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Testing the Validity of the Multi-Factor Model in the Chinese Stock Market

Yangziyu Shen[1,a,*]

[1]The Chinese University of Hong Kong, Shenzhen, LongXiang Street 2001, Shenzhen, Guangdong Province, 518000, China
a. 121090471@link.cuhk.edu.cn
**corresponding author*

Abstract: In the wake of the burgeoning field of quantitative finance, factor models have risen to considerable prominence within the Chinese financial landscape. This research undertakes a comprehensive analysis employing data spanning the years 2014 to 2022, encompassing a total of 108 monthly observations sourced from the Chinese A-share stock market. The principal objective of this study revolves around the evaluation of the effectiveness of an array of common factors. These factors include the market risk premium, market value, book-to-market ratio, profitability, investment, momentum, and liquidity factors. Moreover, our inquiry extends beyond the conventional boundaries of the Fama-French three-factor and five-factor models. It introduces the pivotal elements of momentum and liquidity factors, effectively formulating an enriched model poised to offer a more robust framework for understanding and explaining returns. The discerned findings shed valuable light on the model configurations most apt for dissecting the excess returns exhibited within the sample stocks. Notably, the amalgamation of the three-factor model with the strategic incorporation of the liquidity factor emerges as the most comprehensive explanatory model for the observed excessive returns in the context of the Chinese A-share stock market. It is important to highlight that the introduction of the momentum factor, while explored, does not impart a significant augmentation in the model's capacity to clarify excess returns, a noteworthy departure from expectations within the Chinese A-share market. These insights not only advance our understanding of the Chinese financial landscape but also underscore the intricate dynamics at play in the realm of quantitative finance.

Keywords: Asset pricing model, multi-factor research, quantitative finance

1. Introduction

In the wake of the post-pandemic economic recovery, China's financial industry is poised to regain its vitality, with the stock market exhibiting a parallel resurgence. Notably, traditional financial institutions are pivoting their focus toward investments in financial technology, whereas quantitative investment, as an emerging and increasingly discussed approach, has garnered attention for its systematic rigor, disciplinary nature, and distinct profit-seeking strategies like high-frequency trading and arbitrage, setting it apart from conventional long-term investments. The significance of financial technology in the data-driven era cannot be overstated, and educators in China have recognized the urgency of integrating practical quantitative finance courses into the curriculum. Recent research by

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Xie et al. [1] highlights the need for more hands-on teaching content aimed at bolstering students' financial modeling and research competencies, including instruction in software usage for financial modeling and data analysis. This paper is centered on leveraging data from the Chinese A-share market to engage in financial modeling and quantitative research. By selecting pertinent factors and constructing appropriate asset pricing models, our objective is to elucidate the monthly returns within the Chinese A-share market. Additionally, we will draw a comparative analysis with the comparatively more mature U.S. stock market to discern the performance disparities of various factors.

In the realm of portfolio modeling and factor analysis, a multitude of models have arisen to account for and explain portfolio returns. The Capital Asset Pricing Model (CAPM), conceived by Sharpe [2], stands as one of the most renowned models. Rooted in the foundational assumption that all investors are rational agents seeking high returns while abhorring excessive risks, the CAPM meticulously explores the quantitative relationship between portfolio risk and return. It seeks to ascertain the expected returns an investor can anticipate by assuming a particular level of risk. This sets the stage for the introduction of the initial factor: the market risk premium factor.

Nonetheless, subsequent research has underscored the inadequacy of relying solely on the market risk premium factor to fully explicate stock returns. Thus, Fama and French [3] pioneered the inclusion of market value and the book-to-market ratio of publicly listed companies as supplementary factors to bridge the gap in explaining return variances not accounted for by the market risk premium factor. The introduction of the market value factor, which gauges the size differential among companies, and the book-to-market ratio factor, which evaluates the disparities in companies' market values, expanded the three-factor model's capacity to elucidate portfolio returns.

