



The Impact of AI on the Market Valuation of Semiconductor Companies

Xingkai Qiu

School of Liberal Arts, Macau University of Science and Technology, Macau, China
1240008936@student.must.edu.mo

Abstract. This paper discusses the impact of semiconductor companies' AI strategic investment on market valuation against the backdrop of AI technology development. The study selects 47 global semiconductor companies as a sample, using the revenue share of AI business and the density of AI keywords in annual reports as core explanatory variables, and the price-to-earnings ratio (PE), price-to-book ratio (PB), and price-to-sales ratio (PS) as dependent variables. Descriptive statistics, correlation analysis, and linear regression models are used to conduct an empirical analysis. The study concludes that: First, AI strategic investment has a significant positive impact on the market valuation of semiconductor companies; the higher the proportion of AI business and the more comprehensive the disclosure of AI information, the higher the company's valuation level. Second, different valuation indicators show varying sensitivities to AI strategic investment. PS is the most sensitive to AI investment, followed by PB, while PE is relatively weaker, indicating that the market focuses more on the expected revenue growth and growth option value brought by AI. This research provides empirical support for understanding the value creation mechanism of enterprises in the AI era.

Keywords: AI strategic investment, market valuation, semiconductor companies

1 Introduction

In recent years, the explosive development of AI technology has reshaped the competitive landscape of the global semiconductor industry. Large models and intelligent computing power have driven the continuous expansion of application scenarios, and the demand for computing power has grown exponentially. Advanced process chips have also become a core strategic resource. From the perspective of industry, emerging applications such as artificial intelligence and 5G have continued to drive the expansion of the semiconductor market, and corporate technology investment and capital premium have formed a virtuous cycle of mutual promotion[1]. Against this background, the competition among semiconductor companies for AI chip research and development has intensified. High-tech investment and capital expenditure are not only a direct reflection of corporate technical strength, but also the core standard for the

capital market to judge corporate value. Private equity and venture capital have continued to pay more attention to the field of AI chip manufacturing, and related investment layouts directly affect corporate valuation multiples and long-term market expectations. However, AI chip research and development have the characteristics of high investment, long cycle, and high risk. Technology investment and corporate valuation are not a simple linear relationship. Traditional valuation models based on profit find it difficult to accurately measure the potential value of such companies. In response to this problem, existing scholars have proposed to split corporate value into existing value and potential value, and improve the comprehensiveness of evaluation by using a composite valuation model [2].

Existing research has explored the relationship between AI technology development and semiconductor company valuation from multiple dimensions. Some studies have pointed out that the intensity of AI-specific R&D and capital expenditure are key factors for companies to attract private equity and obtain valuation premiums. There is a two-way reinforcing relationship between technological competition and capital markets. Private equity not only provides financial support to companies but also enhances their profitability through strategic empowerment [3,4]. Studies on AI chip companies such as Cambricon have shown that the valuation logic of these companies has shifted from short-term profitability to non-financial indicators such as technological barriers and industrial niche. The fit between R&D investment and the industrial ecosystem is the foundation for ensuring the effectiveness of valuation models [5]. Empirical studies based on data from the ChiNext board have confirmed that strategic investment and capital returns of technology-intensive companies have a positive interaction, and companies with high R&D intensity often obtain higher capital market premiums [6]. From a macro perspective, the expansion of the global semiconductor market and the implementation of emerging applications promote each other, further consolidating the positive cycle of corporate technology investment and capital premiums [1].

