## **Equity Premium Puzzle in Cambricon: Evidence from Behavioural Finance**

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Abstract:

The stock premium effect in high-tech industries often deviates from the market effectiveness and investor rationality emphasized by traditional financial theories. Based on behavioural finance theory, this study analyses the premium effect of Cambricon, a leading Chinese AI chip company listed on the Science and Technology Innovation Board (STB). Using financial indicators (e.g., negative price-to-earnings ratio, 58.03 times issue price-to-sales ratio), investor sentiment indices (e.g., Baidu search index) and institutional trading data (2020-2025), the study finds that irrational factors-such as the herd effect, sentiment bias and narrative-driven speculation (e.g., the "AI chip localization") drive high stock premiums to some extent. The results suggest that the concentration of institutional positions and retail followers' behaviour together drive this phenomenon, and the sentiment resonance mechanism exacerbates price distortions. The study proposes regulatory reforms (e.g., dynamic position disclosure thresholds, ETF rule optimization) and institutional strategies (e.g., long-term performance assessment) to curb speculative bubbles. These findings reveal the role of behavioural factors in shaping tech stock premiums and provide a practical framework for stabilizing high-volatility markets.

#### 1 INTRODUCTION

In finance, the stock premium effect has been the focus of research. However, empirical studies have found that traditional financial theories based on the efficient market hypothesis have difficulty in explaining valuation deviations in high-tech stocks (Fama, 1970; Shiller, 2003). Behavioural finance proposes that the herd effect and investor sentiment push up premiums through psychological account segregation, while liquidity stratification exacerbates price volatility (Bikhchandani et al., 1992; Baker & Wurgler, 2006; Calzadilla et al., 2021; Thaler, 1985; Shen, 2023). As a benchmark company in China's AI chip industry, Cambricon occupies 30% of China's cloud-based Ai chip market share and has received capital injection from the National IC Industry Investment Fund. It has attracted much attention since its listing, with its capital fervour and domestic substitution narrative providing an opportunity for premium pricing(Li, 2020). Founded in 2016,

Cambium, which focuses on AI chip research and development, has seen its revenues surge from 7,843,300 yuan in 2017 to 444 million yuan in 2019, and through multiple rounds of financing was valued at 2.5 billion dollars in 2018, making it a unicorn enterprise. The stock price jumped 229.86% on the first day of listing on the Science and Technology Board in 2020, and rose over 1,089% after 2023 driven by the ChatGPT concept. The high level of innovation and uncertainty in the AI industry has led to technological developments, capital flows, and macroeconomic changes significantly affecting investor behaviour, which in turn leads to stock price volatility. Existing studies mostly focus on traditional industries, with insufficient research on the behavioural premium mechanism of high-tech stocks, and the special characteristics of China's science and innovation board market due to the high proportion of retail investors and strong policy drivers(Baker & Wurgler, 2006). The high growth of the Ai chip further increases irrational investor industry

<sup>a</sup> https://orcid.org/0009-0003-9287-0811 <sup>b</sup> https://orcid.org/0009-0008-2129-557X behaviour, with Asia-Pacific ai spending projected to reach \$90.7 billion by 2027, with a CAGR of up to 28.9% from 2022 to 2027 (IDC, 2006), as high as 28.9% (IDC, 2023).

Based on this, this paper applies the theoretical framework of behavioural finance and introduces narrative economics in conjunction with the liquidity layering model to reveal how the 'AI chip autonomy' narrative forms a positive feedback loop through institutional hugging and retail followers(Shiller, 2003). Clarify how the degree of premium is calculated and invoke the sentiment index construct (Baker & Wurgler, 2006). The study is conducted in two ways: one, to quantify the degree of Cambricon premium by comparing financial data with industry averages; and two, to quantify the abnormal returns on stock price from events such as the release of ChatGPT's concept and its inclusion in the SSE 50 index using event analysis. This research enriches the application scenarios of behavioural finance in the stock premium of high-tech enterprises and extends the 'cognitive bias-price feedback' model, which not only analyses the impact of investors' behavioural biases on stock prices and provides theoretical support for their investment decisions, but also provides government, It also provides suggestions for government, institutions and individual investors to help the government to better manage the market and investors to make more rational decisions(Barberis & Huang, 2008). It can also design 'sentiment warning indicators' for retail investors to avoid the risk of bubbles.

