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Investigation on Influence Factors of the C-REIT Market: Applying the Fama-French Three-Factor Model

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Abstract. This research paper has applied the Fama-French Three-Factor Model to the China Real Estate Investment Trust (C-REIT) market over a two-year period from June 2022 to June 2024. The innovation is recognized as the C-REIT market was established in 2021 with the first 9 REITs issued and few researches were conducted on the C-REITs. The study obtained data from the Wind database in the after-COVID period and concluded that the model fits well for the behavior of the Chinese REIT market. The market premium factor is found to be positive, while the size factor (SMB) is negatively significant, and the value premium (HML) is positively significant. This suggests that REITs with smaller market capitalization and those with a higher book-to-market ratio are more likely to contribute to the portfolio's excess returns. The intercept in the regression is statistically significant and that implies that there may be additional factors that are not captured by the current model. As such, the paper advocates for further research into multi-factor models to explore potential factors.

Keywords: REIT, Fama-French model, China REITs, C-REITs.

1. Introduction

1.1. China Real Estate Investment Trusts Market Overview

Having gone through three stages of embryonic exploration, pilot cultivation, and normalization promotion, China Real Estate Investment Trusts (C-REITs) play an important role in promoting the utilization of existing assets, expanding effective investment, optimizing asset allocation, and serving the real economy. In May 2021, 9 C-REITs, issued in the Shanghai and Shenzhen Stock Exchange with a scale of 31.4 billion yuan and a spread of industries of industrial parks, highways, rental housing, warehousing and logistics, clean energy, and ecological and environmental protection facilities, marked a historical establishment of the bridge between real estate market and capital market. By June 2024, according to Wind, the issuance size of public REITs in China has exceeded 100 billion yuan. The Chinese public REIT market has been growing rapidly and expanding over the years.

1.2. Capital Asset Pricing Model (CAPM) and the Fama French 3-Factor Model

The concept of the Capital Asset Pricing Model (CAPM) was come up with by William Sharpe and followed by contributions from John Lintner and Jan Mossin among others [1]. The model describes a theoretical framework that measures the correlation between the excess returns and the market index. The core of the theory indicates the relationship between the expected return of an asset to the systematic risk it bears, measured by the beta coefficient (Beta) relative to the entire market. The establishment of the CAPM model lays the foundation for the modern financial theory. Based on the development of the CAPM model, Fama and Frech indicated an important supplement to the model, which introduced the market capitalization factor and the book-to-market ratio factor besides the market risk premium factor [2]. In the empirical test, the Fama-French-3-factor model explained the significant effects of the three factors and provided financial investors and scholars with a more comprehensive asset pricing framework and a more solid understanding of the risk and the returns.

1.3. Literature Review

The Fama-Frech-three-factor model was frequently conducted in various markets and its effectiveness was compared with the Capital Asset Pricing Model (CAPM) model. Bui and Tran compared the two theoretical models, the CAPM model and the Fama-Frech-three-factor model, and investigated that the Fama-Frech-three-factor model explained volatility in portfolio returns better than CAPM in the Vietnam stock market from 2010 to 2022 [3]. Coskun, Kestel, and Yilmaz proved that the Fama-Frech-three-factor model performed better than CAPM model in terms of capturing the variation in T-REITs returns [4]. The same implication was conducted in the Spanish market by Su and Taltavull and shows that the Fama-Frech-three-factor model explained the S-REITs' return better than the traditional CAPM model [5].

Specifically in factors, market capitalization factor (Small minus Big factor) and book-to-market factor (Low minus High factor) are mostly likely to have a significant impact on the excess return of the stock market. Asmaa and Safae indicated that the value effect contributes more to the portfolio's excess returns than the size effect, supported by the stock data of Moroccan Stock Exchange since July 2002 to June 2020 [6]. Using data from oil fund investment portfolios from 2006 to 2019, Fernando et al. discovered that SMB and HML have a negative and significant impact on the excess returns in the Fama-French three-factor model and five-factor model [7].

According to various research conducted on different REIT markets, all three factors were significantly correlated to the excess returns in most countries, while some of the results depended on other factors as the period that REITs went public. Jackson used the Fama-French three-factor model to analyze 33 US real estate investment trusts over a 20-year period, and discovered that all three factors were significant for the REITs with the longest market histories and the highest mean market capitalization against the other REITs with shorter market histories and the lowest mean market capitalization [8]. Meanwhile, in the Singapore REIT market, He and Neo concluded that all three factors were statistically significant [9]. Besides the time factor mentioned by Jackson, Zhao came up with the China stock market factor had an impact on China's REITs market specifically in aspects of the response to the domestic and international monetary policy [10].