As the frontier of factor research advances, numerous other rational factors have been posited and methodically formulated. Among these, the liquidity factor, considering stock liquidity, and the momentum factor, which incorporates historical stock returns, have gained prominence. By prudently selecting and amalgamating these factors, models can proffer enhanced explanations for portfolio pricing. This study will center its attention on trading data drawn from the Shanghai Stock Exchange, Shenzhen Stock Exchange, the Science and Technology Innovation Board, and the Growth Enterprise A-share Market in China, with the aim of pinpointing the most potent multi-factor model replete with explanatory power.

2. Model Design

Our model design begins with the foundational Capital Asset Pricing Model (CAPM), as proposed by Sharpe in 1964. This model initiates by evaluating the sensitivity of asset returns to market variations through the β coefficient and the contemporary market risk premium, known as the market risk premium factor. The CAPM model is structured as follows:

$$E(R_i) - r_f = \beta_i * \left(E(R_m) - r_f\right) \tag{1}$$

In this equation, represents the anticipated return of investment portfolio (individual stock) i; represents the expected market return; represents the exposure of the stock to the factor; and represents the risk-free rate.

Expanding on this foundation, we delve into the Fama-French three-factor model introduced in 1993. This model is constructed by considering the prevailing market risk premium factor, the differences in simulated portfolio returns based on market value (size factor SMB) at time t, and the differences in simulated portfolio returns based on the book-to-market ratio (book-to-market ratio factor HML) at time t. The explicit formulation is presented as:

$$E(R_{it}) - r_{ft} = \beta_i * \left(E(R_{mt}) - r_{ft}\right) + s_i * SMB_t + h_i * HML_t \quad (2)$$

Where, represents the expected return of investment portfolio (individual stock) i from time t to t+1; represents the expected return of the market from time t to t+1; represents the stock's exposure to the market value factor; represents the stock's exposure to the book-to-market ratio factor.

Building upon this foundation, the Fama-French five-factor model, introduced in 2013, further expands by integrating the profitability factor (RMW) and the investment factor (CMA). These factors gauge the profitability level and investment capacity of listed companies, thus culminating in a more comprehensive five-factor model for attribution analysis. The specific form is outlined as:

$$E(R_{it}) - r_{ft} = \beta_i * \left(E(R_{mt}) - r_{ft}\right) + s_i * SMB_t + h_i * HML_t + r_i * RMW_t + c_i * CMA_t \quad (3)$$

Where, represents the exposure of the stock to the profitability factor; represents the exposure of the stock to the investment pattern factor.

Additionally, on the basis of the three-factor model, the Carhart [5] four-factor model can be constructed by considering the simulated portfolio returns based on a 12-month momentum at time t (momentum factor UMD). The specific form is as follows:

$$E(R_{it}) - r_{ft} = \beta_i * \left(E(R_{mt}) - r_{ft}\right) + s_i * SMB_t + h_i * HML_t + u_i * UMD_t \quad (4)$$

Where, represents the exposure of the stock to the momentum factor.

Additionally, by considering the turnover rate and the buy-sell cycle to measure the liquidity of individual stocks, the liquidity factor (IML) can be introduced. Combined with the Fama-French [4] five-factor model, a new asset pricing model can be constructed. The specific form is as follows:

$$E(R_{it}) - r_{ft} = \beta_i * \left(E(R_{mt}) - r_{ft}\right) + s_i * SMB_t + h_i * HML_t + r_i * RMW_t + c_i * CMA_t + l_i * IML_t \quad (5)$$

Where, represents the exposure of the stock to the liquidity factor. These models collectively form the bedrock of our analytical framework, offering a robust foundation for the comprehensive examination of asset pricing and returns.

3. Data Source

This study selects data from the Shanghai Stock Exchange, Shenzhen Stock Exchange, Science and Technology Innovation Board, and Growth Enterprise Board A-share markets for a total of 108 monthly observations from January 2014 to December 2022. The data is sourced from the CSMAR database (excluding all financial enterprises and ST stocks). The econometric method used is Ordinary Least Squares (OLS), and the analysis is conducted using STATA.

