Proceedings of ICFTBA 2024 Workshop: Human Capital Management in a Post-Covid World: Emerging Trends and Workplace Strategies
DOI: 10.54254/2754-1169/145/2024.LD19020

Evaluating CAPM: Strengths, Limitations, and Alternative Asset Pricing Models

Chengxuan Xiang[1,a,*]

[1]*College of Business & Public Management, School of Wenzhou Kean University, Wenzhou, China*
a. 1162270@wku.edu.cn
**corresponding author*

Abstract: The Capital Asset Pricing Model (CAPM) has actually long been the basis of modern finance, supplying a structure to link risk and expected return. However, although its academic assumptions are sophisticated, they are ending up being more and more impractical in useful application. This leads to the development of different models, which are preferable for capturing the complexity of the real monetary market. This write-up initially talks about the advantages of CAPM, highlights its simplicity and fundamental function in portfolio management, and then explores its restrictions, such as unrealistic presumptions and key abnormalities such as failure to describe scale and value effects. These weak points motivate researchers and specialists to explore alternative models that can better record the intricacy of the real-world monetary market. For that reason, this paper assesses the primary option versions, including the Fama-French three-factor model, the Carhart four-factor model and the arbitrage pricing theory (APT). Although CAPM is still appropriate for basic risk-return evaluation, the multi-factor model offers a stronger framework for understanding asset pricing in intricate markets and aids to create wiser investment techniques.

Keywords: CAPM, Asset Pricing, Portfolio theory, Arbitrage Pricing Theory (APT).

1. Introduction

Created by William Sharpe, John Lintner and Jan Mossin, CAPM is still a preferred tool in monetary evaluation and is commonly utilized to assess the partnership between asset risks and their potential returns, provided that financiers Compensation ought to be obtained according to the moment worth of the currency and the dangers they bear [1-3]. The model is based upon a basic formula in which the anticipated rate of return of assets is identified by the risk-free interest rate, the sensitivity of possessions to market risk (beta variation) and the expected market return. CAPM has ended up being a preferred tool for scholars and financial experts to assess financial investments and build profiles. The mathematical equation of CAPM is shown below.

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f) \quad (1)$$

Where $E(R_i)$ is the expected return of asset i, R_f is the risk-free rate, β_i is the sensitivity of the asset to market risk, and $E(R_m)$ is the expected return of the market portfolio.

The influence of CAPM on modern money should not be undervalued, primarily due to the fact that it lays the foundation for modern portfolio theory. However, it is not without restrictions. With

DOI: 10.54254/2754-1169/145/2024.LD19020

time, critics mentioned its major shortcomings, including its dependency on impractical presumptions and the lack of ability to completely discuss specific market habits. This research study adequately evaluates the benefits of CAPM, such as its simplicity and fundamental features, along with its key weaknesses, including its empirical failings and academic limitations. Additionally, this paper discovers several alternate designs, such as the Fama-French three-factor model and arbitrage pricing theory (APT), which aims to supply an extra exact framework for asset pricing in contemporary monetary markets.

2. Advantage of CAPM

2.1. Simplicity

One of the major strengths of CAPM is its simplicity. There is only one endogenous variable β_i in the formula, and the rest variables $R_f, E(R_m), R_f$ are exogenous variables that are easy to detect. This simpleness is extremely eye-catching to academic and expert users.

The simple nature of CAPM has also contributed to its wide adoption in a vast array of fields. It is an initial framework for pupils to discover risk-return compromises and portfolio theory, offering an entrance point for a lot more intricate monetary model.

2.2. Broad Applicability

CAPM is frequently made use of to assess systemic dangers and is an essential tool for financial evaluation of safety and securities pricing and approximating the expected return of properties based on associated dangers and capital expenses.

For example, in corporate financing, it plays a vital duty in identifying equity costs, which is a vital part of calculating the weighted average cost of capital (WACC). In the field of investment monitoring, CAPM is used to review the efficiency of personal properties and profiles by connecting risks with predicted returns to assist investors choose whether supplies or portfolios are appropriately valued. Additionally, CAPM, as a standard, enables comparison with more complex asset pricing designs and helps to examine the risk-return compromise.

2.3. Predictive Power

CAPM has some anticipating capabilities in determining property returns, especially in a setting where the evaluation of large-cap stocks or design presumptions is reasonably large [3]. It links systemic threats with expected returns, providing a theoretical basis for understanding asset pricing under equilibrium conditions [4].

For long-lasting investors, CAPM can measure lasting financial investment by providing a simple structure based on the asset beta variation. By choosing possessions with various beta variations, CAMP is especially helpful for profile building, which causes the use of limited understanding and sources to maximize performance.

