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Introduction to CAPM: Advantages, Disadvantages and Alternatives

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Abstract: Capital Asset Pricing Model (CAPM) is a widely used financial model for asset pricing. This paper summarizes the advantages of CAPM, highlighting its applicability to most developed countries. Based on academic research, this paper also discusses the limitations of the CAPM model, including issues with its assumptions and its limited suitability for developing countries. In the end, Alternative solutions are discussed, including finding other financial models to replace or improve the CAPM. However, through the summary, this paper finds the current financial models are relatively independent and most of them have some shortcomings in the assumption. It is difficult to find a perfect model. Therefore, the conclusion is that the future research direction should be to integrate a summative financial model to integrate the advantages of each model to help future financial analysis in both developed and developing countries.

Keywords: CAPM, FF3F, APT, CAPM-based models

1. Introduction

Coming from Markowitz's efficient frontier, capital-asset pricing model (CAPM), which was raised by William Sharpe, has played an important role in finance from the 1960s. In general, this model can help investors to understand the relationship between return and risk and make better decision in market with volatility, uncertainty, complexity, and ambiguity [1]. For example, CAPM can help people analyze herd behavior in the stock market from an empirical perspective, helping scholars and investors understand the causes and consequences of such investment behavior [2]. At the same time, this model can also help companies to calculate the future expected rate of return [3]. What's more, as an academic model, CAPM can help scholars improve and iteratively build financial models and clarify the understanding of input and output of any models in economy [4]. However, in the process of academic development, academics and empirical scholars have gradually found that this model is not a "perfect" model. In addition to advantages, it still has many shortcomings. With the development of academic research, more and more people find these problems in the process of application. Nowadays, the discussion and improvement of CAPM model has become a hot topic in finance.

2. Advantages of CAPM

As one of the most important theories in finance, the Capital Asset Pricing Model (CAPM) has been widely used to evaluate the risk and expected return of assets. The application of the CAPM model

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covers various financial assets such as stocks, bonds, and real estate. Even today CAPM has still been one of the most popular and widely applied models in finance.

The advantages of the CAPM model are not only reflected in its wide application in financial practice but also in its unique strengths and contributions. This part will focus on exploring the advantages of the CAPM model and its application in the field of finance.

Firstly, the most famous advantage of CAPM is simplicity [5]. With CAPM, users only need to put few basic inputs into the model like risk-free rate, market risk premium and beta. In this way, they can easily estimate the required rate of return for an asset. Even beginners can use this model well to have a preliminary understanding of financial markets and assets.

An other benefit of CAPM is giving an accurate risk assessment. Investors could use the CAPM model as an accurate tool for assessing the risk associated with an asset [6]. By using beta, which is a measure of an asset's systematic risk, the model can estimate the expected return on an asset based on its level of risk. Actually, with the help of CAPM, investors might be more rational and have a chance to make more informed decisions in investment.

At the same time, market-based also makes CAPM model become popular among investors. It takes into account the overall market risk when estimating an asset's required rate of return. This helps investors to assess the overall risk of their portfolio and make informed decisions about diversification. In fact, many studies have shown that market risk is the most important factor affecting stock returns [7]. More precisely, there is a significant negative correlation between market risk and the risk-free interest rate [8]. This corresponds to the underlying assumptions of CAPM.

Besides, CAPM is applicable to multiple assets, which means it can be used to estimate the required rate of return for a portfolio of assets as well as for individual assets [9]. That's why people want to use CAPM because most investors in the market today no longer own a single asset or stock. Instead, most of them have a portfolio. This makes it a versatile tool for investors who want to assess the risk of their investments.

In fact, CAPM is a widely used framework for estimating the expected returns of financial assets in some different country in the world. Investigations show that development countries are always well fitted with CAPM model because of their mature market and ample historical data. For example, this model has been used by some scholars to verify the future performance and integration trend of the Japanese and Portugal stock market, respectively [1,10]. Also, CAPM is used in the academic research of financial markets in the UK and the US, because they both have a long history of financial market with rich historical data. Investors here take it to measure whether the gold can be their tool in market [11].

In conclusion, the CAPM model is a useful tool for estimating the required rate of return on an asset. Its simplicity, accuracy, market-based approach, versatility, and wide acceptance make it a valuable tool for investors and analysts. Moreover, years of research in the academic circles around the world have proved that this model can be successfully applied in many financial markets. Whether for academic research, experimental proof or investment decision, CAPM model has its great value in finance.

3. Disadvantages of CAPM

While the CAPM model has many theoretical attractions, there are also some drawbacks and limitations in practical applications. As an imperfect and overly idealistic model, it has proved to be applicable in some countries and regions. But at the same time, in many other places, the results calculated by CAPM are quite different from the real situation.

Firstly, the CAPM model is based on several assumptions that are difficult to meet in actual practice. In practice, this model seems completely fanciful and impractical. For example, the CAPM model assumes that investors' behavior is rational, and they hold the same view of risk like robots.

