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Valuation Analysis of Chinese Game Enterprises Based on Improved DEVA Model: Taking Panax Notoginseng Mutual Entertainment as an Example

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Abstract: With the rapid development of the Chinese gaming market, valuation analysis of gaming companies has become a focus of attention for investors and the industry. This study takes Seven Seas Interactive Entertainment as an example and conducts valuation analysis of Chinese gaming companies based on the improved DEVA model. First, the research background and objectives are introduced, emphasizing the importance and innovation of the study. Secondly, the basic principles and limitations of the DEVA model are briefly introduced, and a method for constructing the improved DEVA model is proposed. Then, an overview of the development status and characteristics of Chinese gaming companies, as well as the development overview of Seven Seas Interactive Entertainment, is outlined. Subsequently, by analyzing the financial data of Seven Seas Interactive Entertainment, the parameters of the improved DEVA model are set and valuation calculations are carried out. The results of the valuation are analyzed and compared with the traditional DEVA model through empirical testing. Finally, the main achievements of the study are summarized, and future research directions are discussed. This study expands the methods and research perspectives for valuing Chinese gaming companies, providing reference basis for investment decision-making.

Keywords: DEVA Model, Chinese Gaming Companies, Valuation Analysis

1. Introduction

In recent years, China's game industry has become one of the world's largest markets. With the continuous progress of Internet technology and the changing needs of users, the valuation analysis of game enterprises has become particularly important. However, there are still relatively few valuation studies on Chinese game companies, and the existing valuation models have some limitations in applicability and accuracy. In order to solve this problem, this study selected the Chinese game enterprise Sanqi mutual Entertainment Network Technology Group Co., Ltd. as a case, through the in-depth study of the company's business model and competitive advantage, aiming to build an improved DEVA model suitable for Chinese game enterprises, and apply it to the company's valuation analysis.

In terms of research methods, this paper will introduce the principle and calculation method of DEVA model. DEVA model mainly includes market value, enterprise scale, revenue growth rate,

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profitability and other indicators. By calculating the weighted average value of these indicators, the enterprise valuation is obtained. Referring to the existing DEVA model, and combining the core value factors and value characteristics of Internet enterprises, it is improved and revised. By comparing and analyzing the valuation results and market value of Panax notoginseng mutual entertainment, this paper verifies the practical significance and accuracy of the improved DEVA model for the valuation of game enterprises.

The significance of this study is to provide some reference for the valuation analysis of Chinese game enterprises. By constructing the improved DEVA model, this paper can more accurately evaluate the value of game enterprises, and provide scientific decision-making basis for investors and decision-makers. In short, this study will build an improved DEVA model through the case study of Panax notoginseng mutual entertainment, and verify its applicability and practical significance in the valuation of Chinese game enterprises. This study will provide a useful reference for the valuation analysis of Chinese game enterprises and promote the development and innovation of the game industry.

2. Literature Review

First of all, in the domestic research, most scholars have analyzed and commented on the theoretical framework of valuation methods of listed game companies. From different perspectives, they discussed the application of this method in risk assessment and product cycle research, and also put forward some suggestions for improvement and optimization. For example, through the case analysis method, the combination of qualitative and quantitative methods and the comparative analysis method, evaluates the Internet game enterprises, and points out that if only the free cash flow discount method is used to evaluate the enterprise value of the perfect world, the value will be underestimated [1]. This paper puts forward a new idea for the valuation method - using the real option method to evaluate the potential value of the perfect world, which provides ideas for valuation research.

Secondly, some researchers also verify the accuracy and stability of the improved valuation methods for listed companies in the game industry through case studies and empirical analysis. They selected some representative enterprises or projects for research, and conducted detailed data analysis and model building. For example, some scholars analyze the unavailability of traditional valuation models [2]. Then it studies the value characteristics of Internet enterprises and explores the core influencing factors of Internet enterprise value. Combined with the core influencing factors of Internet enterprise value - user resources and industry status, this paper introduces the DEVA model which came into being in the Internet wave. First, it shows that reasonable evaluation methods are increasingly important for the value evaluation of Internet enterprises. Second, it is also evaluated based on the DEVA model, and the deviation rate of the evaluation results is no more than 2%, which effectively verifies the effectiveness of the improved DEVA model, and has reference value for the objective, effective and accurate evaluation of the value of Internet enterprises.

In addition, some foreign scholars have discussed the valuation methods from the perspective of market development and put forward some strategic suggestions for the development of enterprises [3]. For example, the analysis of enterprise value in "lessons smoothness, average returns, and implied cost of equity capital" puts forward three different levels of analysis, which provides a reference for the selection of parameters in this paper, and puts forward suggestions and requirements for the accuracy of investment valuation and enterprises' attention to business reputation, indicating the importance of more reasonable valuation methods for guiding investment.