4. Factor Construction

4.1. Market Risk Premium Factor

The market risk premium factor is derived through a meticulous process. Initially, it entails computing the monthly returns of the comprehensive market, a computation executed with due consideration of the market capitalization of A-share stocks. This computation is then followed by the subsequent deduction of the risk-free rate. The precise formula for determining the market risk premium factor for each individual stock in our sample is elucidated below:

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Market Risk Premium Factor = Market Return Considering Reinvestment of Cash Dividends - Three-Month Deposit Rate

4.2. Size Factor

Amid the temporal expanse from July t to June t+1, our factor construction process reaches a pivotal juncture. Here, we meticulously sort the market capitalization of all stocks constituting our sample dataset, taking into account their status as of June 30th in year t. The pivotal outcome of this sorting operation emerges in the form of a median value. This median value, emblematic of the statistical middle point, assumes a defining role as a threshold in our categorization process.

Leveraging the market capitalization figures of all stocks within our sample as of June 30th in year t, we demarcate a clear demarcation line. Companies boasting market capitalization values equal to or exceeding this median threshold earn the classification of large-size entities, denoted as "B." Conversely, companies graced with market capitalization values beneath the median threshold assume the categorization of small-size companies, marked as "S."

The formula that underpins the calculation of the size factor for every stock encompassed within our sample dataset is articulated as follows:

$$SMB = \left(SMB_{B/M} + SMB_{op} + SMB_{INV}\right)/3 \tag{6}$$

Herein, the components of the formula play integral roles in assessing the size factor. Specifically, SMBB/M embodies the essence of size factor associated with market capitalization. It is calculated as:

$$SMB_{B/M} = (SH + SN + SL)/3 - (BH + BN + BL)/3 \tag{7}$$

This portion of the equation dissects the monthly returns of portfolios formed through the intersection of portfolios S, B, and other portfolios. The weighting by market capitalization adds an additional layer of precision to the size factor evaluation.

Simultaneously, the formula accommodates the SMBop component, designed to gauge the impact of size factor stemming from book-to-market ratios:

$$SMB_{op} = (SR + SN + SW)/3 - (BR + BN + BW)/3 \tag{8}$$

In a fashion analogous to its precursor, this section is also rooted in the monthly returns of portfolios, fashioned through the interaction of portfolios R, N, and W. Weighted by market capitalization, it refines the assessment of the size factor.

Lastly, SMBINV enters the equation, serving as the element tasked with evaluating the size factor associated with investment patterns:

$$SMB_{INV} = (SC + SN + SA)/3 - (BC + BN + BA)/3 \tag{9}$$

Once again, the focus remains on the monthly returns of portfolios brought to life through the intersection of portfolios C, A, and S. The consistent incorporation of market capitalization as a weighting factor adds a layer of sophistication to the size factor evaluation.

The multifaceted nature of the size factor formula culminates in a comprehensive assessment that provides crucial insights into the size factor's contribution to asset pricing and returns within our dataset. This meticulous and methodical approach serves as the backbone of our analytical framework, underscoring our commitment to precision and depth in our research.

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4.3. Computation of Book-to-Market Ratio Factor

The meticulous construction of the book-to-market ratio factor necessitates a sequence of precise steps aimed at ensuring its accuracy and relevance in our analytical framework. The inception of this process commences with the exclusion of stocks featuring a book-to-market ratio less than or equal to 0 from our sample dataset.

Subsequently, we adhere to a systematic methodology. Within the timeframe extending from July t to June t+1, we embark on the exacting task of sorting the book-to-market ratios of all stocks contained within our sample, considering their status as of December 31st in year t-1. This sorting operation, performed with unwavering precision, results in a descending order of book-to-market ratios. This ordered dataset assumes a pivotal role in the subsequent categorization process.

In our pursuit of a comprehensive framework, the establishment of clearly defined thresholds becomes essential. To this end, we judiciously select the 30th and 70th percentiles. These percentiles derive their significance from the distribution of book-to-market ratios observed within the sample, a distribution anchored in data from December 31st of year t-1.

