerings, and a slew of startups attracting investors eager to bet on the next chip industry giant. Meanwhile, cloud computing firms such as Amazon and Google are developing self-designed chips in a push to become bigger players in the space. On this basis, NVIDIA should increase its GPU development in AI.

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