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The Limitaitons and Alternatives of CAPM

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Abstract: The Capital Asset Pricing Model (CAPM), a conventional financial model, has undergone extensive testing. This research critically examines the limitations of CAPM from four distinct perspectives and offers alternative frameworks. Specifically, this paper delves into these issues through the lens of the Conditional CAPM. Traditionally, CAPM has been viewed as a simplistic single-factor model. The limitations addressed here encompass temporal constraints, uniform expectations, the role of consumption factors, and underlying assumptions of rationality. This study employs a systematic literature review methodology to conduct its analysis. Through carefully selecting samples, our investigation reveals a correlation between the number of papers published and the years in question. Furthermore, certain keywords surface more frequently, indicating emerging phenomena and trends. However, our primary focus remains aligned with the research inquiry, leading us to select 12 samples for in-depth exploration. Ultimately, this paper argues that the Intertemporal CAPM (ICAPM) may ameliorate the time-related constraints inherent in traditional CAPM. Additionally, the Liquidity CAPM (LCAPM) factors in liquidity considerations, offering improvements to CAPM. The Consumption CAPM (CCAPM) augments CAPM's comprehensiveness by introducing consumption factors. Furthermore, the alpha-neutral CAPM and the sentiment-scaled model both acknowledge the influence of investor behaviour on asset pricing.

Keywords: Capital Asset Pricing Method, limitations, literature review

1. Introduction

In investment, the Capital Assets Pricing Model (CAPM) serves as a guiding framework for numerous investors with a shared goal: to receive a higher return with less risk. However, it has been demonstrated that there are numerous CAPM shortages. For instance, the abnormally flat correlation between investment returns and market beta, a lack of explanatory capacity for this idea, and occasionally even a negative correlation, and the volatility of market beta over time, where the return can vary between firms with different book-to-equity ratios even though the market beta is the same.[1] Regarding the constraints imposed by beta, there are still some other uncertainties brought on by issues with the environment, such that the factor structure in returns undergoes changes over time. Factor exposures are most likely time-varying due to modifications in the event portfolio's composition over time or changes in the local economic environment.[2]

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While the drawbacks of CAPM and how it can be enhanced have been substantially illuminated, some unanswered questions remain. To cover this research gap, this paper endeavours to discuss the limitations of CAPM and give some improved alternatives of CAPM according to those limitations with the literature review method.

There will be two crucial questions: What is the limitation of CAPM, and how can CAPM be improved to be more efficient? To respond to these queries, this study conducted a literature analysis on CAPM, critically appraising CAPM's drawbacks and suggesting ways to strengthen it. 12 papers were chosen for this paper from the Clarivate Analytics database. This research aims to engender a heightened comprehension of CAPM, thereby equipping fellow researchers and investors with a more effective tool for evaluating risks and returns.

Regarding the structure of this paper, Section 2 will expound on the research methodology and the literature selection process. The outcome of the literature review will be discussed in Section 3, together with the analysis and comments. The conclusion of this essay is found in section 4.

2. Method

In pursuit of the research objectives, I conducted a meticulous literature review, amassing a corpus of 12 scholarly papers subjected to thorough examination and analysis. The primary source of the paper selection was the Clarivate Analytics database, chosen for its comprehensive coverage and reliability. To ensure the relevance and coherence of the sample, I specifically sought papers in which the terms "CAPM" (Capital Assets Pricing Model) or "Capital Asset Pricing Model" appeared within the titles or keywords.

Moreover, I implemented a strategic focus by including papers that incorporated keywords such as "limitations," "shortages," "improvements," or "alternatives" within their titles or keywords. This refined approach allowed the researcher to constrain the thematic scope of the selected articles effectively. I also prioritized studies featuring empirical tests, offering empirical substantiation and robust evidence for the analysis.

Each paper in the study adhered to a publication timeframe from 2019 to 2023 and was composed in English, ensuring a contemporary and uniform dataset for my examination. Additionally, I directed the attention to articles that approached the CAPM from the vantage point of its inherent assumptions, which are also its limitations. This provided a structured framework for the analysis.

The final set of papers was ranked based on their citation frequency, aligning with conventional academic practices. The top 12 papers were selected for the analysis. These selected papers underwent meticulous scrutiny and analysis, with the evaluation grounded in a deep and comprehensive understanding of the subject matter.

3. Analysis/Result Analysis and Discussion

3.1. Year of Publication

During the paper selection process, the author noted an intriguing pattern in the distribution of papers related to CAPM (Capital Asset Pricing Model). While there was a reasonable number of relevant papers in 2019 and 2022, 2020 exhibited a substantial surge in the volume of papers compared to other years. According to papers we looked up in the database, 35 were published in 2019, 40 in 2020, 28 in 2021, 26 in 2022, and 18 in 2023.