These thresholds, now firmly in place, play a fundamental role in the classification of stocks. Stocks characterized by book-to-market ratios equal to or surpassing the 30th percentile, inclusive of the 30% figure, earn the designation of high book-to-market ratio (H) stocks. Meanwhile, those occupying the intermediate territory between the 30th and 70th percentiles, encompassing the 70% mark, fall into the category of medium book-to-market ratio (M) stocks.

Conversely, stocks residing below the 30th percentile are unequivocally identified as low book-to-market ratio (L) stocks. The meticulous execution of this process ensures the precision and relevance of the book-to-market ratio factor in our analytical pursuits, setting the stage for a more insightful evaluation of asset pricing and returns within our dataset.

Incorporating these detailed categorizations, we proceed to calculate the book-to-market ratio factor for all stocks within our sample. The formula for this calculation is as follows:

$$HML = (SH + BH)/2 - (SL + BL)/2 \tag{10}$$

Here, the variables SH, BH, SL, and BL denote the monthly returns of portfolios formed by taking the intersection of portfolios H, L, and S, B, and subsequently weighting them according to their market capitalization. This meticulous procedure ensures the precision of our book-to-market ratio factor calculation, a key element in our comprehensive analysis.

4.4. Profitability Factor

In delineating the profitability factor, our process is characterized by meticulous steps aimed at precision and relevance. To begin, within the timeframe spanning from July of year t to June of year t+1, we initiate by computing the profitability factor, labeled as OP, for year t-1. The OP computation is as follows:

OP = (Operating Revenue - Operating Costs - Selling Expenses - Management Expenses - Interest Expenses) / (Shareholders' Equity + Deferred Income Tax Liabilities - Deferred Income Tax Assets - Preferred Stock Book Value)

Crucially, all values necessary for this calculation are sourced from the comprehensive year-end financial statements for year t-1.

Subsequently, within the period encompassing July of year t to June of year t+1, we proceed to arrange the calculated profitability factors, OP, for all the stocks in our sample as of December 31st of year t-1 in a descending order. The ensuing step is the establishment of definitive thresholds, originating from these percentiles. We select the 30th and 70th percentiles, and they form the basis

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for the categorization of the stocks. Stocks with profitability factor OP equal to or exceeding the 30th percentile are identified as stocks characterized by robust profitability (labeled as "R"). Those falling within the range between the 30th and 70th percentiles (inclusive of the 70th percentile) are designated as stocks with moderate profitability (referred to as "N"). Finally, stocks with profitability factor OP lower than the 30th percentile earn the classification of stocks with limited profitability (denoted as "W").

This intricate categorization framework informs the calculation formula for the profitability factor across all stocks within our sample:

$$RMW = (SR + BR)/2 - (SW + BW)/2 \tag{11}$$

In this equation, SR, BR, SW, and BW denote the weighted monthly returns of investment portfolios that result from the intersection of portfolios M, W, S, and B, respectively. The market capitalization serves as the weighting factor, underpinning the meticulousness of our profitability factor computation—a pivotal element of our comprehensive analysis.

4.5. Investment Factor

In our meticulous construction of the investment factor, a series of well-defined steps are taken to ensure precision and clarity. Commencing this process, we turn our focus to the period from July of year t to June of year t+1. Initially, we calculate the investment pattern parameter INV for year t-1, a pivotal determinant in this factor. The INV is computed through the following formula:

INV = (Year-end Total Assets for year t-1 - Year-end Total Assets for year t-2) / Year-end Total Assets for year t-2

It's important to note that the values used in this calculation are sourced from the comprehensive year-end financial statements for both year t-1 and t-2.

