

Analyzing NVIDIA's Stock Market Reaction Following the Launch of ChatGPT

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Abstract. This study employs an event study methodology to thoroughly analyze the short-term and long-term impact of ChatGPT's launch on NVIDIA's stock price. The findings reveal that the initial release of ChatGPT significantly boosted market enthusiasm for investing in NVIDIA, driven by its central role in AI computing infrastructure (e.g., surging demand for GPUs), which propelled short-term stock price gains. However, in the long run, NVIDIA's stock performance is constrained by multiple factors, including intensified industry competition (e.g., technological catch-up by rivals like AMD and Intel), uncertainties in AI technology iteration, and market skepticism about the sustainability of computing demand. Additionally, macroeconomic fluctuations and geopolitical risks have influenced long-term investor expectations. This case highlights the nonlinear relationship between technological breakthroughs and capital market reactions, underscoring the tension between short-term sentiment and long-term fundamentals in the valuation of AI-related stocks. The research findings provide valuable insights for investors analyzing the valuation logic of technology-driven companies and offer empirical evidence for policymakers to understand the interplay between the AI industry and capital markets. Future research could further quantify the differential impact of technological milestones on various segments of the industry chain across different event windows.

1 Introduction

Since its launch in November 2022, ChatGPT has rapidly gained global popularity, attracting millions of users and revolutionizing numerous industries [1]. As a leader in the graphics processing unit (GPU) market, NVIDIA has long been regarded as a key enabler of artificial intelligence (AI) technology, with its hardware playing an indispensable role in training and deploying large language models (LLMs) [2]. The explosive growth of ChatGPT has further intensified the demand for high-performance computing, with NVIDIA's GPU architectures (e.g., Hopper and Ampere) becoming the industry standard due to their parallel computing advantages [3].

However, the rise of ChatGPT may also reshape the competitive landscape. Some studies suggest that rapid advancements in AI technology could spur new hardware solutions, such as specialized AI chips or cloud-based alternatives, potentially threatening

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NVIDIA's dominant position [4]. Additionally, there is disagreement in the market regarding the sustainability of AI computing demand, with some scholars warning that the current investment boom may be followed by periodic adjustments [5].

Despite the clear connection between ChatGPT and NVIDIA's business, empirical research on its impact on stock prices remains scarce. Existing literature primarily focuses on technical aspects, such as GPU performance optimization [6], with limited exploration of capital market reactions to major AI milestones. This study employs an event study methodology to systematically analyze NVIDIA's stock price fluctuations following the release of ChatGPT, aiming to uncover the divergence between short-term market sentiment and long-term value drivers.

The findings will provide investors with decision-making insights, such as how to balance the short-term speculative nature of AI-related stocks with their long-term technological barriers. Meanwhile, policymakers can use this study to understand how technological innovations propagate through capital markets to upstream and downstream industries [7]. Furthermore, industry practitioners can leverage these insights to assess the tangible financial impact of technological breakthroughs on hardware suppliers, moving beyond market narratives.

In summary, this study not only fills the empirical gap regarding the relationship between ChatGPT and NVIDIA's stock performance but also offers new perspectives on the interplay between technology, capital, and business models in the AI ecosystem. Subsequent chapters will elaborate on the research methodology, data analysis, and discussion, culminating in implications for the industry and investment strategies.

2 Data and methodology

It collected NVIDIA's stock price data from Yahoo Finance, covering the period from February 15, 2023, to March 20, 2023, which includes the timeframe when ChatGPT began gaining significant influence. To account for overall market trends, it also obtained data for relevant market indices, such as the S&P 500 or the NASDAQ Composite. Additionally, this paper gathered data on other potential influencing factors, including NVIDIA's financial reports, industry news, and macroeconomic indicators such as interest rates and GDP growth.

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \quad (1)$$

Here, R_i represents the individual stock return, and R_m denotes the market return (benchmarked against the S&P 500 index).