This observed trend led to an investigation into the potential impact of the COVID-19 pandemic on research related to CAPM. The author discerned that the pandemic had induced adverse conditions in the capital market, manifesting as a heightened systemic risk. Consequently, this surge in systemic risk presented new challenges that the traditional CAPM model needed to be equipped to address effectively.

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3.2. Keywords Analysis

Table 1: Keywords and appearances.

Keywords	Appearance
Cross-sectional	6
Asset pricing	4
Conditional CAPM	4
Abnormal returns	2

I also discovered the phenomenon that the keywords “cross-section”, “asset pricing”, “conditional CAPM”, and “abnormal returns” appear more times than other keywords. (Table 1) I list a table above which shows the appearances. The “cross-section” may reveal a trend in the analysis method. Cross-sectional research is time-saving and economical. It is also easy to implement. The study results also have an excellent generalisation. The timeliness of horizontal research is vital, which can obtain the research results quickly and avoid the loss of subjects. The keyword “conditional CAPM” also reveals the point of our research: the limitation of CAPM is precisely the “conditional”. CAPM can only be effective in some specific assumptions. The result of the ineffective CAPM is “abnormal returns”. So, almost all these samples focus on these keywords, indicating a trend in CAPM research.

3.3. Content Analysis

The author examined how the epidemic might affect it. The capital market is in a poor state, and the systemic risk has increased significantly, leading to additional issues that CAPM cannot handle. The author also observed that practically all of these papers concentrated on the viewpoint of a single factor of the CAPM. As far as we know, the CAPM is a conventional single-factor model, which is also one of its problems. I examined the limits resulting from some CAPM assumptions that do not consider other elements and provide alternatives in accordance with these assumptions. Then, I will test the improved model using empirical method based on former literature.

To answer the research question: What the limitation of CAPM is, and how can this model be improved? I look into CAPM shortages from the following four angles: time constraint, homogeneous expectation, consumption factor, and rationality assumption. This study also offers improvements in compliance with these restrictions.

3.3.1. Time Constraint

In the first part, the research wants to discuss the single period limitation, which is also the problem that CAPM only consider a single factor.

The first limitation I can observe from the single period assumption. The risk premium is constant, unlike the static CAPM. Lettau and Ludvigson suggest that the risk premium is changeful related with the time. This suggests that because the CAPM mis-specifies risk, equities with more excellent static markets do not necessarily produce better average returns.[3] The traditional CAPM only discusses the relationship between the systematical risk and return in the single period, so it does not consider the inter-temporal investment. Given this shortage, Merton constructed a conditional two-factor model from the CAPM that Considering investors' potential future consumption and investment opportunities, it includes variables for systematic and hedging risk. The ICAPM's risk-return relationship is time-varying, and the conditional covariance of returns on available assets fluctuates, unlike the CAPM. In addition, Merton's intertemporal risk-return trade-off has been empirically examined in both equity and housing literature, with mixed results.[4] In the article “Intertemporal

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Risk-Return Relationship in Housing Markets", the author used the empirical test in the housing market to testify the ICAPM and found it works. Besides Pin-Te Lin's paper, the author also chose another sample to support ICAPM. Barroso P et al. also gave a literature review on the ICAPM, and they followed the advice of Cochrane and Princeton, instead of the relationship between state variables and a restricted investment opportunity set, the relationship between state variables and future consumption growth should be used for risk measurement.[5] They gave me another angle to test ICAPM and prove its feasibility.

3.3.2. Homogeneous Expectation

In the second part, the research analyses the limitation of CAPM from the assumption of homogeneous expectation.

Since this assumption, CAPM assumes everyone holds the same investment portfolio, and there do not have quick trading. The traditional CAPM does not consider the liquidity that also influences the asset pricing.

Acharya and Pedersen built a liquidity-adjusted CAPM to examine the liquidity risk component's implications on asset returns. After the LCAPM came out, a series of tests and improvements have been used to improve LCAPM. According to Erdinç Altay, Seda Çalgıcı's literature review, the tests and improvements continued from 2005 to 2017 from their sample. Erdinç Altay and Seda Çalgıcı also gave an empirical test on LCAPM on their own, and they applied the well-known two-stage Fama & MacBeth method in order to test LCAPM. The test's sample span runs from January 1997 to October 2018. The research also chose Xiuli Ma et al.' study, which supplied recent studies about LCAPM to find the significance of liquidity factor in asset pricing. Their empirical method is believable and proved that the corresponding LCAPM performs well and practicable. [6]

3.3.3. Consumption Factor

The third factor that CAPM does not consider is the consumption factor.