Following the computation of the INV, our next task is to sort this investment pattern parameter for all stocks in our sample. This sorting process is based on the values obtained as of December 31st of year t-1, and they are arranged in descending order. We subsequently employ definitive thresholds, specifically the 30th and 70th percentiles, to categorize the stocks based on their investment patterns. Stocks with an INV value equal to or exceeding the 30th percentile are characterized as stocks exhibiting conservative investment patterns (designated as "C"). Those within the range between the 30th and 70th percentiles (inclusive of the 70th percentile) are deemed stocks with neutral investment patterns (labeled as "N"). Finally, stocks with an INV value lower than the 70th percentile are identified as stocks with aggressive investment patterns (referred to as "A").

This comprehensive categorization framework underpins the calculation formula for the investment pattern factor across all stocks within our sample:

$$CMA = (SC + BC)/2 - (SA + BA)/2 \tag{12}$$

In this formula, SC, BC, SA, and BA represent the weighted monthly returns of investment portfolios formed by the intersection of portfolios C, A, S, and B, respectively. The market capitalization serves as the weighting factor, ensuring the rigor of our investment factor computation—a key component of our comprehensive analysis.

4.6. Momentum Factor

Firstly, in month t, construct 12-month momentum as the cumulative returns from the end of month t-12 to the end of month t-1.

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Next, for the month t, sort the 12-month cumulative returns for all stocks in the sample in descending order. Take the 30th and 70th percentiles. Stocks with 12-month cumulative returns higher than or equal to the 30th percentile are classified as high cumulative returns group. Stocks with 12-month cumulative returns lower than the 30th percentile are classified as low cumulative returns group. The calculation formula for the momentum factor for all stocks in the sample is as follows:

UMD = Monthly Returns of the High Cumulative Returns Group - Monthly Returns of the Low Cumulative Returns Group

Where the cumulative returns of the investment portfolios are weighted by market capitalization.

4.7. Liquidity Factor

Firstly, exclude stocks with missing monthly returns. For month t, calculate the Amihud [6] illiquidity measure ILLIQ for the period from t-3 months to t-1 month for stock i. The calculation formula for stock i's ILLIQ for a certain number of periods y is as follows:

$$ILLIQ_{iy} = 10^8 * 1/D_{iy} \sum_{t=1}^{D_{iy}} \left|R_{iyd}\right| / VOLD_{ivyd} \tag{13}$$

Where Diy represents the number of trading days with valid trading data for stock i in the y-period; Riyd represents the daily return rate of stock i on the d-th day taking into account cash dividends for investment; VOLDivyd represents the daily trading volume for stock i on the d-th day.

Calculate the stock Volatility as follows:

$$Volatility = \sqrt{\frac{1}{n-1} \sum_{d=1}^{n} \left(r_{i,d} - \overline{r_i}\right)^2} \tag{14}$$

Where ri,d represents the daily return rate of stock i on day d; i represents the mean daily return rate for the period from t-3 months to t-1 month; n represents the number of valid trading days in the interval.

Next, divide the stocks into groups based on the magnitude of ILLIQ and Volatility. Sort the Volatility for month t in descending order and divide it into three equal groups, labeled as B, M, and S. Sort the ILLIQ for month t in descending order and divide it into five equal groups, labeled as 1, 2, 3, 4, and 5. This results in a total of 15 portfolios: B1 to B5, M1 to M5, and S1 to S5.

Finally, calculate the market capitalization-weighted monthly returns for the 15 investment portfolios in month t+1. The monthly returns are denoted as rB1, rB2, rB3……rS4 and rS5. The calculation formula for the liquidity factor in month t+1 is as follows:

$$IML_t = [(r_{B1} - r_{B5}) + (r_{M1} - r_{M5}) + (r_{S1} - r_{S5})]/3 \tag{15}$$

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5. Results of Regression Analysis

5.1. Validity Test of Factors

Table 1: The mean and T-value of factors

Factor Name	Market Risk Premium	Market Value	Book-to-Market Ratio	Profitability	Investment	Momentum	Liquidity
Mean	0.486%***	0.429%***	-0.188%***	0.035%***	0.063%***	0.091%***	0.080%***
T-value	45.57	48.80	-27.39	6.58	14.27	89.33	77.04

Note: *** indicates significance at the 1% level; ** indicates significance at the 5% level; * indicates significance at the 10% level.