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However, in reality, investors' behavior is difficult to predict and understand and their behavior may be influenced by psychological factors, information asymmetry, and conflicting interests.

Additionally, the CAPM model assumes that asset returns follow a normal distribution. However, in reality, the distribution of asset returns is often non-normal, which may lead to distorted predictions by the CAPM model. An operation based on a perfect assumption may produce a mathematically perfect result while it does not apply to real data and specific applications in investing.

Secondly, the CAPM model has a weak explanatory power for non-systematic risk (specific risk). This is because the CAPM model only focuses on the systematic risk of the entire market and ignores the specific risk factors of assets. Although this feature and assumption can be counted as an advantage of CAPM, which is that the calculations are simpler and more rudimentary. In practical applications, non-systematic risk has a significant impact on the volatility of asset returns, which the CAPM model cannot capture. As a result, when using this model to make simple estimates, the result is a very incomplete consideration of risk.

Lastly, the CAPM model is only applicable to risk-neutral investors and cannot be applied to risk-averse or risk-seeking investors. In reality, different investors have different risk preferences and return requirements. Therefore, the CAPM model's single risk and expected return assumptions may lead to biased investment decisions.

In recent years, many scholars have begun to question CAPM and conducted empirical analysis in different countries and regions, especially in some developing countries. Through their research and calculation, it is proved that CAPM is not applicable to all regions and industries without a very prosperous market. For example, in the Chinese market, some scholars found that the β index used in CAPM could not explain the average return of the Chinese stock market through data analysis [12]. For China, many markets are immature and lack historical data. Furthermore, some scholars analyzed the stock market of specific cities in China. For example, in Shanghai and Shenzhen, China's famous and economically developed cities, CAPM model is not yet applicable [13-14].

Nowadays, whether in the academic circle or in the economic market, more and more scholars and market participants find that the results are not ideal or not applicable when using this model. Unattainable assumptions, or a lack of data in the history of market make it hard for CAPM to be the perfect tool in people's hands. Therefore, the academic circle has carried out a lot of research, trying to find the alternative method of CAPM or the way to improve CAPM.

4. Alternatives

With time passing, it has become apparent that the CAPM has certain limitations, such as its assumption of a single risk factor and the unrealistic assumptions made about investors' behavior. As a result, researchers have developed alternative asset pricing models, such as the Three-Factor Model and the Arbitrage Pricing Theory (APT).

The Three-Factor Model, proposed by Fama-French, expands on the CAPM by adding additional factors. The model asserts that market portfolio, market value factor and book value ratio factor explain variations in stock returns as well that cannot be explained only by the market factor. In some ways, the Three-Factor Model has been shown to have better explanatory power than the CAPM, particularly in explaining the returns of small-cap and value stocks because it pays much attention on different other factors more than CAPM. For example, studies have shown that the three-factor model has better explanatory power and visual acuity than the CAPM model for the oil industry in China [15].

The APT, proposed by Stephen Ross, is another alternative to the CAPM. The APT is a multifactor model that assumes that the returns of an asset are influenced by multiple factors, such as macroeconomic variables or industry-specific factors. The model asserts that an asset's return can be explained by a linear combination of these factors. In APT, different from CAPM, the stock can be individual

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and mispriced which means it's not on the SML curve. At the same time, in the assumption of APT, there are not any market portfolios. Also, people can have their opportunity short and long sale. Unlike the CAPM, which assumes that the market factor is the only relevant risk factor, the APT allows for multiple factors to affect an asset's return. However, the APT requires that the factors are correctly identified and quantified in order to accurately estimate an asset's expected return. But in general, APT looks more comprehensive than CAPM, being closer to real life. As a result, it can be applied to some markets in developing countries.

At the same time, there have been attempts to improve the CAPM model. Some people introduce investors with extrapolative expectations into CAPM to build a new X-CAPM [16]. What is more, there is another model called D-CAPM, which uses the downside beta but not the beta used in CAPM. It is surprising that in the research, D-CAPM seems more useful compared with CAPM in both developed and emerging markets [17]. Different from the three-factor model and APT model, such an improved way can make full use of the advantages of CAPM while correcting unreasonable CAPM's assumptions or factors, adjusting the way of using CAPM as well as the data and factors used in different situations.

5. Conclusion

In general, the CAPM model, as a very traditional model, has been found to have some applicability issues in practice, despite providing some convenience to its users through the assumption of a perfectly efficient market. This is due to the excessively perfect assumptions made about investors and the market. Many scholars have discovered that the CAPM does not have the same accuracy and applicability in developed countries and developing countries. Therefore, in today's financial market, models such as the three-factor model and the APT have been introduced to replace the CAPM model. At the same time, many scholars are trying to improve the CAPM model by modifying or adding some factors. In fact, research on the CAPM has not stopped. Both investors and scholars should inject more energy into trying to find a better investment and financial model derived from the CAPM, trying to integrate the characteristics of different models to build a hybrid financial system model. Furthermore, it is necessary to pay more attention to countries with different economic development levels and different financial market development histories, in order to find a financial model that can be applied to different countries and industries in different situations.

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