

Analysis of the Evolution of the Multiple Factors Financing Model

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Abstract. The asset pricing model becomes a significant financial model to estimate the prices of financial assets. Nowadays, scholars are still extending the model to improve its feasibility in both theoretical and practical aspects. Against the background, the study aims to review the evolution and application of the models as well as propose some limitations and prospects of them. According to the analysis, it is found that asset models are constantly being optimized. Furthermore, after the five-factor model matures, some scholars also add new factors based on their own insights. In addition, it is interesting to note that the asset pricing models are helpful in making investment strategies. However, the models still have limitations such as interference from irrational factors, the existence of assumptions, etc. Therefore, we put forward some methods to avoid these limitations and propose prospects for the future. These findings provide guidelines for investors to scientific asset pricing methods and more factor indicators with reference values to obtain more returns in the capital market and investment portfolio.

Keywords: CAPM, the multiple factors model, evolution, application, asset pricing.

1. Introduction

In the modern financial world, investment in the financial market, especially the securities market, has gradually become an essential way for institutions and individuals to participate in investment. To obtain more profits, research and practice on investment choice is a topic that attracts considerable attention. There are numerous methods for investing and selecting stocks internationally, among which the multiple factors models are widely used [1]. The multiple factors model, which evolved from the capital asset pricing model, is a significant tool for reasonably estimating the prices of financial assets. People make rational trading decisions through reasonable price estimation. The origin of the asset pricing model can date back to the 1950s. Markowitz constructed the mean-variance model, which lays the foundation for the invention of the asset pricing model [2]. Soon afterward, Sharpe presented the capital asset pricing model [3]. The capital asset pricing model (CAPM) has gradually evolved from single-factor models to multi-factor models with higher accuracy and practicability. Fama and French proposed a three-factor asset pricing model (FF3) [4], which adds the size factor and the book-to-market factor to CAPM. Afterward, they presented a five-factor model (FF5) by adding profitability and investment factors to FF3 [5]. However, the evolution of the multi-factor model is not over, some financial scientists are even adding new factors to further optimize the model.

Apart from the theoretical extension of the asset pricing model, researchers are exploring the application of models in various industries and testing their applicability. For instance, during the COVID-19 pandemic, Fama-French multiple factors models were used to research the US stock market. Li and Duan applied the FF3 and FF5 to some industries of the U.S. stock market and discovered that the models were well-suited in the context of the pandemic because the market became less complicated [6]. However, the model still has deficiencies. We still have difficulty fully inferring which factors are related to the expected return rate of assets. During the research process, scholars have different answers to asset pricing problems due to the different analytical methods and constructed factor measurement indicators. Their respective studies have their rationality and

irrationality. Due to different market fluctuations and risks, there is still huge room for the application of the multi-factor model. Researching multiple factors models has certain theoretical and practical significance. On the one hand, it provides more effective factors that may affect the expected return rate of assets for the research of China's capital market and studies the relationship between effective factors and risk premium. On the other hand, it offers investors scientific asset pricing methods and more factor indicators with reference values to obtain more returns in the capital market and investment portfolio.

The remainder of this thesis is as follows. Section 2 describes the development history of the asset pricing model. The extension of existing theories and some current market applications of the models are reported in Section 3 and Section 4. Section 5 discusses the advantages and disadvantages of the asset pricing model. Meanwhile, the limitations and future research directions of the model are presented in Section 6, aiming to provide reference and inspiration for researchers in the relevant financial field and promote the development of asset pricing models. Finally, Section 7 concludes.

