

Construction and Optimization of Pricing Models and Algorithms for Listed Enterprises on the Science and Technology Innovation Board

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Abstract: As an emerging sector of China's capital market, the Science and Technology Innovation Board specialize in serving high-tech and innovative enterprises. However, the existing stock issuance pricing system on the Science and Technology Innovation Board has some adaptability, and new pricing models and algorithms need to be studied to better meet the needs of listed companies on the Science and Technology Innovation Board. Future research should focus on building pricing models and algorithms suitable for the Science and Technology Innovation Board, taking into account the characteristics of enterprises on the board, such as technological innovation capabilities, business models, technological barriers, etc. This helps to more accurately evaluate the value of enterprises and estimate reasonable issuance prices. At the same time, the issuance pricing mechanism has been optimized, and market-oriented pricing methods have been introduced, such as auctions and bidding, to improve market efficiency and liquidity, and meet the financing needs of different types of companies. The experimental results showed that the three-year net profit of stock companies using the traditional model algorithm has increased from 250 million yuan to 310 million yuan, while stock companies using the Sci Tech Innovation pricing model algorithm have increased from 250 million yuan to 520 million yuan. Financial company C using the traditional model algorithm has increased its three-year net profit from 350 million yuan to 470 million yuan, while financial companies using the Sci Tech Innovation pricing model algorithm have increased their net profit from 350 million yuan to 730 million yuan. From this, it can be seen that the research on pricing models and algorithms for listed companies on the Science and Technology Innovation Board can play an important role in the future, promoting the prosperity and sustainable development of the Science and Technology Innovation Board market.

1. Introduction

As a pioneer of reform, the Science and Technology Innovation Board bears the important mission of promoting a comprehensive registration system, aiming to lead industrial innovation and

break through core technologies, thereby comprehensively improving the high-quality development level of the capital market [1]. In recent years, with the continuous development of the market economy, more and more large companies have successively gone public [2]. Among them, R&D investment in science and technology innovation board enterprises at different stages of development has a certain effect on the growth of enterprises [3]. Therefore, the development of academic entrepreneurial enterprises for listed companies on the Science and Technology Innovation Board has attracted widespread attention [4]. As a major measure of capital market reform, the Science and Technology Innovation Board has significant implications for economic development from its decision to establish, to institutional design, and now to its orderly promotion. However, for the current data pricing model and pricing indicator system of large enterprises, further research can be attempted through algorithm optimization. Mathematical algorithms have many advantages in this scenario [5]. This study focuses on the construction and optimization of pricing models and algorithms for listed companies on the Science and Technology Innovation Board.

Through the analysis of scholars, it can be seen that the Science and Technology Innovation Board plays an important role in the reform of the capital market and has an impact on the growth of enterprises. Further research can contribute to promoting industrial innovation and market economy development.

2. Current Situation and Problems of Stock Issuance Pricing System

2.1. Basic Concepts and Principles of Stock Issuance Pricing System

There is a problem of stock premium in stock markets of various countries [6]. However, the pricing system for stock issuance is a crucial part of the stock market. In the process of stock issuance, the issuer needs to reasonably determine the issuance price of the stock to attract investors' participation and ensure the efficiency and fairness of the company's financing. The determination of issuance price involves multiple factors and principles, including market supply and demand relationship, company valuation, market comparison, and issuance cost profit. Through a scientifically rigorous pricing system, the fairness, effectiveness, and sustainability of stock issuance can be ensured. The Science and Technology Innovation Board holds an important position in the capital market.

The stock pricing system is shown in Figure 1.

In the process of economic globalization, more and more investors are entering the financial industry, among which stock investment is receiving more and more attention from the public. Predicting stock trends has attracted the attention of many investors [7], and the stock pricing system is a key link in the stock market. Through the analysis in Figure 1, it can be seen that when determining the stock issuance price, factors such as company valuation, market supply and demand relationship, market comparison, issuance costs, and expected profits need to be considered. By scientifically and reasonably determining the issuance price, the fairness and effectiveness of stock issuance can be ensured, providing a good market environment for company financing.



Figure 1: Stock Issuance Pricing System

2.2. Inadaptability of the Existing Stock Issuance Pricing System on the Science and Technology Innovation Board

In recent years, the stock market has been a major area where financial risks have become prominent [8]. However, with the establishment and development of the China Science and Technology Innovation Board, in order to meet the special needs of high-tech enterprises, the stock issuance pricing system also needs to be adjusted and improved accordingly. The overall efficiency of the stock market not only directly affects the development of the stock market, but also determines the specific construction and development of the stock market [9].