## 2 THEORETICAL FOUNDATIONS

## 2.1 Relevant Theories of Behavioural Finance

The traditional "efficient market hypothesis" holds that investors are completely rational in making investment decisions in financial markets. However, research results in behavioural finance show that investors are often influenced by the external environment to create cognitive bias and deviate from the efficient market when making investment decisions (Tang et al., 2017). As a high volatility technology stock, Cambricon's stock price may be significantly stronger affected by behavioural finance factors than traditional industries. Based on this, this paper investigates four aspects: herd effect, loss aversion, sentiment influence, and information effect.

Herding effect refers to the tendency of investors to mimic others' decisions rather than analyse them independently when information asymmetry or uncertainty is high, resulting in excessive volatility as a result of blindly following the herd (Bikhchandani et al., 1992). As an emerging technology company, Cambricon's technological complexity and uncertainty of future profitability may lead investors to rely on the behaviour of others and form a herd effect. For example, concentrated positions of institutional investors may trigger retail investors to follow suit, further amplifying stock price volatility (Lakonishok et al., 1992).

Loss Aversion (Loss Aversion) is a core concept of Prospect Theory, which refers to the fact that investors are more sensitive to losses than to equivalent gains, and this psychology leads investors to be more conservative in making investment decisions, demanding higher risk premiums, and leading to irrational position-taking behaviour (Kahneman & Tversky, 1979 ;Gupta & Shrivastava, 2022). Sentiment Effect (Sentiment Effect) refers to the significant impact of investor sentiment on stock prices through media rendering, social media communication and other channels, when investment sentiment is high, over-optimism affects investor valuation of stocks, which leads to risky decisions (Baker & Wurgler, 2007). With the iteration of ChatGPT, investors show overconfidence in AIrelated stocks, and as a tech hotspot company, Cambricon, its stock price is vulnerable to market sentiment-driven, leading to short-term overshooting of the stock price.

## 2.2 Theories Related to the Premium Effect

Liquidity premiums and risk premiums have an important place in finance. The liquidity premium reflects the link between transaction costs and asset prices, with investors demanding a higher rate of return to compensate for the risk of holding less liquid assets. The risk premium, on the other hand, is the return that investors expect to receive over and above the risk-free rate for taking on additional risk.

In terms of liquidity premium, for example the scale has expanded rapidly in recent years(Shen, 2023) . The literature takes the high-frequency trading data of SSE 50ETF options and CSI 300ETF options market as the research samples, and concludes that there is a significant liquidity premium phenomenon in the market of all moneyness categories of SSE 50ETF options as well as OTM Put and ATM Put categories of CSI 300ETF options

(Jiang, 2022). It is mentioned that liquidity premium represents the extra rate of return that investors expect to get to compensate for the risk of holding illiquid assets, and in stock investment, the liquidity factor captures the excess return from illiquid stocks, and it is also suggested that investors should consider the liquidity risk when pursuing the liquidity premium and realize the balanced portfolio allocation to the liquidity risk factors, and four measures of liquidity in the stock market are also proposed. Indicators.

On risk premium, the uncertainty affecting asset prices is categorized into fundamental uncertainty, market-level and firm-level external uncertainty (Yang, 2011). It is argued that investors form heterogeneous beliefs about fundamentals and external factors, respectively, on the basis of which a model of consumer capital asset pricing based on investors' heterogeneous beliefs is established, which theoretically proves that in addition to the fundamental risk from total consumption/endowment, the differences in investors' beliefs about marketlevel and firm-level external factors also have a significant influence on the risk premium of idiosyncratic volatility. In addition to the fundamental risk from total consumption/endowment, it is theoretically demonstrated that the differences in investors' beliefs about market-level and firm-level external factors are also risk factors affecting stock Based on the perspective of institutional investors, the study of China's financial risky investment and bond risk premium empirically examines the impact of institutional investors' motivation of stockholding behaviour on bond risk premium as well as the transmission paths of its action mechanism, and points out that the different risky investment behaviours of institutional investors can be identified and manifested in bond risk premiums(Guan, 2020).