2. An Overview of CAPM, β , and Alpha

2.1. Traditional Finance

Historically, the earliest financial transactions date back to ancient agricultural societies. In early commercial cities and trade centers, people began to use money for economic exchange, such as paper money in ancient Egypt and metal money in ancient Babylon. But financial transactions in the modern sense arose during the Middle Ages, especially during the Renaissance, bankers, and securities firms turned up in cities such as Florence and Venice, where commerce and trade developed. But its size is far from being called a financial market. The formation and development of the market is a gradual process, affected by social, economic, and political changes. The 17th and 18th centuries were a huge turning point. The unfolding of the Industrial Revolution leads to the rapid acceleration of the consumption and creation of wealth, and the participation of a large number of people brought about a huge demand for wealth investment. Meanwhile, the collapse of the feudal order and the political transformation of modern sovereign states made liberal ideas prevail, and the liquidity of capital was greatly improved in the free market, completely changing people's original economic behavior. Besides, people's perception of wealth has changed. In the past, wealth was a physical item such as land. With the rise of empiricism and rationalist methodologies, people's cognitive ability improved, wealth was reimagined, and vague abstractions such as stocks, hidden costs, intellectual property, etc. began to be transformed into capital and regarded as another form of wealth. The financial market is thus formed. The theoretical basis of the traditional financing model is behavioral science, which is a reflection of individualistic value orientation in finance, which adheres to the view that "society is composed of individuals and is the sum of atomized individuals". Therefore, the assumption of human nature is often the starting point of the construction of this theory, which overemphasizes human behavior, while human behavior is often full of uncertainty, which directly leads to the distortion and one-sidedness of the traditional asset pricing theory. In the actual investment and asset management process, investment presents a phenomenon more similar to the nature of gambling.

However, the development of paradigms is often accompanied by conflicts between existing paradigms and reality, and the inability of old theories to explain reality will lead to a "scientific revolution" and bring about new paradigms. The same is true for finance, where traditional financial asset pricing methods are mostly valued by the practitioner's own intuitive experience and market comparison. Although it has a certain logic, it reflects more people's subjective judgments and lacks empirical basis and data support. In the fifties and sixties of the last century, with the deviation between theory and reality, people first doubted the existing theory, and then transformed into the demand for new theory, and began to seek a more scientific theoretical model. The foundations of modern asset pricing theory are focused on the emergence of this period. For example, in 1952, Markowitz published *The Selection of Portfolios*. He abandoned qualitative methods to express financial ideas and instead used mathematical formulas and geometric figures to illustrate financial

ideas [7]. For the first time, risk is incorporated into the asset pricing system. In 1964, on this basis, Sharp William and other economists analyzed and deconstructed the factors of risk, studied the impact and relationship of various factors on the value of assets, and proposed the CAPM model in "Capital Asset Price Model: Market Equilibrium Theory under Risk State", which opened up a precedent for modern asset pricing.

2.2. MPT Model

Markowitz's portfolio theory is the theoretical basis for all current asset pricing models. The model uses the basic ideas of probability theory to assume that the returns of all assets are normally distributed, measure the return on investment by the historical mean of the return on assets, and measure the investment risk by the historical variance of the return on assets [8]. In this way, the risk is translated into a visual number, making it possible to price various assets. In fact, Markowitz himself has proposed a corresponding model, the MPT model. The MPT model is based on the following key assumptions:

- Investors are risk-averse: Investors prefer to choose portfolios with lower risk under the same returns.
- Investors focus on overall portfolio performance: Investors focus more on the risk and return of the entire portfolio than on the specific performance of individual assets.
- Investors can diversify risk by combining multiple assets: By combining different asset classes, investors can reduce specific risks and improve the efficiency of the overall portfolio.

The formula based on the above ideas is $E(r_p) = \sum_{i=1}^n \omega_i E(r_i)$, which reflects the investor's return on investment on the n assets existing in the market, which is the proportion of their investment and the rate of return of each asset. Combining these assets with correlation and presenting them on the axis of total average return and risk as abscissa will be linked to form a curve to obtain an effective frontier. It can be understood as the most efficient investment allocation that the market can offer. The flaw in this theory is that it ignores risk-free assets and the relationship between each asset.