2. Methodology

2.1. Research Motivation

The C-REITs market and the China stock market share several common aspects, in terms of sizable market capitalization, high trading volumes, and abundant liquidity. In recent years, the reducing barriers to the C-REITs market proved a burgeoning platform for investors besides traditional stock and bond markets. However, little research was conducted about the significance of factors in the C-REITs market. Chen, Huang, and Lin determined that the SMB and the HML effects were both significant in C-REITs market using the data from 2005 to 2013 [11]. Since the first 9 C-REITs were issued in 2021, the data and conclusion in the previous articles were based on REIT-like instruments that shared similar structures but differed in legal and regulatory requirements, investment threshold, liquidity, profit model and so on. As a result, this thesis will be the first to investigate how the Fama-French-three-factors model can be applied to the C-REITs market from 2022 to 2024. This paper's main goal is to identify the components significantly contributed to the excess return of C-REITs over the most recent era.

2.2. Data Collection

This paper obtained 12 C-REITs' weekly data from 2022 June to 2024 June from the Wind Database. The data collected includes weekly closing prices, market value, net asset value, number of outstanding shares, and the 10-year Chinese treasury yields. Weekly REIT returns are computed by the difference value of each two weekly closing prices divided by the first weekly REIT return. Book-

to-market ratios are computed by the product of net asset value and the number of outstanding shares divided by the market value. All the numbers are in 100 million Chinese yuan.

To have relatively complete 2-year period data, this research contains all 12 C-REITs that went public before June 2022. Since it has been only 3 years since the first 9 C-REITs were issued, this paper uses weekly data instead of yearly data to have as much data as possible. The weekly 10-year Chinese Treasury yields are used as the risk-free rates employed in the regression analysis.

2.3. Fama-French-three-factor Model

The Capital Asset Pricing model was proposed in the 1960s by William Sharpe, John Lintner, and Jan Mossin, which addressed the correlation between the excess return and the systematic risk the portfolio bears. To explore additional potential factors of influence, Fama and French added the market size factor and price-to-book factor to the model [12]. The Fama-French-three-factor model is included in Equation (1):

$$\left(R_i - R_f\right) = r_f + \beta_1\left(R_m - R_f\right) + \beta_2 c + \beta_3(HML) + \varepsilon_1 \quad (1)$$

The definition of each part of the formula includes: R_i is the weekly return of the portfolio, which is calculated by the market-value-weighted average return of each REIT in the portfolio. R_f is the risk-free rate which is represented by the 10-year Chinese treasury yields. The three factors $R_m - R_f$, SMB, and HML are the market premium effect, market volume effect, and market value effect, where $R_m$is the weekly return of China Securities REITs return index (932047.CSI) provided by the Wind database. Specifically, SMB refers to the amount of the return difference between the small market value REIT and the big market value REIT, and HMLrefers to the amount of the return difference between the high book-to-market ratio REIT (Value REIT) and low book-to-market ratio REIT (growth REIT). ε_1 represents the residual error term.

3. Results and Discussion

3.1. Regression Results

This paper regresses the data via the Fama-French-three-factor model. Some observational results shown in Table 1 indicate that the mean market excess return -0.02801 is less than all other portfolio returns from 2022 June to 2024 June. The relatively low standard deviations refer to a rational dispersibility of each factor.

Table 1. Descriptive Statistical Results.

	Mean	Standard Deviation	Minimum	Maximum	Median
$\boldsymbol{SMB}$	-0.00147	0.011229	-0.03839	0.028432	-0.00132
$\boldsymbol{HML}$	-0.00531	0.019444	-0.10994	0.040484	-0.00393
$\boldsymbol{R_m - R_f}$	-0.02801	0.018672	-0.07333	0.060237	-0.02927
$\boldsymbol{R_i - R_f}$	-0.00288	0.020049	-0.05196	0.099889	-0.00371

Figure 1 shows the correlations of each combination of the three factors. The low correlations reveal the independence of the market value factor, book-to-market factor, and systematic risk factor.

