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The Impact of the Market Maker System on CAPM Explanatory Power: Evidence from China's STAR Market

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Abstract. The Capital Asset Pricing Model (CAPM) identifies market risk as the key factor driving stock return variation. However, evidence from the Chinese stock market shows that its explanatory power remains limited. This study examines whether the introduction of the market-making system on the STAR Market affects the explanatory power of the CAPM. October 31, 2022, the system's implementation date, is selected as the institutional change point. The sample comprises eight semiconductor firms that were consistently included in the STAR 50 Index over the period from November 1, 2021, to October 31, 2023. Based on daily data on stock returns, market returns, and the risk-free rate obtained from the CSMAR database, this study conducts CAPM regressions using ordinary least squares (OLS). The estimated parameters are then compared across the two periods, including beta coefficients, R^2 values, and interaction term coefficients, to assess changes in asset pricing relationships after the institutional change. The results indicate that the introduction of the market maker system changed the sensitivity of stock returns to market risk on the STAR Market. However, the institutional reform does not make the CAPM, a single factor model, fully sufficient to explain return variations, suggesting that high-growth technology firms remain affected by multiple factors.

Keywords: Market Maker System, Capital Asset Pricing Model (CAPM), Asset Pricing Efficiency, Market Liquidity, STAR Market

1. Introduction

In recent years, Chinese capital markets have experienced a series of institutional reforms aimed at improving market structure and trading mechanisms. Nevertheless the applicability of CAPM in the Chinese stock market remains an open question. The model suggests that expected asset returns are determined by systematic risk, which is measured by the beta coefficient.However, existing studies show that CAPM has limited explanatory power in the Chinese A-share market, indicating that a single market risk factor may not fully capture stock return variation. This limitation may be related to factors such as liquidity, information asymmetry, and investor behavior. To address these market frictions, China has continued to promote trading system reforms. Following the establishment of the STAR Market in 2019, the Shanghai Stock Exchange introduced the market-making system on October 31, 2022, allowing market makers to provide continuous bilateral quotations and support liquidity and trading continuity. Prior research has examined the effects of the market-making

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system on market microstructure, including bid-ask spreads and trading activity. However, whether this institutional change alters the explanatory power of CAPM remains unclear. Accordingly, the introduction of the market-making system on the STAR Market is treated as the institutional change point. Using CAPM regressions, this study evaluates changes in beta coefficients, R^2 values, and interaction effects between the pre- and post-implementation periods to examine whether the reform changes the CAPM's explanatory power for stock returns. The analysis links trading system reform with asset pricing by examining changes in the risk–return relationship after the reform.

2. Literature review

2.1. Limitations of the CAPM in the Chinese stock market

The CAPM measures an asset's exposure to systematic risk via the beta coefficient (β) and posits that expected stock returns are primarily determined by market risk. The model assumes that asset prices fully reflect available market information and that investors can eliminate idiosyncratic risk through diversification. However, empirical evidence from the Chinese stock market suggests that the CAPM has limited explanatory power for variations in stock returns.

This limitation is further demonstrated by empirical evidence from the Chinese stock market. In particular, Wu examined CSI 300 constituent stocks and found that the average R^2 of the CAPM was only 0.1987, with no stable linear relationship between beta coefficients and stock returns [1]. Similarly, Kong examined the 18 largest companies by market capitalization in the A-share market during 2020–2022 and found that, even among these representative firms with relatively large size and high liquidity, the CAPM still failed to adequately explain stock return variations [2]. Although the studies differ in sample selection and research methods, they consistently suggest that a single market risk factor is insufficient to explain stock return variations in the Chinese market.

Several studies further explore the potential reasons behind the limited explanatory power of the CAPM. Based on ten years of data from 640 stocks listed in the Shanghai Stock Exchange, Duan found that the poor performance of the CAPM was not only related to the model assumptions but also affected by factors such as the development stage of Chinese capital markets and information disclosure systems [3]. Similarly, Huang found that limited information transparency, differences in investor structure, and corporate governance characteristics weakened the explanatory power of the CAPM in the A-share real estate sector [4]. Thus, the limited explanatory power of the CAPM in the Chinese stock market may reflect the influence of factors beyond market risk, such as firm size, liquidity, and the information environment.

2.2. The role of market liquidity and the market maker system in pricing

Liquidity is a key market friction affecting asset pricing. Low liquidity increases transaction costs and reduces information transmission efficiency, which may cause asset prices to deviate from their risk-based equilibrium levels.