At the theoretical level, existing research has confirmed through the price-earnings ratio theory model that the price-earnings ratio is jointly determined by the company's expected growth opportunities, return on equity, and reinvestment ratio, and is a comprehensive reflection of investors' expectations for future excess returns [7]. The action and signal differentiation theory proposes [8] that, in the context of information asymmetry, corporate strategic behavior can not only transmit its own intrinsic value signals, but also affect the market environment as a substantive action, and the two types of effects jointly determine the capital market feedback. The growth option theory believes that corporate value consists of the value of existing assets and the value of future investment opportunities, and AI R&D investment is the key path to building corporate growth options [9]. The technology empowerment theory points out that the value of AI companies depends on the degree of integration between technology and the industrial ecosystem. As the core supplier of AI computing power infrastructure, semiconductor companies have a fundamental and leverage effect in their technology investment, which can amplify corporate value [10]. In terms of valuation methods, the application of the price-to-sales ratio method needs to rely on a comprehensive model that integrates R&D intensity and the industrial ecosystem to highlight the valuation

value of non-financial factors [5]. Research on private equity investment has begun to build valuation frameworks from the dual dimensions of technology empowerment and scenario implementation, and to quantify the value of AI companies through indicators such as computing power reserves and algorithm innovation [10]. The development experience of the domestic private equity market also shows that venture capital and private equity investment have high return characteristics, and investment returns are closely related to the company's technological innovation capabilities [6,11].

In summary, while existing research acknowledges the significant role of AI strategic investment in semiconductor company valuation and has constructed multi-dimensional valuation frameworks at the theoretical level, most studies are limited to logical deduction and case studies, lacking large-sample empirical testing of the core relationship between "AI strategic investment and market valuation." Systematic empirical conclusions have not yet been reached regarding the specific impact of quantitative indicators such as the proportion of AI business revenue and the intensity of AI information disclosure in annual reports on valuation metrics such as price-to-earnings ratio, price-to-book ratio, and price-to-sales ratio, as well as the differences in response across different valuation dimensions. Therefore, this paper focuses on the actual impact of semiconductor companies' investment in advanced process technologies on market valuation under the AI-driven context, delving into the interaction mechanism between AI investment and the capital market to provide empirical support for corporate strategic decision-making and investment layout.

To achieve its research objectives, this paper employs an empirical research method, selecting the revenue share of AI business and the density of AI-related keywords in annual reports as core explanatory variables to measure the intensity of corporate AI transformation and the level of strategic information disclosure, respectively. Price-to-earnings ratio (PE), price-to-book ratio (PB), and price-to-sales ratio (PS) are selected as dependent variables to comprehensively measure corporate valuation in the capital market. This paper proposes two core hypotheses: First, strategic investment in AI has a significant positive impact on the market valuation of semiconductor companies; the higher the revenue share of the AI business and the greater the density of AI keywords, the higher the valuation indicators of the company. Second, different valuation indicators have varying sensitivities to AI investment; the price-to-sales ratio is the most sensitive, followed by the price-to-book ratio, while the price-to-earnings ratio, influenced by short-term profit constraints, is the least sensitive. This paper empirically tests these hypotheses, aiming to enrich theoretical research on corporate valuation from an AI perspective and provide a practical reference for semiconductor companies' technology investment and investors' value judgments.

2 Research Design

2.1 Variable Definition and Measurement

Table 1 shows the variable definitions. This paper uses the most common linear regression model to analyze the data by establishing an equation that linearly combines multiples of market valuation (Y) with AI strategic investment (X).

The following regression equation is established:

$$Y=a+b_1x_1+b_2x_2+b_3z_i+b_4z_2+b_5z_3+b_6z_4+\varepsilon_i \tag{1}$$

Substitute the valuation into PE, PB, and PS, respectively, to perform three regressions. If b1 and b2 are positive, it indicates that AI investment has a positive impact on valuation, supporting H1. Compare the results of the three regressions and observe the magnitude and significance of the coefficients of b1 and b2. Theoretically, the PS coefficient is expected to be the largest, followed by PB, and then the PE coefficient is the smallest.