Liquidity premiums and risk premiums play a crucial role in financial markets and have an important impact on investors' decisions and asset pricing. An in-depth study of liquidity premiums and risk premiums can help to better understand the operating mechanism of financial markets and provide investors with a more accurate basis for investment decisions.

#### 3 CASE DESCRIPTIONS

Founded in 2016, it is a leading AI chip enterprise in China, focusing on the research and development of AI chip products and technological innovation, and providing a series of intelligent chip products and

platform-based system software with a unified ecology, such as the integration of cloud, hardware and software, and the integration of training and reasoning.

Cambium-U, on June 23, 2020, received approval from the China Securities Regulatory Commission (CSRC) for the registration of its initial public offering, and on July 20, it was listed on the Kechuan Board of the Shanghai Stock Exchange. Initial public offering of RMB 40.1 million ordinary shares to the public, with a total share capital of 360 million shares before issuance and 400.1 million shares after issuance. On the first day of listing, the stock price soared 229.86%, but since then the stock price fell continuously, and once fell to 46.59 yuan/share in 2022. 2023 ushered in the rise by the concept of Chatgpt, and rose 1089% since the beginning of 2023 to 2024. 2024 December 23, the intraday rose to 700 yuan/share, and then fell 4.02% on the same day to close at 648.75 yuan / shares, January 24, 2025 closing share price of 612.98 yuan, compared with the previous trading day fell 8.02 yuan, or 1.29%.

#### 4 EFFECTS ANALYSES

#### 4.1 Existence of Premium Issue

As shown in Fig. 1, Cambricon landed on the S&T board in 2020 with an offering price of \$64.39. From the information provided in its prospectus, there is a possibility that Cambricon's stock offering will be at a premium. During the period 2017-2019, Cambricon is in a continuous loss. Among them, the net profit was -380,704,000 yuan in 2017, -410,465,000 yuan in 2018, and -117,898,560,000 yuan in 2019. In the case that the company has not yet achieved profitability for the stock issue, its issue price is difficult to obtain strong support from the current earnings data, and is based more on the expectation of future earnings. Analysed from the traditional perspective of earnings valuation, the issue price determined in this earnings situation is likely to be overestimated, which also increases the possibility of Cambricon stock premium issuance to a certain extent. From the point of view of valuation indicators, according to the prospectus and other public information, although the price-earnings ratio was not disclosed at the time of the issuance, the 2019 postissuance market-to-sales ratio was as high as 58.03 times, far exceeding the average static market-tosales ratio of comparable companies, which means that relative to the level of the industry in the same period, the market pricing or its market pricing is

overestimated. The market environment also has an impact. 2020 Cambricon listing, the science and technology innovation board for unprofitable technology enterprises to open the listing channel, the market for artificial intelligence and other emerging technology fields enthusiasm. The opening price of 250 yuan on the first day of listing, the initial peak of 297.77 yuan, followed by significant fluctuations. The dramatic ups and downs of the stock price reflect the market's disagreement over the reasonableness of its offering price, side by side indicating that there may be a premium at the time of issuance. When Cambricon went public in 2020, the Science and

Technology Innovation Board happened to open up a listing channel for unprofitable technology companies, which made the market unprecedentedly enthusiastic about artificial intelligence and other emerging technology fields. In this market environment, investors generally have higher expectations for emerging tech companies and are more willing to give them higher valuations. Cambricon's offering price is likely to be driven by market sentiment and investor expectations, resulting in a premium to some extent. This leads to the conclusion that there is a degree of premium issuance when Cambium issues in 2020.

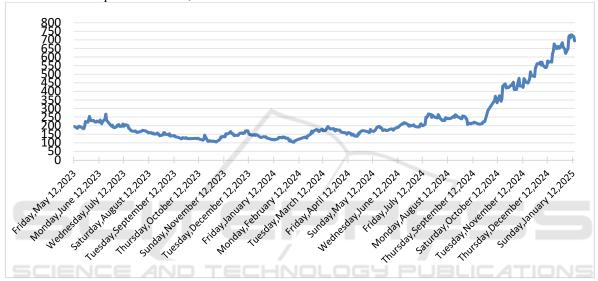


Figure 1: Closing price of Cambricon stock from 2023 to 2025 on a line graph (Photo/Picture credit: Original).