The results of our factor analysis, presented in the table above, shed light on the statistical significance of all seven factors, each demonstrated to be significant at the 1% level. This robust level of significance underscores the effectiveness of these factors in explaining the returns in our dataset.

Among the factors examined, the market risk premium factor stands out with a notable mean of 0.486%. This signifies that investors can secure a monthly return of 0.486%, translating to an annualized return of 5.99%, by strategically engaging in the purchase of stocks with a high market risk premium while simultaneously divesting in stocks with a low market risk premium.

Similarly, the market value factor reveals a mean of 0.429%, indicating that investors can achieve a monthly return of 0.429%, or an annualized return of 5.27%, through the strategic purchase of stocks with low market value and divestment in stocks with high market value.

In contrast, the book-to-market ratio factor displays a mean of -0.188%, signifying that investors can realize a monthly return of 0.188%, equivalent to an annualized return of 2.23%, by tactically investing in stocks with a low book-to-market ratio and selling stocks with a high book-to-market ratio.

Moreover, the profitability factor exhibits a mean of 0.035%, revealing that investors can secure a monthly return of 0.035%, which translates to an annualized return of 0.42%, by selectively investing in stocks characterized by strong profitability and divesting in stocks with lower profitability.

The investment factor indicates a mean of 0.063%, highlighting that investors can garner a monthly return of 0.063%, or an annualized return of 0.76%, by strategically investing in stocks with a conservative investment style and selling stocks with an aggressive investment style.

The momentum factor is characterized by a mean of 0.091%, emphasizing that investors can achieve a monthly return of 0.091%, which corresponds to an annualized return of 1.10%, through the strategic purchase of stocks with strong past performance while divesting from stocks with poor historical performance.

Finally, the liquidity factor unveils a mean of 0.080%, indicating that investors can secure a monthly return of 0.080%, or an annualized return of 0.96%, by judiciously investing in stocks with high liquidity and divesting from stocks with lower liquidity. These findings collectively underscore the practical relevance and potential returns that investors can realize by considering these significant factors in their investment strategies.

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5.2. Results of Factor Model Analysis

Table 2: The regression results of each model

Variable	CAPM	Three-Factor	Five-Factor	Carhart Four-Factor	Three-Factor+Liquidity	Five-Factor+Liquidity
α	0.0040***	0.0014***	0.0019***	0.0018***	0.0011***	0.0018***
t-value	17.48	6.20	8.54	8.10	4.92	7.80
β	1.1114***	1.0069***	0.9829***	1.0063***	1.0111***	0.9853***
t-value	276.50	243.08	229.14	242.98	241.04	225.23
s		0.7460***	0.5383***	0.7357***	0.6523***	0.5838***
t-value		128.81	76.28	125.61	40.71	35.68
h		0.0223***	-0.0610***	0.0345	0.0027	-0.0679***
t-value		2.84	-5.29	0.43	0.32	-5.76
r			-0.2203***			-0.2156***
t-value			-15.38			-14.94
c			0.0338*			0.0330*
t-value			1.94			1.90
u				-0.0481***		
t-value				-11.62		
l					0.0759***	0.0339***
t-value					6.27	2.76

Note: *** indicates significance at the 1% level; ** indicates significance at the 5% level; * indicates significance at the 10% level.

In our comprehensive analysis, we delve into the evaluation of excess returns (α) across a spectrum of models, unveiling insightful findings regarding the efficacy of each. The Capital Asset Pricing Model (CAPM) emerges as a standout with the highest excess returns, reaching 0.403%. This outcome underscores a vital point: relying solely on the single market risk premium factor is inadequate in providing a comprehensive explanation for stock returns. It becomes evident that supplementary factors are imperative to attain a more accurate understanding of this intricate landscape.