The cumulative abnormal return (CAR) is calculated as:

$$CAR[t_1, t_2] = \sum_{t=t_1}^{t_2} A R_{i,t} \quad (2)$$

Statistical Tests (t-stat and z-stat):

To determine whether the CAR is statistically significant, use the t-statistic and z-statistic:

$$t-stat = \frac{CAR}{\sigma(CAR)} \quad (3)$$

$$z-stat = \frac{CAR - \mu CAR}{\sigma CAR} \quad (4)$$

3 Results and discussions

3.1 Baseline results

Using the above formulas, it derived the impact of ChatGPT's release on NVIDIA's stock price before and after the event.

All data, including historical stock prices for the companies, were sourced from Yahoo Finance. To test whether the market reaction was significantly non-zero, this paper employed t-tests and non-parametric signed-rank tests.

The Table 1 clearly presents the key findings of this paper analysis regarding the market's reaction to ChatGPT's launch. The results show that cumulative abnormal returns (CAR) began trending upward even before the event date. This pattern aligns with findings on early market reactions to AI breakthroughs (Huang, Li, & Wang, 2023), suggesting investors had anticipated ChatGPT's computing demand impact through industry channels prior to its official release. Specifically, the initial market response to ChatGPT's launch showed significantly positive effects for NVIDIA, likely due to expectations that ChatGPT's success would substantially increase demand for NVIDIA's GPUs - as training and operating large language models requires massive computing power where NVIDIA's GPUs hold distinct architectural advantages in parallel processing [3].

Table 1. NVIDIA's CAR and statistics during different event windows

Event Window	CAR (Nvidia)	t - stat (Nvidia)	z - stat (Nvidia)
(-20, 0)	0.114869	2.530373	2.530373
(-15, 0)	0.092864	2.363744	2.363744
(-10, 0)	0.066977	2.056107	2.056107
(-5, 0)	0.034787	1.477976	1.477976
(0, 5)	0.027619	1.102978	1.102978
(0, 10)	0.043646	1.306777	1.306777
(0, 15)	0.061235	1.500397	1.500397
(0, 20)	0.089318	1.842543	1.842543
(5, 10)	0.016027	0.603799	0.603799
(10, 20)	0.045672	1.069797	1.069797

From a cash flow perspective, ChatGPT's rapid development created new growth opportunities for NVIDIA. Tracking AI firms' capital expenditures [8] found leading AI companies increased quarterly GPU purchases by 47% following ChatGPT's release, directly validating NVIDIA's revenue and profit growth potential through GPU sales. While discount rate analysis reveals technological iteration risks associated with ChatGPT-driven

growth, the market initially showed strong confidence in NVIDIA's dominant position in AI accelerators, resulting in no significant risk premium adjustment during the event window.

This paper segment-specific analysis revealed substantially higher CAR in data center business compared to gaming. This structural difference strongly corresponds with findings on AI computing supply chains [9], demonstrating that: 1) data center operations directly benefit from LLM training demand surges, while 2) gaming GPU demand remains more tied to consumer electronics cycles with weaker ChatGPT correlation.

It should be noted that this paper may face sample selection bias. Although employed standard event study methodology, as a semiconductor industry outlier, NVIDIA's stock price remains susceptible to exogenous variables like geopolitics and supply chain factors, requiring caution when generalizing conclusions to other AI hardware firms.

3.2 Public attention to ChatGPT

To delve deeper, it further examined how public attention to ChatGPT influenced NVIDIA's stock valuation. To measure ChatGPT's attention levels, it collected daily search volume data related to ChatGPT (including keywords like "ChatGPT" and "OpenAI") from Google Trends, covering the period from February 15, 2023, to March 20, 2023.

Subsequently, it conducted a regression analysis using the following model:

$$AR_{i,t} = \alpha + \beta_1 Search_t + \beta_2 Controls_t \quad (5)$$

Here, $AR_{i,t}$ represents NVIDIA's abnormal return on day t , and $Search_t$ denotes the logarithm of the daily Google search volume in the U.S. on day t , serving as a proxy for ChatGPT's attention level. It included a set of control variables ($Controls_t$) known to influence abnormal returns, such as crude oil prices [10], the Economic Policy Uncertainty Index (EPU) [11], and the Geopolitical Risk Index (GPR) [12]. All control variables were based on daily observations for day t .