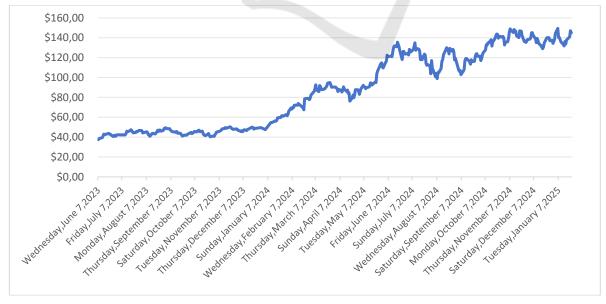


Figure 2: Line graph of closing price of NVIDIA stock from 2023 to 2025 (Photo/Picture credit: Original).

# 4.2 Select Companies in the Same Industry for Comparison to Determine the Extent of Premiums

According to Dolphin Wealth's February 14, 2025 data, Cambricon has a negative TTM P/E ratio and is in the red. Tiger International's February 13, 2025 data shows that NVIDIA has a P/E TTM of 53.42. Finance's February 6, 2025 data shows that the semiconductor industry has a P/E average of 123.31x and a median of 73.16x (seen from Fig. 2).

Cambricon as a newcomer in the field of AI chips, in the expansion period, a large number of resources into research and development, resulting in the current unprofitable, negative price-earnings ratio. Nevertheless, the market is optimistic about its potential in the domestic AI chip market, giving it a high market value. NVIDIA, with its leading position in the global AI chip and graphics processing field, has achieved steady growth in revenue and profit by virtue of its mature product line, extensive customer base and stable market share, and its price-earnings ratio reasonably reflects its operation and market value. Cambricon cannot be directly compared with the industry average due to losses, deviation is obvious, reflecting market pricing based on future expectations; NVIDIA's P/E ratio is lower than the industry average but higher than the median, if only compared with the industry's high-quality enterprises, the level reflects its leading advantage.

Cambricon although losses but high market value, indicating that the market for its future earnings expectations are extremely high, the stock price or there is an overdraft on future performance, contains a large potential premium, if the future earnings are less than expected, the stock price adjustment pressure. Compared with the industry, the degree of deviation reflects the market's high expectations for it to become the domestic AI chip leader. For NVIDIA, assuming that future earnings growth is sustained, when your former price-earnings ratio is in a reasonably high range, there is a certain premium, which stems from the market's recognition of its leading position. technological and market advantages and future profitability. Compared to industry averages, NVIDIA's price-earnings ratio is low, but compared to high-quality companies in the industry, the premium reflects the market's confidence in its future earnings growth.

## 4.3 Analysis of the Reasons for the Premium

Investor sentiment amplifies irrational market volatility through cognitive biases and group contagion mechanisms, and when market sentiment is in a state of exuberance, the valuation of emerging technology assets may systematically deviate from the fundamentals, creating a persistence premium (Baker & Wurgler, 2006). Second, investors tend to categorize risky assets in separate mental accounts and relax risk constraints, resulting in significantly higher allocation weights to Cambricon-related assets than predicted by traditional asset pricing models(Thaler, 1985) . Further, the overconfidence bias prompts investors to focus excessively on optimistic signals and ignore tail risks during information processing, thus reinforcing the positive feedback loop of premium formation (Odean, 1998). As an AI chip company at the forefront of technology, Cambricon has a high level of industry attention. Cambricon's stock price has risen sharply in 2024, and the Baidu Information Index has crested more and more frequently, indicating that investors subconsciously amplify Cambricon's development prospects and ignore some of the potential risks in their decision-making, thus buying a large number of Cambricon shares and pushing the stock price to continue to rise (seen from Fig. 3).