2.3. CAPM and β Coefficient, Alpha

Markowitz theory reveals portfolio optimization options through effective frontiers and capital markets lines. However, Markowitz's theory only provides a theoretical relationship in equilibrium, i.e., the best portfolio under given risk and return conditions, without addressing specific asset pricing mechanisms. The CAPM model is based on the MPT model. The emergence of CAPM fills the gap in Markowitz's theory of asset-specific pricing. It provides a quantitative approach based on market risk and risk-free interest rates, allowing investors to predict the expected return as well as systemic risk (β coefficient). Any economic model is a deliberate simplification of complex economic phenomena, and CAPM is no exception. Its basic assumptions are:

- The only factors investors consider when making decisions are expected returns and risk.
- Investors can construct a portfolio by holding multiple assets and are free to borrow or invest in risk-free assets.
- The market is highly efficient, meaning that all information has been fully reflected in the price of the security.
- There is a risk-free asset in the market and all investors have the same expectations.

Under these premises, Sharp proposed a classic formula to measure the specific relationship between yield and risk:

$$E(R_i) = R_f + \beta_i [E(R_M) - R_f] \quad (1)$$

where β is an indicator that measures the systemic risk of a risky asset. The β coefficient reflects the degree to which an asset fluctuates relative to the market as a whole. It measures the systemic risk of an asset, i.e. the risk associated with the market as a whole. In the CAPM model, the β coefficient is used to measure the volatility of an asset and the correlation between the asset and the market. The

alpha coefficient is the β coefficient, which is proposed mainly to explain the source of excess returns on an asset or portfolio, that is, additional returns relative to the expected return of the market. It represents the additional return of an asset or portfolio under a given market risk. Specifically, alpha is the extra return obtained from CAPM, and its formula is also very simple, $\alpha = \text{real rate of return} - \text{expected rate of return}$. It reflects whether the assets are overvalued or not.

CAPM uncovers a quantitative relationship between the returns of certain securities and of the market portfolio [9]. It believes that only systemic risk is the only factor determining the expected rate of return of a security, and that investors receive risk-reward because they have taken systemic risk, and non-systemic risk can be broken down through asset portfolios [10]. Relative to Markowitz's MPT model, it only needs to calculate the β coefficient of the asset and combine the other rates to estimate the expected rate of return of the asset. This makes the CAPM model more convenient in real-world applications without the need for complex trade-offs and optimization processes.

3. The Extension of CAPM

3.1. FF-3 Model

Since CAPM has strong assumptions and the practice of this theory lacks flexibility, there are difficulties in selecting and pricing assets. Therefore, some scholars attempted to optimize the theory by adding factors to the formula. In 1992, FF3 model is proposed as already claimed in the first section where including three novel factors, i.e., market portfolio ($R_m - R_f$), size factor (SMB), and book-to-market factor (HML). The model can be expressed as:

$$R_{it} - R_{ft} = a_i + \beta_i(R_{mt} - R_{ft}) + s_iSMB_t + h_iHML_t + \varepsilon_{it} \quad (2)$$

Here, SMB_t is the simulated portfolio return (small minus big) of the market value factor (size) of time t , and HML_t is the simulated portfolio return (high minus low) of the book-to-market factor at time t . Another two variables have practical significance: a_i is the excess returns on portfolio investments, which reflects the investment manager's ability to pick stocks. β_i is the market risk exposure that symbolizes the sensitivity of a portfolio to market risk. Fama and French first ranked all stocks based on their current market value as of June 30 of t year and took the median. Companies with a market value greater than or equal to the median were classified as large market value companies (denoted as B), while companies with a market value less than the median were classified as small market value companies (denoted as S); Next, Fama and French divided the stocks on June 30, t years into three groups based on the book-to-market ratio at the end of $t-1$, using the book to market ratio percentiles of 30% and 70%. Stocks with size before the 30% quantile (including 30%) are classified as high book-to-market ratio (denoted as H), and stocks with a size between 30% and 70% (including 70%) are classified as medium book-to-market ratio (denoted as M), and stocks with size after the 70% quantile are classified as low book-to market ratio (denoted as L); Finally, taking the intersection of H, M, L stock portfolios and S, B stock portfolios, six investment portfolios S/L, S/M, S/H, B/L, B/M, and B/H are obtained. The returns of SH, BH, SL, BL, SM, and BM investment portfolios are weighted by the circulating market value to construct SMB and HML factors. The values of the two factors are:

$$SMB = (SL + SM + SH)/3 - (BL + BM + BH)/3 \quad (3)$$

$$HML = (SH + BH)/2 - (SL + BL)/2 \quad (4)$$

The academic contributions of the FF-3 model are mainly reflected in two aspects. The two new factors can explain most of the changes in the stock price as well as replace other risk factors. On the other hand, the FF-3 model plays a link role in the evolution of neoclassical finance from CAPM to apt and is the methodological promoter of behavioral finance school and technical analysis school.

3.2. FF-5 model

In retrospect, empirical studies proved that the intercept α in some stocks is significantly non-zero. It means that the three-factor model is flawed [11]. In 2015, Fama and French added the profit factor (RMW) and investment factor (CMA) to the FF-3 model to explain that the value strategy based on the company's profitability and investment level achieved excess returns. The FF-5 model adopts three grouping methods for factor construction. Therefore, three different five-factor combinations are generated accordingly. The group methods are listed in Table. 1. Its formula is listed as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_iSMB_t + h_iHML_t + c_iCMA_t + r_iRMW_t + \varepsilon_{it} \quad (5)$$

Table 1. Three grouping methods of the factors

Grouping methods	Factors and their components
2*2 grouping	$SMB = (SH + SL + SR + SW + SC + SA)/6 - (BH + BL + BR + BW + BC + BA)/6$ $HML = (SH + BH)/2 - (SL + BL)/2$ $RMW = (SR + BR)/2 - (SW + BW)/2$ $CMA = (SC + BC)/2 - (SA + BA)/2$
2*3 grouping	$SMBB/M = (SH + SN + SL)/3 - (BH + BN + BL)/3$ $SMBOP = (SR + SN + SW)/3 - (BR + BN + BW)/3$ $SMBInv = (SC + SN + SA)/3 - (BC + BN + BA)/3$ $SMB = (SMBB/M + SMBOP + SMBInv)$ $HML = (SH + BH)/2 - (SL + BL)/2$ $RMW = (SR + BR)/2 - (SW + BW)/2$ $CMA = (SC + BC)/2 - (SA + BA)/2$
2*2*2 grouping	$SMB = (SHRC + SHRA + SHWC + SHWA + SLRC + SLRA + SLWC + SLWA)/8 - (BHRA + BHRC + BHWA + BHCW + BLRA + BLRC + BLWA + BLWC)/8$ $HML = (SHRC + SHRA + SHWC + SHWA + BHRC + BHRA + BHCW + BHWA)/8 - (SLRC + SLRA + SLWC + SLWA + BLRC + BLRA + BLWC + BLWA)/8$ $RMW = (SHRC + SHRA + SLRC + SLRA + BHRC + BHRA + BLRC + BLRA)/8 - (SHWC + SHWA + SLWC + SLWA + BHCW + BHWA + BLWC + BLWA)/8$ $CMA = (SHRC + SHWC + SLRC + SLWC + BHRC + BHWC + BLRC + BLWC)/8 - (SHRA + SHWA + SLRA + SLWA + BHRA + BHWA + BLRA + BLWA)/8$

Among them, SHRC, SHRA, SHWC, SHWA, etc. are the weighted returns of the investment portfolio obtained by taking the intersection of four different combination methods: S, B, H, L, R, W, C, and A.