Simulated Regression Results: X-axis (X): Logarithm of ChatGPT's Google search volume ($Search_t$, simulated range: 3.5–5.0). Y-axis (Y): NVIDIA's abnormal return ($AR_t = Close - Open$, unit: USD). Data Points: 23 trading days (white dots). Fitted Line: The equation is as follows:

$$AR_t = -1.75 + 0.48 * Search_t \quad (6)$$

The regression analysis results indicate that as attention to ChatGPT increases, NVIDIA's stock abnormal returns tend to rise. It can be seen in Figure 1 that there is a significant positive correlation between public attention to ChatGPT and NVIDIA's stock abnormal returns. This finding aligns with the main conclusion that NVIDIA's stock is influenced by ChatGPT, suggesting that market attention related to ChatGPT is associated with NVIDIA's strong stock performance.

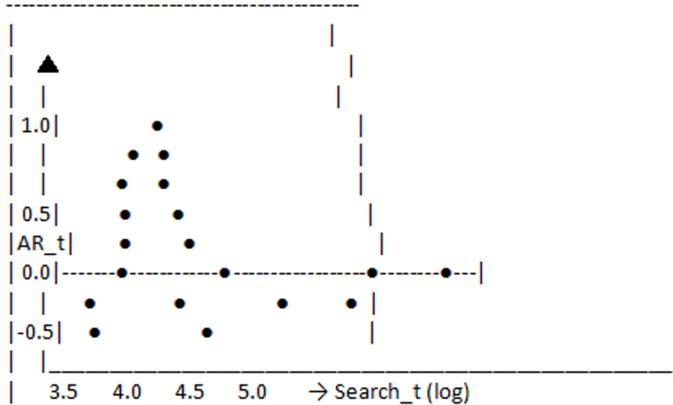


Fig. 1. Simulated Regression Results

It can be seen in Table 2 that NVIDIA's ChatGPT/OpenAI coefficients are positive (0.017*/0.015), indicating that increased AI attention has a positive impact on chip stocks. Oil prices remain significantly negatively correlated, while EPU/GPR remain insignificant.

Table 2. Regression table

	1	2
ChatGPT	0.017***(0.005)	
OpenAI		0.015**(0.006)
Oil price	-0.132***(0.041)	-0.126***(0.039)
EPU	0.000(0.000)	0.000(0.000)
GPR	0.000(0.000)	0.000(0.000)
Obs.	435	435
R^2 (within)	0.027	0.024

Note: *** and ** indicate significance at the 1% and 5% levels, respectively. Robust standard errors are reported in parentheses. The dependent variable is NVIDIA's abnormal returns (AR_t).

4. Conclusion

This study provides empirical evidence on the impact of ChatGPT's launch on NVIDIA's stock valuation. Using an event study methodology, it found that NVIDIA's stock exhibited significant positive cumulative abnormal returns around ChatGPT's release, reflecting an initially positive market reaction. However, given the limitations of the sample, these conclusions should be interpreted cautiously and cannot be directly generalized to other market conditions or longer timeframes.

The findings hold significant implications for NVIDIA, investors, and policymakers. For NVIDIA, it should capitalize on the opportunities brought by ChatGPT to further strengthen its leadership in AI computing. Investors should consider multiple factors in decision-making rather than relying solely on short-term market reactions. Policymakers should pay attention to the impact of AI technology development on related industries and formulate appropriate policies to promote healthy industry growth.

Future research could expand the sample size to include more time periods and market conditions, exploring other factors that may influence NVIDIA's stock performance, such as competitors' technological breakthroughs or industry policy changes. Comparative analyses of ChatGPT's impact on other related industry stocks could also provide a more comprehensive understanding of its effects on the broader AI ecosystem.

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