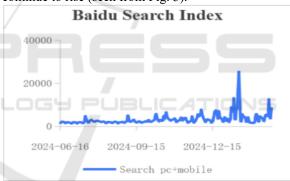


Figure 3: Baidu Search Index (Photo/Picture credit: Original).



Figure 4: Cambricon Share Price Trend (Photo/Picture credit: Original).

From the stock price volatility data (illustrated in Fig. 4), Cambricon in 2023 at the end of September stock price of about 230 yuan, to 2025 January rose to more than 600 yuan, January 10 once rushed to 777.77 yuan, or 238%, more than the average rate of increase of the artificial intelligence chip industry in the same period. Seen from Table 1, on November 29, 2024, Cambricon was added to the SSE 50 index, and its share price rose by +15% in the month before its inclusion in the SSE 50, and +32% in the week after its inclusion, with the turnover rate rising from 3.5% to 12.8%. The impact of early leakage and official release of information on the market should not be underestimated, investors will adjust their investment decisions based on this information, and the positive nature of the information (e.g., inclusion in important indices) makes investors more optimistic about the future expectations of Cambricon, which increases the demand for buying, and pushes the stock price up.

Table 1: Stock Price, Average Daily Volume, Turnover Ratio.

Time Period	Stock	Average	Turnover	
	Price	daily	Rate	
	Increase	turnover		
		(billion yuan)		
One month	+15%	8.2	3.5%	
before				
inclusion in				
SSE				
One week	+32%	25.6	12.8%	
after inclusion		1100 11		
Day after	+12%	18.3	9.1%	
brokerage				
rating release				

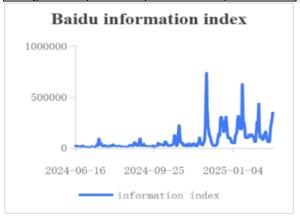


Figure 5 Baidu Information Index (Photo/Picture credit: Original).

As can be seen from the Baidu Information Index given in Fig. 5, in order to meet the demand of investors for relevant information, the organization

has increased its research investment. Positive ratings and research reports from a number of investment institutions have kept Cambricon hot. According to the data of Securities Star, a total of 3 institutions gave ratings, including 2 buy ratings and 1 hold rating. This concentrated release of information and positive guidance has intensified market demand for Cambricon stock, driving the stock price ever higher. From the data of the day following the release of the brokerage ratings, the stock price rose by +12%, with an average daily volume of 1.83 billion yuan and a turnover rate of 9.1%, indicating that investors reacted positively to this information, further pushing the stock price away from the reasonable range and causing the stock price to overflow (shown in Fig. 6).

The synergy of these three types of behavioural mechanisms may trigger the phenomenon of "cognitive resonance", in which emotionally driven attentional biases, the segregation effect of mental accounts, and misattributions due to overconfidence combine to drive up pricing distortions in specific asset classes (Barberis & Huang, 2008).

Herd Behavior is an irrational behavior in which investors abandon their own information analysis and blindly imitate others' decisions in an environment of information asymmetry or uncertainty (Banerjee, 1992). When individuals believe that others' behavior implies private information, they may choose to follow it even if it contradicts their own judgments, thus forming an information waterfall (Bikhchandani et al., 1992). In financial markets, the herd effect is often manifested as convergent trading by investors influenced by the information waterfall, resulting in asset prices deviating from fundamental value



Figure 6: Cambricon Institutional Positions and Shares (Photo/Picture credit: Original).

The spike in Cambricon's stock price is essentially a positive feedback loop triggered by the collective irrational behaviour of market participants. Head institutions accelerated the concentration of positions, institutional holdings soared from 146.6 million shares in 2022 to 193.9 million shares in 2024Q3 (an increase of 32.3%), but the number of institutions fell from a peak of 739 to 302. Among the top ten shareholders, Huaxia, Efontaine and other science and technology ETFs combined position accounted for more than 12% of the formation of passive capital bottoming effect - index funds need to be configured according to the weighting machinery, even if the valuation of the abnormally high is still forced to buy