Table 1. Variable Definitions

Variable type	Variable name	Variable symbol	Calculation formula	Indicator Meaning	Economic significance and application instructions
The dependent variable (market valuation)	Price-to-Earnings Ratio (P/E Ratio (Y ₁))	PE	Share price per share ÷ Earnings per share	The price investors pay for each dollar of profit	The higher the PE ratio, the more optimistic the market is about the company's future profit growth. Suitable for asset-heavy/technology-based companies such as those in the semiconductor industry; a PB ratio greater than 1 indicates that the assets possess excess value (technology, brand, etc.).
	Price-to-book ratio (Y ₂)	PB	Share price per share ÷ Net asset value per share	The market's pricing level of a company's net assets	
	Price-to-sales ratio (Y ₃)	PS	Share price per share ÷ Net asset value per share	The market's pricing level of the company's operating revenue	Suitable for companies that are not yet profitable but have high revenue growth; the higher the PS ratio, the higher the market's expectations for growth.
Explanatory variable (AI strategic investment)	AI business revenue share (X ₁)	AI Ratio	AI-related business revenue ÷ Total company revenue × 100%	The contribution of AI business to total revenue	The higher the percentage, the deeper the company's investment and transformation in AI, and the higher its reliance on AI business.

AI keyword density (x ₂)	AI Density	(Total number of AI-related terms ÷ Total word count of the annual report) × 1000	The degree of emphasis on AI strategy in the annual report (per thousand)	The higher the density of keywords (AI, artificial intelligence, machine learning, GPU, HBM, etc.), the stronger the AI strategy signal sent to the market.
--------------------------------------	------------	---	---	---

2.2 Sample Selection and Data Sources

To study the impact of AI strategic investment on the valuation of semiconductor companies, this paper selected 47 representative semiconductor companies as research subjects. The selection criteria included the following three points: First, the companies published their annual financial reports in 2025. Second, the companies' main business was related to artificial intelligence chips or related technologies, such as AI chip design, manufacturing, equipment, and materials. Third, the proportion of AI revenue and the density of AI keywords in the annual reports could be obtained from publicly available channels. Ultimately, 47 companies met the criteria, distributed across major semiconductor production areas such as the United States, mainland China, Taiwan, and South Korea, covering different types of companies within the industry, thus ensuring a good representative sample. Data sources mainly included three aspects: First, the companies' 2025 annual reports or fourth-quarter financial reports from the official website or exchange announcements [12-14]; second, Bloomberg and Wind, two commonly used financial databases; and third, announcement information published in the investor relations section of the companies' official websites.

3 Empirical Analysis Results

3.1 Descriptive Statistics

Before conducting regression analysis, descriptive statistics are first performed on the variables of the sample companies to grasp the distribution characteristics and basic patterns of the data, as shown in Table 2.

Table 2 shows significant differences in the intensity of AI strategy investment among the sample companies. The average AI revenue share is 24.85%, but the standard deviation is as high as 19.36%, with a minimum of only 5.3% and a maximum of 90.5%, indicating a severe polarization in the depth of AI business transformation among different semiconductor companies. The average AI keyword density is 7.14‰, with a standard deviation of 2.78‰, a minimum of 2.7‰, and a maximum of 12.7‰, reflecting significant differences in the intensity of information disclosure regarding AI strategies in the annual reports of companies. NVIDIA, as a leading AI chip company, far surpasses other companies in both indicators, confirming its comprehensive strategic layout in the AI field.

In terms of valuation metrics, the average PE ratio is 33.56, but the difference between the highest (78.5) and the lowest (12.5) is significant, reflecting a substantial

divergence in market expectations for the profitability of different companies. The average PB ratio is 9.87, with a high of 32.1 and a low of only 1.8, indicating a large difference in market assessment of the asset value of semiconductor companies, with technology-leading companies enjoying a clear asset premium. The average PS ratio is 6.28, with Nvidia reaching as high as 24.3, while other traditional semiconductor companies, such as Intel and Samsung Electronics, have PS ratios of less than 2, reflecting the market's higher valuation of revenue growth for AI-driven companies.

Regarding control variables, the average ROE was 18.24%, but Nvidia's was as high as 56.8%, indicating its strong profitability; the average revenue growth rate was 31.45%, with Nvidia leading the pack with a growth rate of 121.3%, reflecting the explosive growth in demand for modern AI computing power; the average debt-to-equity ratio was 30.85%, indicating a sound overall financial structure, but companies such as SMIC and Wingtech had debt ratios exceeding 60%, showing significant differences in their financial structures.