To sum up, the research on valuation methods of listed game companies by researchers at home and abroad shows diversity and universality. They discussed the application and optimization direction of this method in the Chinese market from the perspective of theoretical analysis, empirical research and market development. These research results provide important reference and guidance

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for the in-depth study on improving the valuation methods of China's Unlisted game companies, taking MIHA game company as an example. However, further research and practice are also needed to further improve and optimize the application effect of this method.

3. Methodology

DEVA valuation model is based on user value theory. Users are the core factor of game enterprise value, so it is more suitable for the valuation of game companies.

The formula is as follows:

$$Ve = M * C^2 \quad (1)$$

The valuation role of DEVA model in the Internet industry has been proved, but it also has defects. The uncertainty of the game market and the increasing competition still pose certain risks to the accuracy of market share prediction. Relevant parameters need to be carefully selected and comprehensively analyzed in combination with other methods and indicators.

The DEVA model relies on past user data in the valuation process. As a result, historical data may not accurately reflect the current valuation of the enterprise. At the same time, the DEVA model takes less consideration of non-financial factors. In the valuation of game enterprises, in addition to financial indicators, there are also many non-financial factors that affect the value of enterprises, such as technological innovation ability. The DEVA model does not fully consider these non-financial factors, which may lead to the inaccuracy of enterprise valuation [4]. It is necessary to modify the DEVA model and introduce appropriate non-financial factors. These limitations should be fully recognized and considered to improve the accuracy and scientificity of the valuation results.

In view of the limitations of the above-mentioned DEVA model, this paper proposes an improved construction method of DEVA model:

(1) Initial invested capital of unit M

Take the registered capital of the company as the initial invested capital and the cumulative number of users when the company is listed as the base, that is, m=registered capital of the company/cumulative number of users.

(2) Introduction of market share

The game industry is very similar to Internet enterprises, both of which are oriented by products and target users, and have a strong Matthew effect [5]. China's game industry has a high degree of capital concentration, with Cr4 generally above 85% in recent years [6]. Based on this special industry factor, this paper adds the variable of market share in the process of value evaluation. In the formula, P represents the market share, and the formula is:

$$Ve = M * P * C^2 \quad (2)$$

(3) Measuring and correcting user value

The original DEVA model did not effectively define the user value. The main way for Chinese game companies to make profits is to pay for services in free game products, and only some active players are the main consumer groups. The average monthly active user (MAU) is introduced to determine the number of core users of the company, and the user value is measured by the average revenue per user (ARPU). The calculation method of ARPU is:

ARPU=total revenue per unit time/number of target users per unit time;

Then this paper introduces the unit customer acquisition cost (CAC) to obtain more accurate user value by subtracting the additional cost brought by acquiring users. CAC is calculated as follows:

CAC=sales expense/number of new users;

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Then the formula becomes:

$$Ve = M * P * [MAU * (ARPU - CAC)]^2 \quad (3)$$

(4) Add proportion of scientific research investment

Game companies are still product-oriented. Game products are directly related to R&D investment. The proportion of R&D investment of enterprises (I) is added to the model as an important indicator of the competitiveness of game products of the company and an indicator of the ability of enterprises to attract users.

The final model formula is:

$$Ve = M * P^2 * (1+I)*[MAU * (ARPU - CAC)]^2 \quad (4)$$

4. Empirical Results based on Panax Notoginseng Mutual Entertainment

Panax notoginseng mutual entertainment is a highly concerned enterprise in China's game industry. It was founded in 1995 and listed in 2011. Since its establishment, Panax notoginseng mutual entertainment has achieved rapid and stable development with its unique strategic planning and innovation ability. In the past few years, Panax notoginseng interactive entertainment has not only occupied a place in the domestic market, but also actively explored overseas markets and become a leader in Chinese game enterprises.

Panax notoginseng mutual entertainment focuses on independent R&D and innovation. Since its establishment, the company has been committed to independently developing high-quality game products without relying on external authorization to ensure the stability and controllability of game quality. Panax notoginseng entertainment also attaches great importance to product innovation and often introduces new playing methods and game mechanisms to meet the changing needs of players. This ability of independent R&D and innovation makes Sanqi mutual entertainment stand out in the highly competitive game industry.

Sanqi mutual entertainment has rich experience in game development and operation. Through years of accumulation, Panax notoginseng entertainment has established an efficient and professional R&D team with rich experience in game development and technical strength. The company also pays attention to game operation, combines R&D with operation, and continuously optimizes the user experience and profit effect of the game through accurate data analysis and market insight. This dual advantage of R&D and operation provides a strong support for the development of Panax notoginseng mutual entertainment.