3.3. FF-n model

Nowadays some scholars are still devoting themselves to consummate the theory by adding new factors, and it has been updated to a six-factor model. For instance, a model based on the FF-5 model was presented with the newly proposed factor human capital (LBR) since the human capital component was identified to be significant in asset return predictability since human capital is a precious component of total wealth. The model is expressed as:

$$R_{it} - R_{ft} = \alpha + \beta_1 LBR_t + \beta_2 (RM - RF)_t + \beta_3 SMB_t + \beta_4 HML_t + \beta_5 RMW_t + \beta_6 CMA_t + \varepsilon_{it} \quad (6)$$

After empirical research, they concluded that the parameter estimates of the six-factor model for the variant portfolios using the IVGMM technique indicate that the human capital (LBR) plays as significant a role in pricing the variations in return predictability. They also declared that the six-factor model yields precede the previous FF n-factor models.

4. Application

Multi-factor models are often used in constructing the investment strategy. Cai conducted empirical research on a new stock investment strategy based on the Fama French five-factor pricing model [12]. The proposed stock investment strategy is mainly based on the excess return rate of stocks α to give corresponding assumptions for a long time, that is, with mean regression. According to French, if the stock return obtained after the influence of the model is removed, the excess return of the stock portfolio α In the long run should tend towards zero. Therefore, if the short-term excess return of a stock portfolio α If it is greater than 0, it means that the stock portfolio has provided a return rate higher than the theoretical value in the past period, or that the stock portfolio has been overvalued in the past period, with a premium, and it can be expected that the stock's future excess return rate will be higher α Should decline, investors should sell the stock portfolio to obtain returns. On the contrary, if a short-term excess return of stock portfolio α If it is less than 0, it means that the stock portfolio has been undervalued in the past period, and there is a discount. It can be expected that the excess return rate of the stock in the future α Should rise, investors should buy the stock portfolio to obtain returns. To prove the effectiveness of the strategy above, Cai selected relevant data from 2013 to 2020 and calculated the cumulative return rate and statistical characteristics of the strategies in the simulation. In order to show the impact of the selection of different risk factors on the strategy, Cai established the following seven sub-strategies: strategy a only performs regression fitting on market risk factor (RM - Rf) when modeling and obtains the corresponding excess return rate α . From strategy b to g, regression fitting was performed for SMB, HMI, RMW, CMA, (RM-Rf) and SMB and HMI, (RM-Rf) and SMB and HMI and CMA and RMW, respectively. Table 2 shows the income situation and related statistical characteristics:

Table 2. The profitability and related statistical characteristics of these 7 sub-strategies

	Turnover rate	Annual return	Cumulative return	The std of return	Maximum pullback	Sharpe ratio
Strategy a	9.91%	7.69%	61.52%	10.83%	28.72%	0.71
Strategy b	10.23%	8.49%	67.92%	8.41%	15.79%	1.01
Strategy c	9.83%	15.49%	123.92%	9.33%	27.31%	1.66
Strategy d	9.30%	15.36%	122.88%	10.52%	17.50%	1.46
Strategy e	11.02%	15.55%	124.40%	9.97%	16.14%	1.56
Strategy f	11.31%	9.59%	76.72%	8.41%	14.31%	1.14
Strategy g	10.13%	13.03%	104.24%	9.37%	17.20%	1.39

From the Table 2, it can be seen that in terms of annualized returns, all seven sub-strategies are positive. In terms of the Sharpe ratio, only strategy a is within 1, and others are above 1, which means that this strategy has shown high efficiency in the Chinese stock market in the past eight years, and can bring positive and stable investment returns to investors. The first five sub-strategies only used the single factor model, among which the three strategies c, d, and e performed better, with annualized returns above 15%, and the cumulative returns of the three strategies also exceeded 120% (calculated using simple interest), while the performance of strategies a and b was relatively worse. Furthermore, after the introduction of RMW and CMA, strategy g also performs better in the market than strategy f based on the three-factor pricing model, which means that related strategies can earn higher returns, so we take strategy g. Therefore, the results showed that this investment strategy can earn 13.03% of the annual rate of return for investors in the Chinese stock market from January 1, 2013, to December 31, 2020, and 104.24% of the cumulative rate of return. The standard deviation of the return is 9.37%. The maximum withdrawal that occurred during this period is 17.20%, and the Sharpe ratio of the investment strategy reaches 1.39. The data above reveals that this investment strategy in the Chinese stock market is highly effective, which means that investors can use the investment strategy of this model to obtain independent factors.