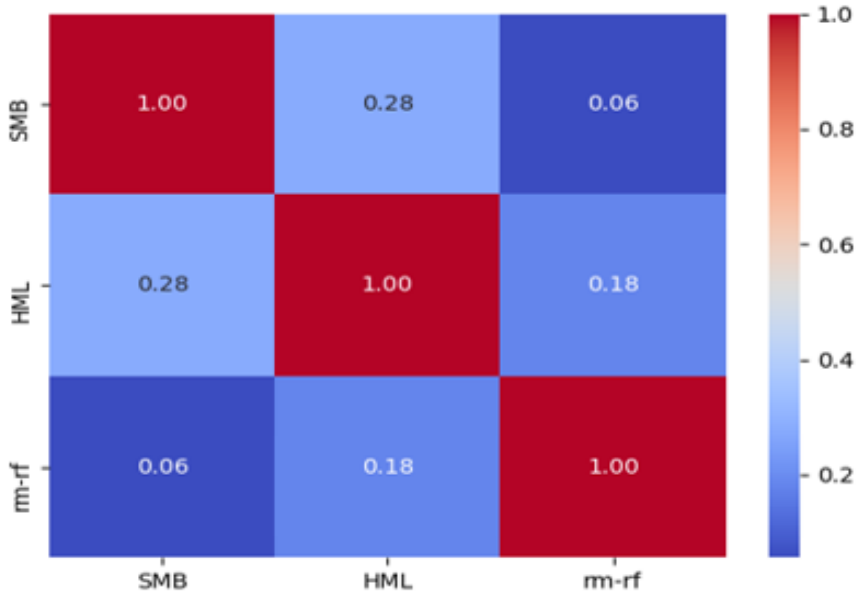

Figure 1. Factor Correlation Results.

The regression model is described in Table 2 below. The R-squared test of 0.94 means that 94% of data could be explained by this regression, which reveals that the Fama-French-three factor model is fit for the C-REITs market. All factors including risk premium, book-to-market and company size have p-value less than 0.05 which represents they are statistically significant to the target, excess return of the portfolio. A negative $\boldsymbol{\beta}$ of $\boldsymbol{SMB}$ refers to the higher return the small market value REIT brings, while a positive $\boldsymbol{\beta}$ of $\boldsymbol{HML}$ explains that grow REITs lead to higher excess returns of the portfolio than value REITs. The results of this regression correlation are consistent with the conclusion of the Fama-French-three-factor model. Most notably, the p-value of the intercept is close to 0, which addresses some factors hiding in the error term that are not discovered.

Table 2. Regression Results Summary.

$\boldsymbol{R_i - R_f}$	p-value	t-value	$\boldsymbol{\beta}$
$\boldsymbol{SMB}$	0. 023645	-2.29947	-0.10375
$\boldsymbol{HML}$	0. 002148	3.154376	0.084088
$\boldsymbol{R_m - R_f}$	5.687627e-60	38.308485	0.996513
Intercept	6.246542e-48	27.964201	0.051321
$\boldsymbol{R^2}$	0.942891		

From the the regression results, we conclude that the Fama-French-three-factor model provides strong interpretability in China's REITs market over a 2-year period from 2020 June to 2022 June. Besides, the market risk factor, REIT size factor, and book-to-market factor are all statistically significant in explaining the excess market return. Specifically, a negative market size effect and a positive book-to-value effect are revealed from the model. Meanwhile, the statistically significant error term brings our thoughts to potentially hiding factors.

3.2. Discussion

In terms of the negative coefficient of the SMB factor, which represents the lower excess return that the return differences between small market value REIT and big market value REIT bring, we attempt to come up with plausible explanations. In other words, the REIT with a higher market size performed better than the lower one. A possible explanation is the market preference. Since it was only one year since the first 9 REITs were issued, investors may prefer the steady cash flow the high-volume assets bring. Besides, the ability to resist the risk of mature companies may draw attentions, especially in the economic environment after the COVID-19 period.

Predictor HML with a positive regression coefficient proves that higher excess returns is lead by value REITs. The value REITs refer to the REITs who have high Book-to-Market Ratios and low asset valuations. From Figure 2, the price change of the first 9 C-REITs was indistinctive from Sep 2021 to March 2022. Thus, investors may not be encouraged to take risks in investing in growth REITs.