The traditional CAPM does not consider investors' future consumption plans and expectations. However, much research indicates that consumption can also affect systematic risk, leading to the difference between the real and theoretical beta. Furthermore, In Lucas' theoretical investigation of the behaviour of equilibrium asset prices in a normal good, pure exchange economy with identical consumers, Lucas develops a consumption-based CAPM (CCAPM).[6] CCAPM derives a new consumption beta, which supplies the limitation of the traditional beta, and It also offers useful guidance for economists conducting actual empirical research. Nevertheless, CAPM has been found to have many drawbacks and performed unsatisfactorily in recent empirical tests.[7] In recent years, specialists still have much work on CCAPM. Yum, Charles, and Dong's fresh perspective on systematic risk is presented. They attest to the robustness of consumption-based CAPM in Hong Kong's housing market. According to Campbell and Akhtar, co-skewness helps understand the cross-sectional variance of equity returns, and systematic skewness is economically significant. Abhyankar et al.Introduce present and long-term consumption periods of uncertainty, which support the significance of CCAPM and volatility in determining the return of US bonds.[8] Dandan Zheng et al.'s paper also gave empirical tests on CCAPM. They expanded the model by incorporating consumption factors and altering portfolios built on the foundation of conventional CCAPM. According to their model, consumption characteristics, such as the consumption of products, services, and other investments, are crucial in determining market risks, proving the CCAPM's effectiveness. Besides, according to Lucía Galicia-Sanguino et al.'s research, despite CCAPM's solid background, it still performed poorly in reality. They added market trading and R&D investment, two factors, into

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this model, demonstrating that both market trading and R&D investment greatly enhance the output of the conventional CCAPM. [9] Their finding may improve the conventional CAPM a lot.

3.3.4. Rationality Assumption

The Last Assumption This Research Wants to Analyse Is That CAPM Assumes Everyone Is Rational. From Francesco Rocciolo Et Al.'S Paper, the "Behavioralist" Interpretation Contends That Some Contravention from the Hypothesis of agents' Rationality Should Explain the Return Which Unaccounted for by the Model. The Most Frequently Advanced Explanations Include investors' Overreactions to Negative Economic News and Market Seasonality, under and Overreaction to Public and Private Information, Optimism/Pessimism, Narrow Framing and Loss Aversion. According to These Limitations, They Derived Alpha-Neutral CAPM, Which Offers an Understandable and Straightforward Analytical Explanation of the Aberrant Returns of the Conventional CAPM.. In Their Research, They Also Gave a Statistical Test on This Model.[9] The Other Sample We Chose from John A. Doukas and Xiao Han Also Indicates That Investor Sentiment Has Significant Influence on the Investment Value. As Their Paper Pointed Out, This Result Is in Line with the Findings of Huang Et Al. and Greenwood and Shleifer, Who Employed Survey Data on Investor Expectations and the Results of the Various Sentiment Indices Used. Therefore, Investor Mood Appears to Be a Practicable Tool to Explain the Undulation in Stock Returns. They Also Investigated the Sentiment-Scaled CAPM from a Cross-Sectional Perspective and Gave It an Empirical Analysis, and Then They Found That the Sentimental Model Has an Performed Perfectly.[10]

4. Conclusion

This research is designed to find out the current research direction and future research agenda of CAPM, especially on the limitations and future development of CAPM. A systematic literature review method was conducted in this research, based on 12 papers selected from the Clarivate Analytics database. The result shows that CAPM, as a conventional single-factor model, still has many limitations. This research analyses the single temporal investment problem and discusses the improved model ICAPM according to this limitation. The second limitation discussed is the homogeneous expectation problem and introduces the improved model LCAPM. This paper discusses the consumption factor that CAPM does not consider and prefers the alternative CCAPM. Last, it discussed the rationality limitation and gave the sentiment-scaled model and alpha-neutral version of the CAPM.

This research also found that "cross-sectional," "conditional CAPM," and "abnormal returns" appeared several times in the keywords of the candidate papers, which represent that cross-sectional is a popular method used in CAPM research, analysis the abnormal returns is a popular area in CAPM research area. However, there are several limitations of this research. First, the sample of this research is not large enough; second, research on the selected paper can be broader, and the perspectives of the research can be more comprehensive. The future research can select more papers for the review, and more aspects of the CAPM can be analysed to summarise the current research situation and future research agenda.

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