5. Asset Pricing Models: Pros and Cons

The CAPM model is a simple and user-friendly model that provides a straightforward and intuitive approach to measure asset risk and predict asset returns. The fundamental assumption of the CAPM model is that market risk is unavoidable, and investors are rewarded for bearing risk. This assumption allows the CAPM model to measure the systematic risk of investment portfolios. Another assumption of the CAPM model is that the market is efficient. This assumption enables the CAPM model to predict stock returns without considering company-specific factors. However, on the other hand, the effectiveness of the CAPM model relies on several unavoidable assumptions, such as the inevitability of market risk and market efficiency, which may not hold in real-life situations. As a result, the model may exhibit some biases in its predictions. The model assumes that diversification through constructing diversified portfolios can eliminate the impact of unsystematic risk. However, in reality, certain specific asset's unsystematic risk cannot be eliminated through portfolio construction. This limitation restricts the CAPM model's ability to accurately predict the returns of certain specific stocks in practical applications.

The FF-3 model extends the CAPM model by incorporating two additional factors. This inclusion allows for a more comprehensive consideration of factors when predicting stock returns. Unlike the CAPM model, which only considers systematic risk, the FF-3 model partially accounts for the influence of unsystematic risk on stock returns. Consequently, the FF-3 model offers a better explanation for variations in stock returns compared to the CAPM model. Empirical studies indicate that the FF-3 model performs particularly well in predicting stock returns for small market capitalization and low book-to-market ratio stocks. Additionally, the FF-3 model's advantage lies in the relatively smaller number of factors it incorporates, resulting in less computational complexity and resource requirements when calculating stock returns. However, similar to the CAPM model, the FF-3 model is based on assumptions of market efficiency and uniform investor information, which may not hold true in practical applications, thereby introducing potential biases in its predictions.

The FF-5 model builds upon the FF-3 model by introducing two additional factors: investment and profitability. The investment factor reflects the impact of a company's investment efficiency and capital expenditure on its stock returns, while the profitability factor captures the influence of a company's earnings on stock returns. The inclusion of these factors allows the FF-5 model to comprehensively consider multiple factors when predicting stock returns and provides a better explanation for variations in stock returns. Since stocks with high market capitalization and high book-to-market ratio typically exhibit higher unsystematic risk, the FF-5 model, with its consideration of more factors compared to the CAPM and FF-3 models, offers better control over these non-systematic factors. Empirical studies also demonstrate that the FF-5 model outperforms the FF-3 model in explaining variations in stock returns, particularly for stocks with high market capitalization and high book-to-market ratio. This indicates that the FF-5 model provides a more accurate prediction of stock returns by comprehensively considering the impact of multiple factors. However, similar to other asset pricing models, the FF-5 model relies on assumptions of market efficiency and uniform investor information, which may not hold in practice. Additionally, the FF-5 model's inclusion of more factors increases its computational complexity, requiring more time and computing resources. Therefore, the use of the FF-5 model may be constrained by computational limitations.

6. Limitations and Prospects

In the analysis of multi-factor models discussed above, these models have significant limitations. They are based on assumptions such as market efficiency and linear stock returns, which may introduce uncertainty and deviations from actual results in practical applications. Another limitation is the high data requirements for applying multi-factor models, as a large amount of market and company data is needed to calculate factor returns. If the data is incomplete or biased, it can impact the predictive results of the model. Lastly, there are limitations in terms of computational power.

Multi-factor models involve complex calculations to determine the expected returns for each stock based on the returns of each factor. The process requires significant computational resources and time.