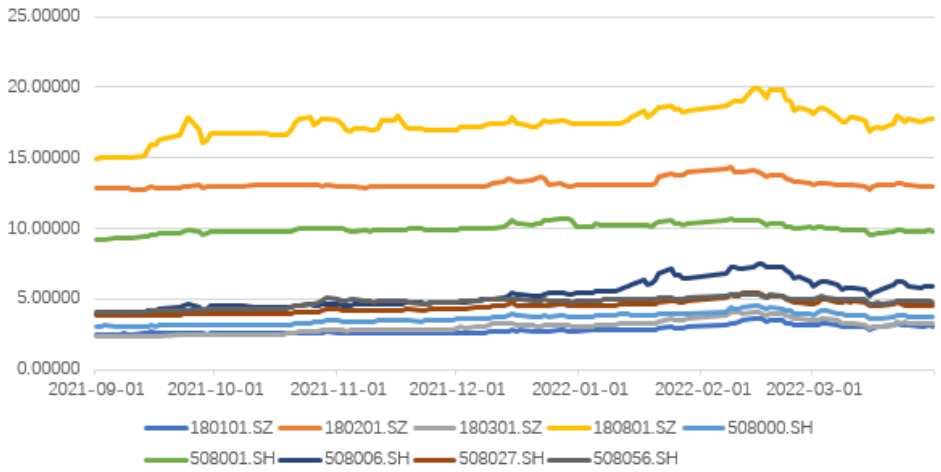

Figure 2. China First 9 REITs Price (Chinese yuan).

Since the regression results indicate that the intercept shows statistical significance on the excess returns, the Fama-French-five-factor model might be considered in future studies. According to Fama and French, the profitability factor (RMW) and investment factor (CMA) were put forward to explain the influence factors of excess return more comprehensively [13]. In addition to RMW and CMA, other factors such as regulation might be considered as well. Chen, Mo et al. constructed a monthly Chinese Real Estate Policy Uncertainty (REPU) index from 2001 to 2018 and found that the index increased significantly near the promulgation of major policies [14].

4. Conclusion

This paper conducted the Fama-and-French-Three-Factor model in the China REITs market over a 2-year period from June 2022 to June 2024. Through the regression and analysis of the study, the research concludes that the Fama-and-French-Three-Factor model can explain the China REITs market well. The positive market premium factor, the negative market volume factor (SMB), and the positive book-to-market ratio factor (HML) are all statistically significant. In other words, low market value REITs and high book-to-market REITs are likely to bring increment to the excess return of the portfolio. Market preference, liquidity, and economic environment might account for the negative beta of the SMB factor, while the low volatility of the China REITs market behavior might be an interception of the positive HML beta. As the significant intercept of the model' regression result represents existence of unexplored factors, future research of the multifactor models such as the Carhart Four-factor Model is encouraged.

References

[1] Sharpe, William F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk, Journal of Finance 19, 425–442.

[2] Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. Journal of Financial Economics, 33(1), 3e56.

[3] Khoa, B. T., & Huynh, T. T. (2023). Effectiveness of OLS and SVR in Return Prediction: Fama-French Three-factor Model and CAPM Framework. Industrial Engineering & Management Systems, 22(1), 73-84.

[4] Coşkun, Y., Selcuk-Kestel, A. S., & Yilmaz, B. (2017). Diversification benefit and return performance of REITs using CAPM and Fama-French: Evidence from Turkey. Borsa Istanbul Review, 17(4), 199-215.

[5] Su, Z., & Taltavull, P. (2021). Applying the Fama and French three-factor model to analyze risk/reward in the Spanish REITs: An ARDL approach. Journal of European Real Estate Research, 14(2), 189-208.

[6] Alaoui Taib, A., & Benfeddoul, S. (2023). The empirical explanatory power of CAPM and the Fama and French three-five factor models in the Moroccan stock exchange. International Journal of Financial Studies, 11(1), 47.

[7] Anuno, F., Madaleno, M., & Vieira, E. (2023). Using the Capital Asset Pricing Model and the Fama–French Three-Factor and Five-Factor Models to Manage Stock and Bond Portfolios: Evidence from Timor-Leste. Journal of Risk and Financial Management, 16(11), 480.

[8] Jackson, L. A. (2020). An application of the Fama–French three-factor model to lodging REITs: A 20-year analysis. Tourism and Hospitality Research, 20(1), 31-40.

[9] He, F., & Neo, K. T. (2021). Application of the Fama-French Model to Singapore REITs (Doctoral dissertation, Massachusetts Institute of Technology).

[10] Zhao, Y. (2023). Study on the Impact of Stock Market Performance on REITs Market in China. Financial Engineering and Risk Management, 6(1), 71-78.

[11] Chen, C. X., Huang, X., & Lin, R. F. Y. (2021). What does China's REITs market tell us?-an application of Fama-French three factors model.

[12] Fama, E. F., & French, K. R. (1996). Multifactor explanations of asset pricing anomalies. Journal of Finance, 55e84.

[13] Fama, E.F. and French, K.R. (2015) 'A five-factor asset pricing model', Journal of Financial Economics, Vol. 116, No. 1, pp.1–22.

[14] Chen, Y., Mo, D., Tang, S., & Li, H. (2023). Measuring real estate policy uncertainty in China. China Economic Quarterly International, 3(1), 23-34.