The arrival of the Science and Technology Innovation Board has opened a new window for the capitalization of small and medium-sized enterprises. However, the current stock issuance pricing system on the Science and Technology Innovation Board has some adaptability and needs to solve some challenges and problems.

The current stock issuance pricing system has some adaptability on the Science and Technology Innovation Board, mainly manifested in the following aspects (as shown in Figure 2):

Pricing Range Restrictions: The Science and Technology Innovation Board has set strict restrictions on the issuance pricing range, requiring the issuance price not to exceed the upper limit of the pricing range. This may limit the flexibility of issuers in pricing, making it difficult to fully reflect market demand and investor expectations.

The market is relatively difficult: Enterprises on the science and technology innovation board often belong to high-tech and high growth industries, which have significant differences from traditional industries. Therefore, it is difficult for issuers to find similar companies for market comparison when determining the issuance price, which may lead to inaccurate pricing [10].

The supply and demand relationship in the market is unstable: Enterprises on the Science and Technology Innovation Board often have high growth potential and investment value, thus attracting a large number of investors' attention and participation. This may lead to instability in the market supply and demand relationship, causing significant fluctuations in the issuance price and making it difficult to determine an appropriate pricing. Enterprises can promote consumption upgrading by improving the market supply and demand relationship, which is of great significance for optimizing industrial structure and promoting rapid and healthy economic growth [11].

Insufficient pricing ability of issuers: Enterprises on the Sci Tech Innovation Board are often emerging high-tech enterprises, and for issuers, they may lack sufficient experience and ability to accurately evaluate the value of the enterprise and market demand, leading to unreasonable pricing.

In summary, the current stock issuance pricing system on the Science and Technology Innovation Board is not adaptable and needs further improvement and adjustment to better meet the special needs and market characteristics of enterprises on the board.

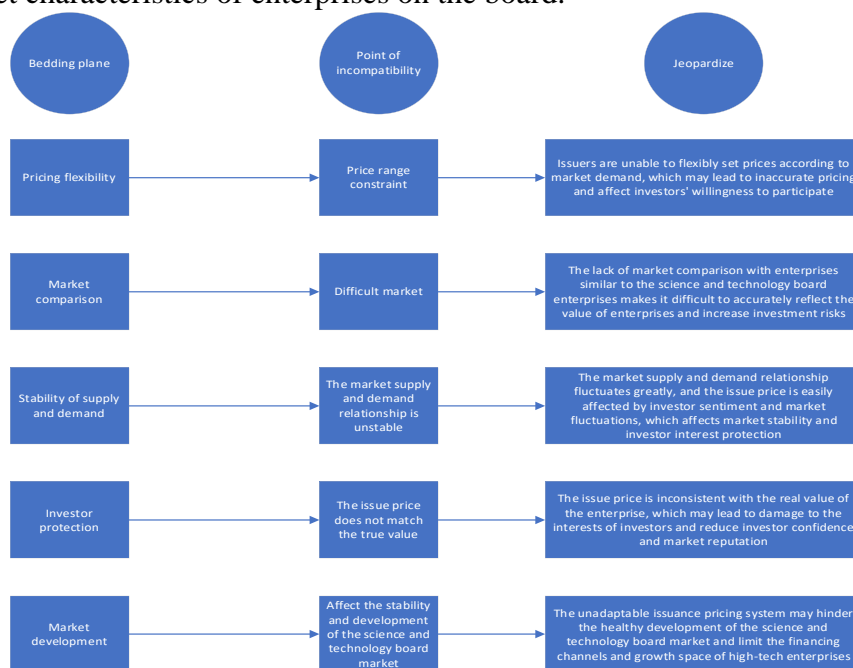


Figure 2: Inadaptability of Stock Issuance Pricing System

By addressing the issues caused by the non-adaptation points in Figure 2, the pricing system for the issuance of the Science and Technology Innovation Board can better adapt to the special needs and market characteristics of high-tech enterprises, improve market efficiency and investor protection level, and promote the stability and prosperity of the Science and Technology Innovation Board market.