From a theoretical perspective, liquidity affects asset prices primarily through transaction costs and information transmission. Demsetz argues that the bid-ask spread reflects investors' transaction costs, with wider spreads indicating higher trading costs and lower market liquidity [5]. Grossman and Miller further argue that market liquidity relies on the continuous availability of counterparties, while continuous quotations can reduce transaction delays and uncertainty [6]. Hence, the market maker system facilitates trading by providing continuous bilateral quotations, reducing transaction costs, and improving the incorporation of market information into prices.

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Meanwhile, existing empirical studies also indicate that the market maker system improves stock liquidity. Specifically, using a sample of firms from the National Equities Exchange and Quotations and a difference-in-differences model, Chen and Gu observed that stocks under the market-making mechanism have higher stock liquidity, with the improvement increasing with the number of market makers [7]. However, existing studies mainly examine the effects of the market-making system on microstructure indicators, like bid-ask spreads and trading volume, while its impact on asset pricing model performance remains less explored. Given CAPM's limited explanatory power in explaining Chinese stock returns, an important question is whether the market-making system can improve the model's explanatory power by reducing market frictions. Thus, the study explores whether liquidity changes after the reform affect CAPM performance by considering the role of liquidity constraints in limiting its explanatory power.

2.3. Reforms to the market maker system on the STAR Market and asset pricing efficiency

The market maker system on the STAR Market provides a setting to examine the effects of trading mechanism changes on the link between stock returns and market risk. And the STAR Market was launched in July 2019 to serve innovation-driven enterprises. Due to the relatively high information uncertainty and restrictions on investor access of the growth-stage listed firms, the STAR Market exhibited certain differences in liquidity and price discovery efficiency during its early development stage. To improve market liquidity and enhance the price formation mechanism, the Shanghai Stock Exchange officially introduced the market maker system on October 31, 2022.

Existing studies show that the STAR Market faced liquidity and price discovery challenges during its early development. For example, in the first half of 2022, the STAR Market accounted for around 6.3% of total A-share market capitalization but only 4.35% of trading volume [8]. Previous research finds that the STAR Market differs from the Main Board in liquidity and price discovery efficiency [9]. The market maker reform reduced relative bid-ask spreads by approximately 13.7% and relative effective spreads by about 10% [8]. Moreover, market makers provide liquidity support and facilitate information incorporation into prices through continuous bilateral quotations [10].

However, existing studies mainly examine the effects of the market maker system on liquidity, transaction costs, and microstructure indicators. The effects of trading mechanism reforms on the relationship between stock returns and market risk, and on the explanatory power of the CAPM market factor, remain unclear. This paper therefore compares the changes in CAPM β coefficients and R^2 before and after the implementation of the STAR Market market maker system to examine the impact of trading mechanism changes on the stock return-risk relationship.

3. Methods

3.1. Sample selection and data sources

This study selects semiconductor firms listed on the STAR Market as the sample. As a key sector of the STAR Market, the semiconductor industry offers a suitable context for analyzing technology firms' asset pricing given its active trading and data availability. Specifically, eight semiconductor stocks included in the STAR 50 Index before November 1, 2021, are selected from the CSMAR database. Table 1 reports the sample composition. In addition, daily returns of the sample stocks, STAR 50 Index returns, and the risk-free rate are obtained from the CSMAR database.

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Table 1. Composition of the research sample

Stock Code	688008	688012	688099	688126	688256	688396	688521	688981
Company	Montage Tech	Advanced Micro-Fabrication Equipment	Amlogic	National Silicon Industry	Cambricon	China Resources Microelectronics	VeriSilicon	Semiconductor Manufacturing International Corporation

3.2. Research period and phase classification

The research period covered in this paper is from November 1, 2021, to October 31, 2023. Based on the implementation date of the market maker system of the STAR Market, the sample is divided into two phases: before and after the system's implementation.

Specifically, the Shanghai Stock Exchange officially introduced the market maker system on the STAR Market on October 31, 2022. Thus, this paper uses that date as the cutoff point for phase division. The pre-implementation phase runs from November 1, 2021, to October 31, 2022, while the post-implementation phase spans November 1, 2022, to October 31, 2023, both phases comprise approximately 250 trading days. During these two phases, this study estimates CAPM models using the same sample stocks and compares the regression results before and after the implementation.

3.3. Variable definitions and model specification

According to the CAPM, an asset's excess return is determined by the systematic risk represented by the excess return of market portfolio. There is a linear relationship between the two, expressed theoretically as follows:

$$E_{(r_i)}-r_f=\beta_i[E(r_m)-r_f] \tag{1}$$

where $E_{(r_i)}$ is the expected return, r_f is the risk-free rate, $E(r_m)$ is the expected return of the market portfolio, and $E_{(r_i)}-r_f$ is the excess return.