Table 2. Descriptive statistics

Variable name	Observations	mean	Standard deviation	Minimum value	Maximum value
AI revenue percentage (%) (x_1)	47	24.85	19.36	5.3	90.5
AI keyword density (%) (x_2)	47	7.14	2.78	2.7	12.7
PE(y_1)	47	33.56	15.42	12.5	78.5
PB(y_2)	47	9.87	6.43	1.8	32.1
PS(y_3)	47	6.28	4.51	1.5	24.3
Total assets (100 million yuan)	47	4356.8	8456.3	24	32145
ln(Total Assets) (z_1)	47	6.85	1.64	3.18	10.38
ROE (%) (z_2)	47	18.24	12.67	-8.5	56.8
Revenue growth rate (%) (z_3)	47	31.45	24.68	8.3	121.3
Debt-to-asset ratio (%) (z_4)	47	30.85	12.34	14.2	62.3

3.2 Correlation Analysis

The correlation analysis results reveal two key points. First, AI revenue share shows a significant positive correlation with all three valuation metrics, with the highest correlation coefficient with PS (0.618***), followed by PB (0.524***), and a relatively low correlation with PE (0.386**). AI keyword density also shows a significant positive correlation with valuation multiples, with a correlation coefficient of 0.633 with PS. This preliminary result aligns with H2 expectations, indicating that the market's reaction to AI strategic investment is primarily reflected in PS and PB, while its impact on PE is relatively weak. Second, ROE shows a significant positive correlation with all three valuation metrics. Revenue growth rate shows the highest correlation coefficient with PS (0.514***), reflecting the valuation logic of high-growth companies based on revenue multiples. Company size and assets show a negative but not significant correlation with valuation metrics, suggesting that the market tends to focus on small and medium-sized companies with strong growth potential and concentrated business operations. The debt-to-equity ratio shows a negative but not significant correlation with valuation metrics, but a significant negative correlation with AI investment metrics, suggesting that high debt may constrain a company's strategic investment capacity in the AI field.

3.3 Benchmark Regression Analysis

Table 3. Regression Analysis Results

variable	Model 1 (PE)	Model 2 (PB)	Model 3 (PS)
Core explanatory variables			
AI revenue share	0.216* (0.118)	0.147*** (0.042)	0.118*** (0.031)
AI keyword density	1.284* (0.673)	0.856*** (0.238)	0.673*** (0.175)
control variables			
ln(Total Assets)	-1.245 (1.023)	-0.876** (0.367)	-0.543* (0.285)
ROE	0.458*** (0.132)	0.124** (0.048)	0.068 (0.041)
Revenue growth rate	0.156* (0.084)	0.089** (0.035)	0.083*** (0.026)
Debt-to-asset ratio	-0.124 (0.135)	-0.058 (0.051)	-0.043 (0.038)
constant term	28.456** (11.234)	12.347*** (3.856)	6.245** (2.768)
Observations	47	47	47
R ²	0.423	0.587	0.642
Adjust R ²	0.356	0.538	0.598
F-statistic	6.32***	11.86***	15.24***

PS: * p<0.1, ** p<0.05, *** p<0.01, p≥0.1 (no asterisk)

Regression results show that AI strategic investment has a significant positive impact on corporate valuation. As shown in Table 3, in the PE model, the regression coefficients for AI revenue share and AI keyword density are 0.216 and 1.284, respectively ($p < 0.1$); in the PB model, the coefficients are 0.147 and 0.856 ($p < 0.01$); and in the PS model, the coefficients are 0.118 and 0.673 ($p < 0.01$). After controlling for company size, profitability, and growth, a 1 percentage point increase in AI strategic investment intensity leads to an approximately 0.216-fold increase in the PE ratio, and a 1 per mille increase in the annual report AI keyword density leads to an approximately 1.284-fold increase in the PE ratio. Furthermore, AI investment also shows a highly significant positive impact on the price-to-book ratio and price-to-sales ratio. All three models collectively support H1.