3. Method and Technique Construction of Pricing Model for Science and Technology Innovation Board

3.1. Building a Pricing Model and Optimization

After the official opening of the ChiNext market, its listing rules have innovatively formulated many new mechanisms in terms of market access system, trading system, and other aspects. The equity incentive system has also made some groundbreaking breakthroughs in terms of incentive methods, total incentive amounts, incentive targets, and grant prices. Looking at the listed companies that have implemented equity incentives on the Science and Technology Innovation Board [12]. With the launch of the Science and Technology Innovation Board, technology innovation enterprises have been able to more conveniently obtain financing support from the capital market, especially stock companies. However, pricing for such enterprises remains a challenging issue. Science and technology innovation board enterprises usually have the characteristics of high growth, high risk, and high innovation, and traditional pricing models are difficult to fully apply. Therefore, in order to more accurately evaluate the value of these enterprises, it is crucial to construct a suitable pricing model.

Enterprises listed on the ChiNext board have the characteristic of strong innovation [13]. Based on the characteristics of enterprises on the Science and Technology Innovation Board, it can be considered to construct suitable pricing models to more accurately evaluate the value of these

high-tech enterprises. Here are some possible ideas for constructing pricing models:

Growth pricing model:

Science and technology innovation board enterprises usually have high growth and innovation, and traditional pricing models are difficult to accurately reflect their characteristics. Therefore, it is possible to consider constructing a pricing model based on the company's future growth expectations. This model may include considering factors such as enterprise innovation capability, market size, and industry growth rate.

Relative valuation model:

Science and technology innovation board companies may lack comparable listed companies for pricing comparison. Therefore, it is possible to attempt to construct a relative valuation model based on industry benchmarks or market average indicators. This model can determine the reasonable pricing level by comparing the relevant indicators of enterprises (such as P/E ratio, Price–sales ratio, etc.) with the industry average level or indicators of similar enterprises.

Physical assets and knowledge capital models:

The value of science and technology innovation board enterprises may rely more on knowledge capital and innovation capabilities than traditional physical assets. Therefore, it is possible to consider constructing a pricing model based on knowledge capital, incorporating the enterprise's knowledge capital (such as patents, technology, brands, etc.) into pricing factors.

Risk adjusted model:

Science and technology innovation board enterprises usually face high uncertainty and risks, especially in the field of innovation. Therefore, it can be considered to introduce a risk adjusted pricing model to take risk factors into consideration by embedding the concepts of Risk factor and expected rate of return.

The multi-objective optimization algorithm is an effective way to solve high-dimensional multi-objective optimization problems [14], and the optimized pricing models should consider the unique risks and growth characteristics of science and technology innovation board enterprises to more accurately evaluate their value. In practical application, it is necessary to select an appropriate pricing model according to the specific situation of the enterprise and the availability of data, and make continuous adjustment and improvement in combination with the response and feedback of the market.

The steps analyzed above constitute Figure 3.

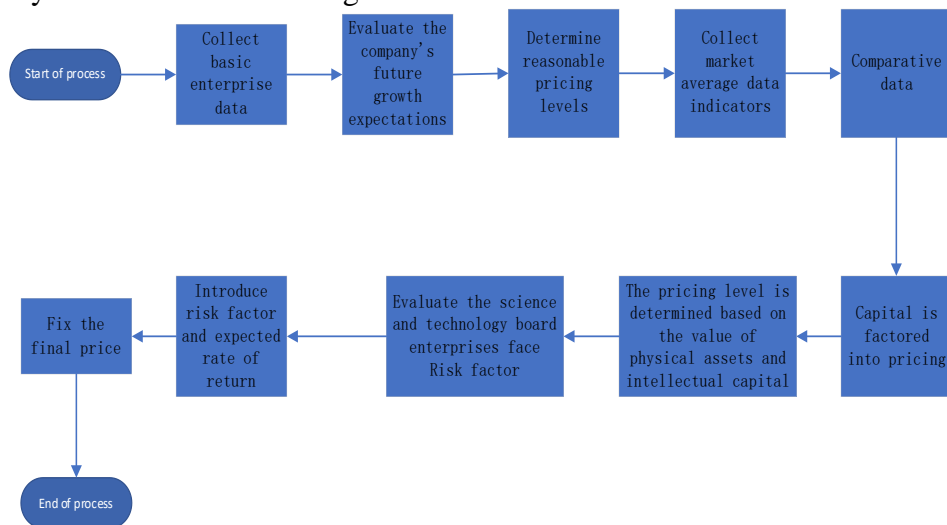


Figure 3: Pricing Model Flowchart

After in-depth research on mathematical algorithms, it can be found that they are a very rigorous and precise calculation method, playing an irreplaceable role [15]. The role of the pricing model process is to provide accurate, scientific, and objective pricing methods for science and technology innovation board enterprises. Through data collection, analysis, and evaluation, it helps enterprises determine a reasonable pricing level. Its advantage lies in its ability to reflect the characteristics of the enterprise, solve difficulties, consider risk factors, provide quantitative basis and decision-making guidance, enable the enterprise to more accurately evaluate the value of the enterprise, avoid subjective judgments and arbitrary decisions, and achieve long-term development and growth goals.