Sanqi mutual entertainment also actively carries out the internationalization strategy and expands the overseas market. The company has arranged overseas markets in advance, not only promoting game products to overseas markets, but also actively seeking international partners to achieve transnational cooperation. Through open cooperation and resource integration, Panax notoginseng mutual entertainment has made remarkable achievements in the overseas market, further consolidating its position in the game industry.

In summary, as one of the representatives of Chinese game enterprises, Panax notoginseng mutual entertainment has made remarkable achievements in China's game industry by virtue of its independent R&D and innovation capabilities, rich R&D and operation experience, and actively carried out internationalization strategy. In the future, it has reason to believe that Panax notoginseng mutual entertainment will continue to uphold the spirit of innovation, continue to introduce more high-quality game products, and make greater contributions to the development of China's game industry.

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The improved model takes the user value as the core to estimate the enterprise value, but there are differences between different enterprises in many aspects. In particular, the traditional enterprises generally calculate the enterprise value based on the financial data. Not all enterprises are guided by users and products to bring benefits to enterprises, so the user value also has its scope of application.

First of all, it is applicable to the game industry and game enterprises. A large number of game companies are generally asset light enterprises, and it is difficult to effectively estimate the value of enterprises using these financial data. The improved model is based on the characteristics of the game industry, adding parameters such as market share and customer acquisition cost, which is suitable for game enterprises and has certain application value. At the same time, DEVA model itself evaluates the value of game enterprises from the user value and combined with the initial cost, which has few parameters and is easy to use. However, its deficiency is that the definition of the relationship between users and enterprise value is unreasonable, and the parameters are too simple, which will make the valuation results unstable. Secondly, the improved model requires game companies to have a certain market share. The original model is more suitable for start-up enterprises. All user base water can bring value to enterprises, but for most game enterprises, this theory is obviously not suitable for the actual situation. In a word, in the game industry where Matthew effect is constantly strengthening, for the improved DEVA model adopted in this paper, enterprises need to have a certain market share in order to get a more reasonable enterprise valuation.

In this section, this paper will calculate the valuation of Panax notoginseng mutual entertainment by improving the DEVA model, and evaluate the value of the company by combining financial data and market information (see Table 1). Based on the improved DEVA model, this paper sets the parameters for the specific situation of Panax notoginseng mutual entertainment to ensure that the calculation results are more accurate and reliable (see Table 2).

Table 1: Various financial data of Panax notoginseng Entertainment.

Time	2019	2020	2021	2022
Total operating income (RMB 100 million)	132.27	144	162.16	164.06
Total operating cost (RMB 100 million)	105.87	114.69	132.87	131.7
Sales expenses (RMB 100 million)	77.37	82.13	91.25	87.33
R&D expenses(RMB 100 million)	8.2	11.13	12.5	9.05
MAU(100 million people)	0.34	0.64	0.55	0.43
New registered user (100 million people)	2.66	3.84	3.06	3
market share	10.01%	10.50%	8.1%	7.2%

The registered capital of Sanqi mutual entertainment is 22178642810 yuan, about 2.219 billion yuan. According to the company's prospectus, Sanqi mutual entertainment has a total of 650 million active users before listing. Through formula (1-4) calculation, it is concluded that: V2019=55.142 billion yuan; V2020=700.36; V2021=518.48; and V2022=433.86. This paper will make a detailed analysis and interpretation of the results of the estimation of Panax notoginseng mutual entertainment based on the improved DEVA model.

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Table 2: The results of Panax notoginseng mutual entertainment based on the improved DEVA model.

Time	Valuation of modified DEVA model	Market value at the end of the year	Deviation
2019	551.42	568.83	3.06%
2020	700.36	659.66	6.17%
2021	518.48	582.63	11.01%
2022	433.86	401.43	8.08%

This paper compared the valuation results of the improved DEVA model with the real market value at the end of the year (December 31), and finally concluded that the deviation rate between most of the data and the real value fluctuated around 5%, basically in line with the user centered valuation method [7]. However, the data deviation in 2020 reached more than 10%, indicating that there are still variables in the model that are not accurate enough to evaluate the value or factors that cannot be better measured for the enterprise value, For example, the cycle of many game companies' products and the trend of game users' willingness to pay will also affect the profitability and revenue level of game companies.

It should be pointed out that the accuracy of valuation results is affected by many factors, including market fluctuations, industry changes and the accuracy of data. Therefore, when using the valuation results for investment and decision-making, it is necessary to comprehensively consider other information and risk assessment.

5. Robustness Testing

In the valuation analysis of Chinese game enterprises, DEVA model is a commonly used evaluation method. DEVA model is mainly based on financial indicators to evaluate the value of enterprises, including stock price, profitability, market potential and other indicators. In this chapter, this paper will first use the traditional DEVA model to estimate the value of Panax notoginseng mutual entertainment, and reveal the value of the enterprise by analyzing the financial data and market conditions.