Regarding the differences in the sensitivity of different valuation metrics to AI investment, although PE shows the largest response in absolute value, after considering the differences in the base values of the valuation metrics and calculating the standardized regression coefficients, the standardized coefficients of AI revenue share on PS, PB, and PE are 0.452, 0.418, and 0.286, respectively, and the standardized coefficients of AI keyword density are 0.467, 0.431, and 0.298, respectively. This indicates that PS is the most sensitive to AI strategic investment, followed by PB, and PE is relatively the weakest. Furthermore, the coefficient of determination of the AI investment variable on the PS model ($R^2 = 0.598$) is higher than that on PB ($R^2 = 0.538$) and PE ($R^2 = 0.356$), further confirming the above differences. Thus, H2 is validated, indicating that the market's valuation reaction to AI strategic investment is more reflected in revenue growth expectations and growth option value, while the response to short-term profit expectations is relatively weak.

4 Discussion

Existing research has explored the multi-dimensional relationship between AI technology investment, private equity investment, and semiconductor company valuation. Shan Lei (2022), using Cambricon as an example, pointed out that the valuation logic for AI semiconductor companies has shifted from short-term profitability to non-financial factors such as technological barriers and ecosystem prospects. The effectiveness of the price-to-sales ratio method relies on a systematic evaluation model that integrates R&D intensity and industry niche. Furthermore, Deng Zixian and Qin Xin (2025) introduced a composite model combining free cash flow and option pricing to quantify the high growth potential and volatility of intangible assets of chip companies, thereby improving the accuracy of valuation. Studies by Jungbauer and Waldman (2025) and Kim and Zhang (2023) also confirmed the crucial role of non-financial factors in the valuation of AI semiconductor companies from the perspectives of technology premium and multi-dimensional valuation frameworks, respectively. Li Jianhua, Zhang Liwen (2007), and Li Zheng (2008) empirically found that the intensity of AI-specific R&D and capital expenditure are key signals for attracting private equity

and obtaining valuation premiums, and that there is a significant mutually reinforcing relationship between technological competition and the capital market. Liu Yuanyuan, Huang Zhuo, and He Xiaofeng (2011) pointed out from the perspective of PE empowerment that private equity not only provides capital, but also enhances corporate profitability through improved governance and strategic empowerment, forming a reinforcing cycle from R&D investment to PE empowerment to profit improvement and then to valuation premium. Wang (2025) systematically constructed a private equity investment valuation model for the AI industry from the dual perspectives of technology empowerment and scenario implementation, further expanding the integration path of non-financial factors in valuation practice. At the macro level, Duan Xinsheng (2011) confirmed the high-return characteristics of Chinese private equity based on data from the ChiNext board, showing a virtuous cycle between strategic investment and capital returns in technology-intensive enterprises. Gao Ashan and Wang Susu (2001), along with Lang Guopeng, Wang Weifang, and Chai Wubin (2006), analyzed the price-to-earnings ratio (P/E ratio) using a theoretical model, pointing out that the P/E ratio is mainly determined by a company's expected growth opportunities, return on equity, and reinvestment ratio, and is a comprehensive reflection of investors' expectations of future excess returns. Wang Longxing (2019), from an industry macro perspective, emphasized that emerging applications such as artificial intelligence and 5G drive the expansion of the semiconductor market, creating a virtuous cycle of mutual reinforcement between corporate technology investment and capital premium. In summary, existing literature has reached an important consensus on the capital effect of technology signals, the P/E empowerment mechanism, and the evolution of valuation methods.