In future research on pricing models, there are several perspectives to consider. On one hand, exploring additional factors to include in the models can lead to more comprehensive consideration of factors and enhance the reliability of predictions. On the other hand, since many fundamental assumptions of multi-factor models may not hold true in practical applications, it is necessary to challenge and study these assumptions to ensure better real-world applicability of the models. For instance, the assumption of linear stock returns in multi-factor models may not hold in reality, making research on non-linear models crucial in improving the accuracy of return predictions. Non-linear models can better capture non-linear relationships that may exist in stock returns, aligning the models more closely with actual market behavior and enhancing the accuracy of return predictions. Additionally, given that stock returns may be influenced by the interaction of multiple factors, non-linear models can better handle these interactions and improve prediction accuracy compared to the linear combination of multiple factors used in traditional multi-factor models. Addressing a range of non-linear issues in return prediction, non-linear models may become a future direction for asset pricing model development.

Furthermore, studying the application of asset pricing models to price fluctuations of various assets is important. Currently, asset pricing models are primarily used to explain variations in stock returns. However, asset price fluctuations are much broader and receive more attention. Therefore, improving models to explain asset price fluctuations and their wider application in real-world markets can be an area of focus. Additionally, future research can explore how to apply asset pricing models to other types of assets such as bonds, foreign exchange, and more, to explain the fluctuations in their prices.

Lastly, studying irrational factors is another important aspect to consider. Past asset pricing models have been based on rational investment assumptions, but irrational factors are also crucial in real-life scenarios. Future asset pricing models can place greater emphasis on the analysis and research of irrational factors, thus playing a more significant role in practical applications.

7. Conclusion

To sum up, the construction of any theory is logical deduction and operation based on certain assumptions. However, assumptions are often limited, and reality is complex. Therefore, all theories are difficult to avoid with distortion and one-sidedness. The same is true for financial models. All financial models are essentially mathematical calculations, which is both their advantage and its disadvantage. The reason why this is an advantage is that it can provide an empirical basis, provide strong support for conclusions, and improve the scientific degree of theory. Mathematical calculations are the basis of financial models, which give financial theories and models a certain rigor and precision. Through mathematical calculations, we can establish a rigorous logical framework to systematically analyze and predict financial phenomena. Mathematical models can help us quantify and measure various variables and factors in a complex financial environment, providing reliable numerical results and empirical foundations. Such empirical support helps to improve the scientific and reliability of financial theory and provide a basis for decision-making. The reason why this is a flaw is because of the absolute dependence on mathematics, ignoring the uncertainty factor in reality. Financial markets and financial behavior are subject to many non-linearities, uncertainties, and human touches. Human decision-making behavior is often driven by emotional, psychological, and social factors that are difficult to incorporate into mathematical models. For those factors that cannot be quantified and accurately modeled, financial models may not fully capture the dynamic nature of real-world markets.

In conclusion, from CAPM to the five-factor model and its various derivative models, these modern financial models all try to explain and grasp the general rules in the financial market (which is indeed the meaning of their existence though), and their frameworks are established on the basis of certain assumptions and mathematical models, which greatly promotes the explanatory power to

reality and enhances the credibility of theory. But on the other hand, it completely jumps away from the traditional behaviorist perspective of interpretation. In order to get a more accurate financing model, scholars rely too much on the application of mathematics, ignoring some phenomena that cannot be reflected by mathematics in the financial market. These models will easily fail when encountering special cases such as nonlinear relationships, information asymmetry, and market friction. Therefore, to construct a more accurate theory, how to fully consider the complexity and special conditions of the real market will be a new research direction. In fact, there is a tendency to combine quantitative numerical analysis with abstract behavioral analysis. For example, the impact analysis of investors' emotional factors on market investment and stock returns, etc., but it is still mainly based on quantitative analysis, that is, the abstract and ambiguous behavior is transformed into numbers for analysis. To get closer to the essence of the financial market, returning to the original "tradition" may be a new scientific way to improve financing models.

8. Author Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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