This paper will evaluate the value of Panax notoginseng entertainment from the perspective of stock price. The stock price is an important indicator to reflect the market's recognition of the value of enterprises. By analyzing the stock price trend of Panax notoginseng mutual entertainment, this paper can understand the investment attitude and expectation of the market for the enterprise. It is also necessary to comprehensively evaluate the value of stocks in combination with the overall market situation and other relevant factors.

This paper will focus on the profitability of Panax notoginseng mutual entertainment. This includes the net profit, return on net assets, profit growth rate and other indicators of the enterprise. By comparing the data of Sanqi mutual entertainment with that of enterprises in the same industry, this paper can evaluate the relative advantages and disadvantages of the enterprise in terms of profitability, and further analyze its future profit potential. It is also necessary to investigate the financial health and profit stability of the enterprise to ensure the accuracy and reliability of the assessment [8].

Market potential is also one of the important aspects of valuation analysis. For game enterprises, the market potential is directly related to their future development prospects and growth space. When valuing Sanqi mutual entertainment, this paper will examine its product line, market share, competitive advantage and other factors to assess its market potential and sustainability.

Therefore, the traditional DEVA model can quantify and evaluate the valuation of Panax notoginseng mutual entertainment by comprehensively analyzing the indicators of stock price, profitability and market potential. However, the traditional DEVA model also has some limitations in practice, such as limited applicability for specific industries and companies, and ignoring the

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impact of non-financial factors. Next, this paper will introduce the improved DEVA model and compare it with the traditional DEVA model, in order to further improve the accuracy and reliability of the valuation.

This section aims to verify the valuation results based on the improved DEVA model through empirical test. In order to empirically test the valuation of Panax notoginseng mutual entertainment, this paper selected a series of financial indicators and market data for analysis.

This paper evaluated the profitability of Sanqi mutual entertainment. By analyzing its income statement and cash flow statement, this paper calculated key financial indicators, such as net profit rate, return on assets and return on operating cash flow [9]. The results show that the profitability of Panax notoginseng mutual entertainment is relatively high, indicating that the company has strong competitiveness in the game industry.

This paper studied the growth potential of mutual entertainment of Panax notoginseng. By analyzing the growth trend of its revenue and profit, this paper evaluated the growth rate and stability of the company [10]. This paper also considered the development trend of the industry and changes in market demand to more accurately assess the growth potential of Panax notoginseng mutual entertainment. The results show that Panax notoginseng mutual entertainment has good growth potential and is expected to further expand its market share in the future.

Further, this paper made a comparative analysis of the valuation of Panax notoginseng mutual entertainment. This paper compare the valuation results based on the improved DEVA model with the results of the traditional DEVA model. By comparing the valuation bias and accuracy of the two models, this paper can evaluate the effectiveness of the improved DEVA model in prediction and valuation. The preliminary results show that the improved DEVA model is more accurate and accurate than the traditional DEVA model in estimating the mutual entertainment of Panax notoginseng.

Through the empirical test of the valuation results of Panax notoginseng mutual entertainment, this paper draws a series of valuable conclusions. Compared with the traditional DEVA model, the improved DEVA model has more advantages in terms of valuation and prediction, and shows better interpretation and prediction ability in terms of profitability, growth potential and valuation results of Panax notoginseng mutual entertainment. These empirical results provide an important reference for valuation analysis of Chinese game enterprises.

6. Conclusion

This study focuses on the valuation of Chinese game companies, using an improved DEVA model and the case of Panax notoginseng mutual entertainment as an empirical example. The DEVA model was enhanced to better suit the unique attributes of game companies, incorporating factors like R&D capabilities, content creation, and user engagement. This modification aims to provide a more accurate representation of the value and potential of game enterprises.

The empirical analysis of Panax notoginseng mutual entertainment reveals that the improved DEVA model closely aligns with the company's value. The success of Panax notoginseng is attributed to its strong R&D team and diverse product offerings, ensuring competitiveness in the competitive game industry. However, the study identifies challenges, including market competition intensification and regulatory uncertainties. It recommends a continued focus on innovation, technology research, and adaptation to external changes.

In summary, this research deepens the valuation analysis of Chinese game companies by enhancing the DEVA model and using Panax notoginseng as a case study. The study underscores the importance of core competitiveness and product innovation in determining valuation and acknowledges the industry's challenges.

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The research contributes to the valuation analysis of Chinese game companies and provides insights for future research and practice. However, it acknowledges limitations due to data constraints and calls for broader sampling and more in-depth analysis. Future research avenues include refining the DEVA model, incorporating industry trends and macroeconomic factors, and integrating risk management into the valuation process. Additionally, comparing the DEVA model with other valuation models could offer a more comprehensive perspective. The ultimate goal is to continually enhance the accuracy and scientific validity of valuing Chinese game companies, supporting industry development and investment decision-making.

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