The relative return ranking mechanism used by public equity funds has created a "prisoner's dilemma" among fund managers. When technology stocks like Cambricon show excess returns, even if fund managers think the stock fundamentals may be overvalued, but in order to avoid short-term performance decline, they have to follow the buy, which further pushes up the stock price. Vanguard Mo Haibo has taken a long position in Cambricon for six consecutive quarters since 2023, gaining a demonstration effect of 37.63% excess returns, triggering other fund managers to follow, which led to the concentration of Cambricon's institutional holdings soaring from 12.7% to 21.4% in three months. As listed in Table 2, from the end of 2023 to the third quarter of 2024, retail investors continued to sell, while institutions absorbed chips through block and other channels, the number of shareholders fell from 33.18 million to 26.47 million. 2024, when the number of institutions reached 739, the market is close to the "crowded trading" tipping point. According to the game theory model, when more than 70% of institutional positions are concentrated in the same underlying, the individual optimal strategy from "follow the group" to "preemptive withdrawal". The number of institutions slashed in the third quarter, but total holdings fell by only 7.4%, suggesting that institutions still holding shares are maintaining control by adding to their positions, creating a new equilibrium.

Table 1: Concentration Quartile of Shareholding of Top 10 A-Shareholders (2000-2023)

Quartile	10%	25%	50%	75%	90%
Shareholding	18%	24%	30%	33%	34%

The current shareholding of the top ten shareholders has reached 37.2%, exceeding the 90% quartile of A-share history. According to the liquidity layering model, when the concentration of institutional positions exceeds 30%, the market depth (Market Depth) falls to the danger zone, when 1% of the selling volume can trigger more than 15% of the price retraction. The irrational prosperity of

Cambricon is the ultimate interpretation of narrative economics. The grand narrative of "autonomous and controllable AI chips" has made Cambricon a vehicle for symbolic capital. Institutions have reinforced this narrative by continuing to take positions, creating a consensus premium similar to that of Bitcoin - prices are no longer dependent on financial metrics, but rather on the strength of participants' belief in the narrative.

#### 5 CONCLUSIONS

To sum up, the abnormal volatility of Cambricon's stock price reveals the structural defects in the Ashare market in institutional design and behavioural regulation. From the perspective of government regulation, it is necessary to build a dynamic risk prevention and control system: on the one hand, for the risk of institutional position concentration breaking through the historical quartile value, it is recommended to introduce counter-cyclical adjustment tools, dynamically adjust downward the disclosure threshold for position concentration (e.g., mandatory disclosure of trading intent when the shareholding ratio exceeds 25%), and correct unilateral market volatility by expanding the underlying securities financing and introducing hedging tools such as individual stock options; on the other hand, it is necessary to Optimize ETF subscription and redemption rules, set valuation deviation thresholds for index constituents (e.g., P/E ratio deviating from the industry average  $\pm 2$  standard deviations), and allow fund managers to suspend subscriptions or adjust weightings to curb the bubbleboosting effect of passive funds.

At the same time, the herd behaviour of institutional investors and appraisal mechanism flaws need systematic correction. It recommended to reconstruct the appraisal system with three-year rolling returns as the core, break the "prisoner's dilemma" of short-term relative return ranking, and establish an internal AI public opinion monitoring system to identify emotional bias in the market narrative (e.g., the concept of "localization of AI chips" speculation). At the level of liquidity risk management, it is necessary to preset rules for mandatory position reduction (e.g., initiate a gradient reduction when the concentration of positions exceeds 30%), so as to avoid the risk of stampede due to insufficient market depth.

For individual investors, behavioural finance interventions are needed to improve decision-making rationality. Investor education should strengthen the

correction of cognitive biases such as mental accounts and overconfidence, and be especially alert to the risk accumulation effect of categorizing high-risk assets as "dream accounts". At the practical level, we can establish a reverse layout framework, when the stock search index and the stock price show a positive correlation (such as the correlation coefficient > 0.8), it will be regarded as an early warning signal of a bubble to implement the position reduction operation. The above multi-dimensional policy synergies can provide institutional safeguards to improve the pricing efficiency of high-volatility technology stocks.

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#### **AUTHOR CONTRIBUTIONS**

All the authors contributed equally and their names were listed in alphabetical order.

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