3. Disadvantage of CAPM

Although CAPM is just one of one of the most influential designs for anticipating property worth in the monetary area, it has numerous benefits. However, as a reasonably primitive concept, CAPM still has imperfections and technicalities that cannot be ignored. These constraints come from the premise of the concept, that is, it is based upon the excellent situation and overlooks the complexity of reality. This area discusses the major drawbacks of CAPM and gives empirical proof and theoretical objection from the literary works.

DOI: 10.54254/2754-1169/145/2024.LD19020

3.1. Unrealistic Assumptions

The model better assumes that all capitalists have the same assumptions for asset return and risk, which seldom occurs in the real market, due to the fact that financiers have different details, spend at various times, and have various perspectives towards risk:

CAPM thinks that all investors will certainly clear up decisions to make the most of energy. However, behavior financing has actually revealed that capitalists' decisions are often driven by prejudice and irrationality [5].

CAPM thinks that all capitalists have the same assumptions for the threats and returns of all possessions. In practice, this seldom takes place because capitalists may have different details, time array and risk choices.

3.2. Beta Instability

An additional useful issue of CAPM is the instability of the beta variation. CAPM thinks that the β value of an asset is constant, but empirical study reveals that the β worth will vary gradually and is affected by different variables, such as the firm's operation, resources framework or more comprehensive economic problems. The instability of the Beta version weakens the usefulness of CAPM, due to the fact that investors cannot count on the taken care of Beta variation to make precise financial investment choices [6].

3.3. Failure to Explain Stock Returns

Empirical evidence reveals that CAPM frequently cannot describe the cross-section of stock returns. A number of variants, such as size effect and value effect, test the forecast of the version.

Research shows that after controlling the beta version, on the basis of risk modification, the performance of small-cap stocks is frequently far better than that of large-cap supplies. This negates CAPM's prediction that stocks with comparable beta versions must have comparable anticipated returns [7].

Stocks with high book listing ratios have always transcended to development supplies with reduced book market ratios, although they normally have comparable beta variations. This uncommon sensation has been validated in multiple markets and periods of time, which questions the adequacy of β in explaining returns [8].

4. Alternatives to the CAPM

By subjecting the useful imperfections of CAPM, financial experts have proposed different alternative models. This area discusses 3 alternatives to CAPM: Fama-French three-factor model and Carhart four-factor model, Arbitrage Pricing Theory (APT).

4.1. Fama-French Three-Factor Model

Eugene Fama and Kenneth French introduced the Fama-French three-factor model in 1992. The design expands CAPM by adding two added aspects to describe the return of the portfolio extra thoroughly.

Size Factor – "Small Minus Big" (SMB) means that financiers may get extra returns by buying small-cap supplies and large-cap stocks.

Value Factor – "High Minus Low" (HML)gauges the return difference between stocks (worth supplies) with a high book-to-market ratio and stocks (development supplies) with a reduced book market ratio.

The Fama-French Three-Factor Model formula is represented as follow.

DOI: 10.54254/2754-1169/145/2024.LD19020

$$E(R_i) = R_f + \beta_m(R_m - R_f) + \beta_{SMB}SMB + \beta_{HML}HML \quad (2)$$

Where $E(R_i)$ is the expected return of asset i, R_f is the risk-free rate, R_m is the expected market return, β_m is the sensitivity to market risk. SMB is the size factor, means small minus big. HML is the value factor, means high minus low. β_{SMB}, β_{HML} are respectively the sensitivities to the size and value factors

Compared with the traditional CAPM, this model has the following advantages:

Better explanation of returns: CAPM's single market factors cannot fully discuss possession returns, especially when it involves small-cap supplies and value supplies. As a matter of fact, the Fama-French model enhances this issue by adding dimension and value aspects. This brings about a better interpretation of supply returns, particularly for portfolios of small-cap stocks or value supplies.

Empirical Evidence: Fama and French prove that the size and value significantly boost the experience of the model Their research shows that small-cap stocks and value supplies have a tendency to carry out much better than the market, which CAPM cannot discuss.

4.2. Carhart Four-Factor Model

The Carlhart four-factor model was presented by Mark Carhart in 1997 [9]. It increases the Fama-French three-factor model by consisting of an added element.

Momentum Factor (MOM) – The energy element determines stocks (champions) that have performed better than the marketplace in the past 3 to 12 months tend to remain to execute far better than the marketplace, while stocks (losers) that choke up tend to continue to choke up.

The formula of Carhart Four-Factor Model is represented as follows.

$$E(R_i) = R_f + \beta_m(R_m - R_f) + \beta_{SMB}SMB + \beta_{HML}HML + \beta_{MOM}MOM \quad (3)$$

Where $E(R_i)$ is the expected return of asset i, R_f is the risk-free rate, R_m is the expected market return, β_m is the sensitivity to market risk. SMB is the size factor, means small minus big. HML is the value factor, means high minus low. MOM is the momentum factor, means winners minus losers. $\beta_{SMB}, \beta_{HML}, \beta_{MOM}$ are respectively the sensitivities of the asset to these factors.