3.2. Optimization and Release Process of Model Parameters

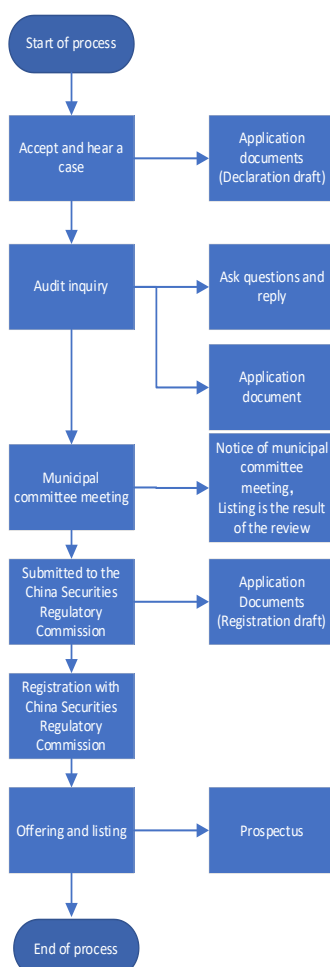


Figure 4: Review and Acceptance Process of Data Issuance for Enterprises on the Science and Technology Innovation Board

Optimization algorithms play an important role in today's society [16], and the method of determining the pricing model parameters of the Science and Technology Innovation Board is helpful for the reasonable valuation and investment decision-making of enterprises on the Science and Technology Innovation Board. Common methods include relative valuation, growth pricing models, and risk adjusted models. The relative valuation method determines the valuation of science and technology innovation board enterprises by comparing their valuation levels with other enterprises in the same industry. The growth pricing model focuses on considering the impact of a

company's growth and future expected returns. By analyzing factors such as the company's profitability, market size, and competitive advantage, it estimates the company's future revenue growth rate and calculates a reasonable valuation. The risk adjustment model mainly considers the impact of the risk factors faced by enterprises on the valuation. By estimating the weight of different Risk factor, and combining the expected return rate of the market, the valuation of science and technology innovation board enterprises is determined. These methods can be combined to comprehensively consider the characteristics of the enterprise, market conditions, and data reliability, providing accurate and reliable valuation and investment recommendations for science and technology innovation board enterprises, as shown in Figure 4.

4. Pricing Model Formula and Experiment for Listed Enterprises on the Science and Technology Innovation Board

4.1. Formula

Relative valuation method formula:

Formula (1) is a method used to determine the pricing of science and technology innovation board enterprises. The formula obtains a relatively reasonable pricing by multiplying the profitability indicators of the science and technology innovation board enterprises by the average P/E ratio of their respective industries. Profitability indicators can be net profit, market value, etc. Formula (1) is based on the industry average P/E ratio, comparing the profitability of the enterprise with the entire industry, and ultimately determining the reasonable level of pricing.

$$P = RM \times EP \quad (1)$$

In Formula (1), P represents pricing, RM represents average P/E ratio, and EP represents profitability indicator.

Growth pricing model formula:

Formula (2) is a pricing method based on the future growth potential of the enterprise. The formula predicts future cash flows and adjusts them using a discount rate. Predicting future cash flow is a prediction of a company's cash flow for a period of time in the future. The discount rate is the discount requirement of investors for future cash flow, and the final predicted future growth rate refers to the expected future growth rate of the company. This method determines the value of the enterprise by discounting future cash flows.

$$P = FEP \times (1 / (DR - EG)) \quad (2)$$

In Formula (2), P represents pricing, FEP represents expected future returns, DR represents discount rate, and EG represents expected future growth rate.

4.2. Traditional Valuation Pricing Model and Sci Tech Innovation Board Pricing Model Algorithm Experiment

In order to test the pricing model and algorithm for listed companies on the Science and Technology Innovation Board, the value of the enterprise is evaluated and reasonable pricing is determined.

Selection of experimental subjects:

Four companies listed on the Science and Technology Innovation Board were selected as experimental subjects. A is a stock related enterprise that uses traditional pricing models and algorithms, and B is a stock related enterprise that uses the pricing model and algorithms of the Science and Technology Innovation Board. C refers to financial enterprises that use traditional

pricing model algorithms, and D refers to financial enterprises that use the Science and Technology Innovation Board pricing model and algorithms, ensuring that the enterprise has sufficient financial data for analysis and evaluation. The experimental period is 3 years. The experimental data is shown in Figure 5.