In contrast, the model amalgamating the Fama-French three-factor model with the liquidity factor showcases the lowest excess returns, at 0.111%. This outcome accentuates the robust explanatory prowess of this composite model concerning stock returns within our sample. It signifies that this particular model excels among the alternatives, offering a more holistic interpretation of the stock returns we've scrutinized. Intriguingly, this investigation highlights a non-linear relationship between the number of factors integrated into the model and its explanatory power. The table provides clear evidence that the inclusion of diverse factors introduces variations in the model's excess return (α).

Moreover, our findings reveal an intriguing insight into the effectiveness of momentum factors in the context of the Chinese stock market. Notably, these factors do not significantly augment the model's capacity to explicate excess returns among our sampled stocks. This observation hints at the inapplicability of momentum factors in the realm of pricing or forecasting within the Chinese stock market.

In stark contrast, the inclusion of the liquidity factor alongside other relevant factors serves to bolster the model's explanatory potency when it comes to elucidating excess returns. This insight underscores the potential of the liquidity factor and paves the way for further exploration to refine the optimal stock pricing valuation model. In conclusion, our analysis reveals the intricate interplay of various factors and their impact on model performance, offering valuable insights for investors and researchers in the Chinese stock market.

6. Conclusion

This study examines the effectiveness of multi-factor models in the Chinese A-share market. A total of 108 monthly A-share trading and company financial data from January 2014 to December 2022 are used to establish different factors through grouping on the CSMAR platform. Subsequently, CAPM model and Fama-French three-factor, Fama-French five-factor, Carhart four-factor, three-factor liquidity factor, and five-factor liquidity factor multi-factor models are constructed.

After preliminary data processing and screening, all data are grouped according to different indicators, and different factors are constructed using market capitalization-weighted calculation method. Then, in the process of model construction and testing, this study mainly uses the Ordinary Least Squares (OLS) method to conduct linear regression analysis on different factor combinations to determine the exposure of each factor to stock returns. Finally, by observing the regression results and summarizing the research findings, particular attention is paid to the size of the excess returns α.

Our examination unveils distinctive insights into the performance of various models and the effectiveness of incorporated factors. The Capital Asset Pricing Model (CAPM), characterized by its sole reliance on a single factor, stands out with notably elevated values of excess returns (α) compared to alternative models. This stark contrast highlights the challenge this model encounters when attempting to elucidate stock returns within the market. It becomes increasingly apparent that a broader spectrum of factors is indispensable to capture the nuanced dynamics of this intricate financial landscape.

Conversely, the integration of the Fama-French three-factor model, featuring the inclusion of the market value factor and the book-to-market ratio factor, yields a noteworthy decline in excess returns (α). This outcome aligns harmoniously with Fama-French's previous research and underscores the model's robust explanatory power concerning stock returns in the Chinese A-share market.

Drawing from Manuel A's [7] insights on US stocks, one might anticipate momentum factors, rooted in historical stock performance, to wield substantial explanatory influence over stock returns. However, our investigation in the realm of Chinese A-share stocks reveals a divergent narrative. Momentum factors, rather than enhancing explanatory potency, elevate the excess returns (α). This intriguing revelation suggests that the applicability of momentum factors in the Chinese stock market for pricing or forecasting warrants a nuanced exploration.

In the pursuit of a more elaborate explanatory framework, the Fama-French five-factor model extends beyond the three-factor model by integrating profitability and investment mode factors. However, our findings diverge from the anticipated outcome. It does not bolster explanatory power to the same degree as expected. Conversely, the liquidity factor, assessing stock liquidity through stock turnover rate, emerges as a compelling factor within the context of our study on Chinese A-share stocks.

These results underscore a fundamental principle: the direct transposition of factors proven effective in other markets, such as the US stock market, may not necessarily yield the same outcomes in the Chinese A-share market. The unique rules and distinctive market characteristics necessitate a deliberate selection of factors tailored to each market's idiosyncrasies, facilitating the construction of a potent multi-factor model capable of delivering optimal explanatory depth.

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