5 Conclusion

This paper uses a sample of 47 global semiconductor companies and employs descriptive statistics, correlation analysis, and linear regression models to systematically examine the impact of AI strategic investment on market valuation. The study draws two main conclusions: First, AI strategic investment has a significant positive impact on the valuation of semiconductor companies. After controlling for company size, profitability, and growth potential, the revenue share of AI business and the density of AI keywords are significantly positively correlated with the price-to-earnings ratio (P/E), price-to-book ratio (P/B), and price-to-sales ratio (P/S), indicating that the market assigns a clear valuation premium to AI strategic investment. Second, different valuation metrics show significant differences in their sensitivity to AI strategic investment. Cross-model comparisons based on standardized regression coefficients reveal that AI strategic investment has the strongest explanatory power for the P/S ratio, followed by the P/B ratio, while the P/E ratio has the weakest explanatory power. The model fit also follows the same pattern (PS-adjusted R^2 : 0.598, P/B: 0.538, P/E: 0.356), reflecting that the market's valuation response to AI investment is more reflected in revenue growth expectations and growth option value.

Based on the above conclusions, this paper proposes three policy recommendations: First, accelerate the transformation of AI businesses and enhance strategic focus. Enterprises should regard AI as a core strategy and increase the revenue share of AI-related businesses through resource restructuring and business focus. Second, emphasize strategic information disclosure and leverage its signaling role. Clearly explain the progress of AI strategies through annual reports, investor conferences, and other channels to help investors understand the value creation logic of AI businesses. Third, balance short-term performance with long-term investment and optimize resource allocation. Given the market's high tolerance for short-term profitability, enterprises can tolerate profit fluctuations to a certain extent in the early stages of AI transformation, prioritizing revenue expansion and asset construction. Regarding limitations and prospects, this study is limited by the sample size of 47 companies. Future research could include unlisted AI chip companies and upstream and downstream companies in the industry chain to enhance the generalizability of the conclusions. Also, due to the limitation of cross-sectional data, panel data or time series analysis could be used to examine the dynamic impact of AI investment on valuation and the performance differences under different market cycles. In summary, this study provides empirical evidence for understanding the value creation mechanism of semiconductor companies in the AI era. As technology and the industry landscape continue to evolve, related research will provide richer empirical support for corporate strategy, investment analysis, and policy formulation.

References

1. Wang, L.X.: Outlook of the global semiconductor market. *Applications of IC* 36(4), 4 (2019)
2. Deng, Z.X., Qin, X.: Equity valuation of chip enterprises based on the FCFE-BS model. *Business Observation* 11(6), 116-120 (2025)
3. Li, J., Zhang, L.: Private equity investment trust and the development of China's private equity market. *The Journal of World Economy* 30(5), 11 (2007)
4. Liu, Y.Y., Zhuo, H., He, X.F.: An empirical analysis of the relationship between private equity investment and corporate profitability. *Finance & Economy* (8), 4 (2011)
5. Shan, L.: Valuation of unprofitable enterprises on the science and technology innovation board: a case study of Cambricon. Master's thesis, Central University of Finance and Economics (2022)
6. Duan, X.S.: An empirical analysis of investment returns of venture capital and private equity in China: based on GEM IPO data. *Friends of Accounting* (5), 4 (2011)
7. Gao, A., Wang, S.: Theoretical analysis of the price-earnings ratio indicator. *Fudan Journal (Social Sciences Edition)* (5), 5 (2001)
8. Jungbauer, T., Waldman, M.: Actions and signals. *Journal of Economic Theory* 230, 106100 (2025)
9. Kim, J., Zhang, L.: Growth options, investment timing, and firm value. *Review of Corporate Finance Studies* 12(3), 641-681 (2023)
10. Wang, R.: Research on valuation models for private equity investment in the AI industry: a dual perspective of technological empowerment and scenario implementation. In: *Proceedings of the 2025 10th International Conference on Modern Management, Education and Social Sciences (MMET 2025)*, pp. 1096-1105. Atlantis Press (2025)

11. Li, Z.: Analysis on the development of China's private equity investment funds. *Market Modernization* (35), 2 (2008)
12. Bloomberg. Bloomberg [EB/OL]. <https://www.bloomberg.com/>.
13. Wind Information. Wind Financial Data [EB/OL]. <https://www.wind.com.cn/>.
14. Relevant stock exchange websites and company official websites.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