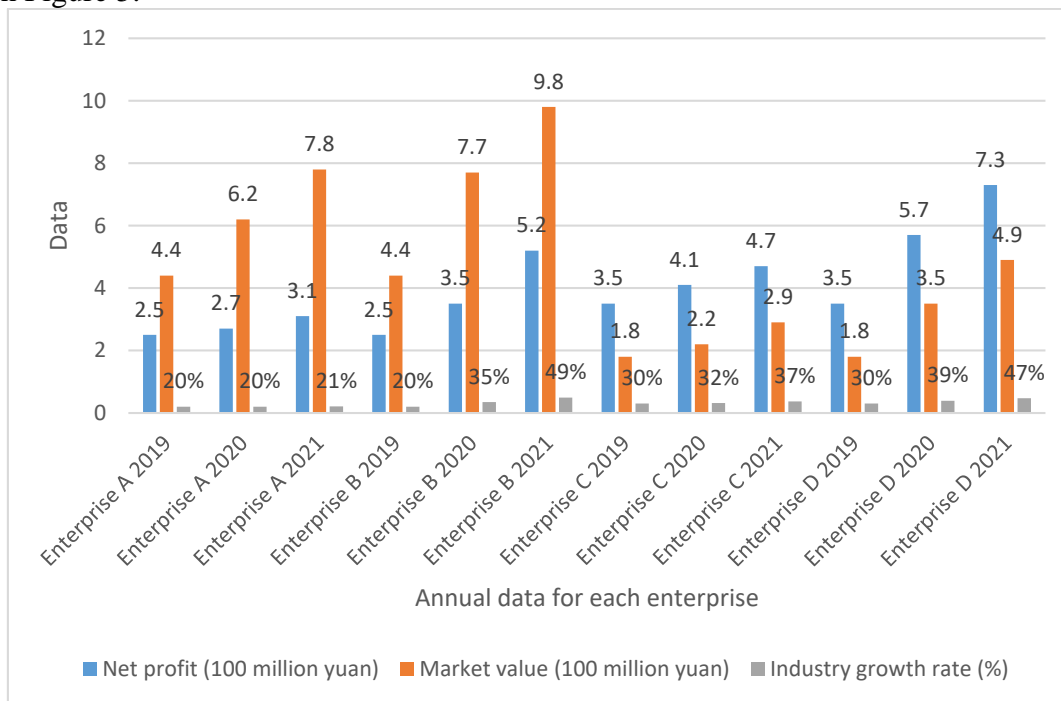


Figure 5: Comparison of Experimental Data between Two Methods

According to the data analysis in Figure 5, it can be seen that the net profit of Enterprise A increased from 250 million to 310 million in three years, Enterprise B increased from 2.5 to 5.2 million, Enterprise C increased from 350 million to 470 million in three years, and Enterprise D increased from 350 million to 730 million. The market value and industry growth rate of Enterprise B and Enterprise D have also increased significantly compared to Enterprise A and Enterprise C. From this, it can be seen that the improvement of pricing models and algorithms for listed companies on the Science and Technology Innovation Board is much greater than that of traditional algorithms.

5. Conclusions

The construction and optimization of pricing models and algorithms for listed companies on the Science and Technology Innovation Board is an important field. Currently, common pricing methods include relative valuation and growth pricing models. By using a growth pricing model to predict the growth potential and profitability of a company by considering future cash flows and discount rates, reasonable pricing can be determined. This method can address the characteristics of science and technology innovation board enterprises, but it requires accurate prediction of future cash flows and the selection of appropriate discount rates, which requires high accuracy and sensitivity of data. Future research can focus on improving data quality and reliability, especially for financial data of science and technology innovation board enterprises, improving data acquisition and processing methods, and ensuring the accuracy and reliability of input data for pricing models. By constantly adjusting and optimizing pricing models in conjunction with changes in the market environment, this paper aimed to adapt to the emergence of more innovative enterprises in the

science and technology innovation board market. The construction and optimization of pricing models and algorithms for listed companies on the Science and Technology Innovation Board is important and challenging. Future research can be conducted in areas such as data quality, model improvement, market environment changes, new technology applications, and empirical research, providing more accurate and reliable methods and tools for the value evaluation and pricing of enterprises listed on the Science and Technology Innovation Board.

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