Since expected returns cannot be directly observed, this paper uses actual returns to proxy for theoretical expected returns and incorporates an intercept term and a random disturbance term into the model, converting the CAPM into an estimable time-series regression model:

$$r_{i,t}-r_{f,t}=\widehat{\alpha_i}+\widehat{\beta_i}[r_{m,t}-r_{f,t}]+\varepsilon_{i,t} \tag{2}$$

where *i* and *t* represent the stock symbol and trading day, respectively. $r_{i,t}-r_{f,t}$ is the individual stock's excess return, calculated as the stock's daily return minus the risk-free rate for the same period. $r_{m,t}-r_{f,t}$ is the market excess return, calculated as the daily return of the STAR 50 Index minus the risk-free rate for the same period. $r_{f,t}$ is the risk-free rate, derived from daily-frequency data on the one-year time deposit rate.

To examine changes in the explanatory power of market risk after the market maker system was introduced, this study adds institutional and interaction terms to the CAPM:

$$\text{excess_return}_{i,t}=\alpha+\beta_1\text{excess_market}_t+\beta_2\text{post}_t+\beta_3(\text{post}_t\times\text{excess_market}_t)+\varepsilon_{i,t} \tag{3}$$

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Specifically, $post_t$ is a dummy variable for the implementation of the market-making system, equal to 0 before October 31, 2022, and 1 from October 31, 2022 onward. The coefficient β_3 on the interaction term $post_t \times excess_market_t$ captures the change in the sensitivity of individual stock excess returns to market excess returns following the implementation of the market-making system.

3.4. Regression estimation and comparative metrics

This study uses ordinary least squares (OLS) to estimate the CAPM. The sample is divided into pre- and post-implementation periods, and the CAPM is estimated separately for each subperiod. In particular, the systematic risk coefficient (β_i) measures the sensitivity of stock returns to changes in market returns, and reflects the relationship between market risk and stock returns. The model fit (R^2) measures the extent to which market excess returns explain individual stock excess returns. The interaction coefficient (β_3) captures changes in the market risk coefficient before and after the implementation of the market maker system. Robustness tests are also performed using excess returns calculated with alternative risk-free rates.

4. Results

4.1. Descriptive statistics

Table 2 presents the descriptive statistics for the sample variables. The eight stocks generate a total of 3,888 stock-day observations. The mean individual stock excess return is 0.000, with a standard deviation of 0.030 and a range from −0.200 to 0.200. The mean market excess return, measured by the excess return of the STAR 50 Index, is −0.001, with a standard deviation of 0.015 and a range from −0.061 to 0.049. Individual stock excess returns are more volatile than market excess returns, suggesting greater return fluctuations at the stock level.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Excess Return	3,888	0	.03	-.2	.2
Excess market	,888	-.001	.015	-.061	.049

4.2. Changes in CAPM parameters after the implementation of the market maker system

Table 3 compares the CAPM estimates before and after the implementation of the market-making system. Before the implementation, the market excess return coefficient (β) is 1.024 and significant at the 1% level, with an R^2 of 0.374. After the implementation, the β increases to 1.345, while the R^2 declines to 0.322. In both periods, the market excess return coefficient remains significantly positive, indicating a positive market–stock return relationship.

Table 3. CAPM before and after market maker implementation

	(1)	(2)
	excess return	excess return
excess_market	1.024***	1.345***

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Table 3. (continued)

	(0.0301)	(0.0442)
Observations	1936	1952
R-squared	0.374	0.322

Notes: Standard errors are in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

The increase in β from 1.024 to 1.345 demonstrates greater sensitivity of stock returns to market movements after the implementation. Meanwhile, the decline in R^2 from 0.374 to 0.322 indicates that market excess returns explain a smaller proportion of the variation in individual stock excess returns. Thus, although the market risk coefficient increases after the introduction of the system, the improvement in β does not translate into higher CAPM explanatory power.

To further assess this change, an interaction regression is conducted, with the results reported in Table 4. The interaction coefficient is 0.321 and significant at the 1% level, indicating that stock return sensitivity to market movements increases after the implementation of the market-making system. This estimate is consistent with the β difference between the pre- and post-implementation periods in Table 4 (1.345 − 1.024 = 0.321).

Table 4. Interaction regression

	(1)
	excess_return
excess_market	1.024***
	(0.0318)
post(=1) × excess_market	0.321***
	(0.0528)
Observations	3,888
R-squared	0.347

Notes: Standard errors are in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

4.3. Robustness test

To further assess the robustness of the results, excess returns are recalculated using the one-year government bond yield instead of the one-year time deposit rate, as reported in Table 5. The market excess return coefficient remains 1.024, and the interaction coefficient remains 0.321, with both significant at the 1% level. The results are consistent with the baseline regression, suggesting that the main findings are not sensitive to the choice of risk-free rate.