Based upon the Fama-French three-factor model, compared to CAPM, this version has the following benefits:

Considering momentum effects: Energy is a usual phenomenon in the monetary market, and the Carhart model clearly combines it. The momentum coefficient enables the version to clarify a majority of the return changes, especially for momentum-driven supplier.

More Accurate Assessment: By considering momentum, the version offers a more comprehensive portfolio performance. This is especially valuable for fund managers and analysts that wish to describe the returns of mutual funds or various other portfolios.

4.3. Arbitrage Pricing Theory (APT)

The Arbitrage Pricing Theory (APT) was suggested by Stephen Ross in 1976 and is among the most influential choices to CAPM [10]. APT assumes that the return on assets is affected by different macroeconomic and corporate-specific elements. The flexibility of APT enables it to record a larger range of dangers, hence providing a much more practical explanation for asset returns.

APT is a multi-factor design that assumes that numerous financial elements will certainly impact the return of securities, and the sensitivity of safeties per variable will certainly influence their expected return. A typical APT version may consist of the following factors:

Inflation rates: Reflects the influence of modifications in price levels on possession worth.

Interest rates: Reflecting the cost of borrowing and the risk-free rate.

DOI: 10.54254/2754-1169/145/2024.LD19020

GDP growth: Reflecting overall economic activity.
Exchange rates: Reflecting international competitiveness.
A general representation of APT can be written as follows.

$$E(R_i) = R_f + \beta_1 F_1 + \beta_2 F_2 + \cdots + \beta_n F_n \quad (4)$$

Where, $E(R_i)$ is the expected return of asset i, R_f is the risk-free rate. $F_1, F_2, F_3, \ldots, F_n$ are the different risk factors, such as inflation, interest rate, etc. $\beta_1, \beta_2, \beta_3, \ldots, \beta_n$ are the sensitivities of asset i to each factor $F_1, F_2, F_3, \ldots, F_n$.

The primary advantages of APT over CAPM are:

Incorporating multiple risk factors: By thinking about multiple elements, APT can have an extra comprehensive understanding of the threats influencing possession rates. Compared with CAPM's single-factor hypothesis, APT can supply an extra in-depth understanding of these dangers, specifically in complicated financial atmospheres.

No market portfolio assumptions: Another significant benefit of APT is that it does not require to make assumptions about the marketplace portfolio. CAPM thinks that all investors hold the "market portfolio", that is, the exact same info, which is impractical and overly idealistic. APT is not based upon this presumption, so it is extra sensible in practical applications.

5. Conclusion

The capital asset pricing model (CAPM) is still a basic tool in finance because it is simple and extensively suitable in figuring out the risk-return relationship of properties. However, as received this article, the limitations of CAPM lower its performance in the real life. It relies on extremely optimistic assumptions and cannot successfully explain sensations such as dimension and value effects. In order to boost these imperfections, the Fama-French three-factor model, Carhart four-factor model and arbitrage pricing theory (APT) provide an even more thorough description of asset returns by integrating other factors. Although CAPM is still useful, these multi-factor models give a stronger structure for asset pricing.

This article suggests that future study can discover the additional improvement of multi-factor models, specifically in comprehending the circumstance or behavioral factors of emerging markets. Furthermore, researching dynamic asset pricing models that consider time-changing threats can acquire a much deeper understanding of the complexity of the global monetary market, so regarding create more exact and useful investment techniques.

References

[1] *Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. The Journal of Finance, 19(3), 425-442.*
[2] *Lintner, J. (1965). The valuation of risky assets and the selection of risky investments in stock portfolios and capital budgets. The Review of Economics and Statistics, 47(1), 13-37.*
[3] *Mossin, J. (1966). Equilibrium in a capital asset market. Econometrica, 34(4), 768-783.*
[4] *Cochrane, J. H. (2005). Asset pricing (Rev. ed.). Princeton University Press.*
[5] *Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. Econometrica, 47(2), 263-291.*
[6] *Blume, M. E. (1971). On the assessment of risk. The Journal of Finance, 26(1), 1-10.*
[7] *Banz, R. W. (1981). The relationship between return and market value of common stocks. Journal of Financial Economics, 9(1), 3-18.*
[8] *Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. Journal of Financial Economics, 33(1), 3-56.*
[9] *Carhart, M. M. (1997). On persistence in mutual fund performance. The Journal of Finance, 52(1), 57-82.*
[10] *Ross, S. A. (1976). The arbitrage theory of capital asset pricing. Journal of Economic Theory, 13(3), 341-360.*