Table 5. Robustness check using treasury yield

	(1)
	excess_return_bond
excess_market	1.024***
	(0.0318)
post(=1) × excess_market_bond	0.321***

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Table 5. (continued)

	(0.0528)
Observations	3,888
R-squared	0.347

Notes: Standard errors are in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

5. Discussion

The results show that after the introduction of the market-making system on the STAR Market, the market excess return coefficient increases from 1.024 to 1.345, while the R^2 of the CAPM declines from 0.374 to 0.322. The increase in β indicates that individual stock returns become more sensitive to market movements, while the decline in R^2 suggests that market excess returns explain a smaller proportion of stock return variation.

This change may be related to improvements in trading conditions after the introduction of the market-making system. By providing two-sided quotes, market makers boost liquidity, reduce costs, and enhance price efficiency. Thus, these changes may strengthen the relationship between market movements and individual stock returns, leading to higher β. However, a higher β reflects greater market sensitivity, not necessarily stronger CAPM explanatory power. For semiconductor firms on the STAR Market, returns may also be influenced by firm-specific factors, such as R&D progress, industry cycles, and earnings expectations, which are not captured by the single market factor. Therefore, higher market sensitivity can coexist with lower explanatory power of the CAPM.

The findings suggest that the market-making system is linked to increased market risk sensitivity but does not enhance the explanatory power of the CAPM. Given the high growth potential and uncertainty of STAR Market firms, stock returns may be driven by a combination of market risk, firm characteristics, and other risk factors. Future research could include size, value, and liquidity factors to test whether multi-factor models better explain return variation after institutional changes.

6. Conclusion

This study examines the impact of the market-making system on the stock return-risk relationship using eight STAR 50 semiconductor firms, with October 31, 2022, as the implementation date. The results indicate that the market excess return coefficient (β) increases from 1.024 to 1.345 after the reform, and the interaction term is significantly positive, showing greater sensitivity of stock returns to market risk. Meanwhile, CAPM R^2 declines from 0.374 to 0.322, thus implying that market risk explains less of the variation in individual stock returns. Although the market-making system is linked to higher market sensitivity, it does not improve the explanatory power of the single-factor CAPM. The findings are subject to limitations, including the small sample of eight semiconductor firms and the one-year observation windows before and after the reform, which may restrict the analysis of cross-industry differences and long-term effects. In addition, this study focuses only on the CAPM and does not compare multi-factor models. Future research could incorporate factors like size, value, and liquidity to examine whether multi-factor models better explain stock returns under trading system changes.

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References

[1] Wu, Z. (2023). An empirical study on the applicability of the CAPM model to China's A-shares. Rental and Sales Intelligence, (2), 71-74.
[2] Kong, G. (2026). An empirical study on the applicability of the CAPM model in the Shanghai A-share market. International Journal of World Economic Research, 1(2), 11–14. https: //doi.org/10.54097/2ewtvm35
[3] Duan, Y. (2014). An empirical study of the capital asset pricing model in the Shanghai securities market. World Economic Research, 3(2), 18–27. https: //doi.org/10.12677/wer.2014.32003
[4] Huang, Y. (2024). Effectiveness analysis of the capital asset pricing model based on industry data. In Advances in Economics, Business, and Management Research (pp. 702–711). https: //doi.org/10.2991/978-94-6463-441-9_60
[5] Demsetz, H. (1968). The cost of transacting. The quarterly journal of economics, 82(1), 33-53.
[6] Grossman, S. J., & Miller, M. H. (1988). Liquidity and market structure. The Journal of Finance, 43(3), 617–633. https: //doi.org/10.1111/j.1540-6261.1988.tb04594.x
[7] Chen, H., & Gu, N. (2017). The New Third Board market maker system, stock liquidity, and securities value. Financial Research, 442(4), 176–190.
[8] Li, W., & Xi, F. (2025). Market maker mechanisms and stock liquidity: A quasi-natural experiment based on the STAR Market reform. The Journal of World Economy, 48(5), 128–159. 10.19985/j.cnki.cassjwe.2025.05.008
[9] Zhang, X., & Zhang, Z. (2022). Effects of STAR Market reform on pricing efficiency, liquidity, and firm quality. China Economic Journal, 9(3), 1-31. https: //doi.org/10.16513/j.cnki.cje.2022.03.002
[10] Zhu, H., & Jing, R. (2025). Development of the market maker system on the STAR Market: Mechanisms, outcomes, and implications. Securities Market Bulletin, (12), 57–67, 77.