Research on the Valuation on Pharmaceutical Manufacturing Enterprises under the Background of STAR Market in China

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Abstract:

The launch of China's Sci-Tech Innovation Board (STAR Board) in Shanghai Stock Exchange provides an important financing channel for technology driven enterprises represented by pharmaceutical manufacturing enterprises. Although technology driven enterprises have great development potential, they also have the characteristics of high operation risk and high product volatility, which makes it difficult to accurately determine their value. This paper selects six typical pharmaceutical manufacturing enterprises listed on STAR Board as the research sample, combined with the enterprise development stage and industry characteristics, explores the suitability and effectiveness of different methods on valuations of pharmaceutical manufacturing enterprises. And the paper also tries to explore the usefulness of the market price to R&D expenditures ratio method.

Key words: STAR Board; Pharmaceutical Manufacturing Enterprises; Valuation; Price to R&D Expenditures Method

1. Introduction

On June 13, 2019,China's Sci-Tech Innovation Board (STAR Board) was officially opened. On July 22, the first batch of companies listed on the STAR board. The STAR board adheres to facing the world's scientific and technological frontier, the main economic battlefield and major national needs. It mainly serves scientific and technological innovation enterprises that meet the national strategyand have high market recognition. Focus on supporting new generation of information technology, high-end equipment, new materials, new energy, and other high-tech industries and strategic emerging industries.

From the perspective of market function, the STAR board should achieve a deeper integration of capital market and scientific and technological innovation. Scientific and technological innovation has the characteristics of large investment, long cycle and high risk. Indirect financing and short-term financing often inadequate in this regard. Consequently, capital market plays a vital role in promoting the integration of science, technology and capital, accelerating the formation and effective circulation of innovation capital. In recent years, China's capital market has made a lot of exploration and efforts in increasing support for scientific and technological innovation, but due to various reasons, there are still many "gaps" between the two. Many innovative enterprises with good development momentum have gone abroad for listing, indicating that there is still much room for improvement in this regard. The establishment of STAR board provides greater possibility for effectively resolving this problem.

Besides, the STAR board unprofitable enterprises to be listed which reflects the inclusiveness of the STAR board. Since the STAR board pays more attention to the science and technology and growth potential of a company. To some extent, it has higher requirements. Its listing standards for unprofitable enterprises are the market value is expected to be no less than RMB 4 billion. The main business or products need to be approved by relevant state departments. There is a large market space. At present, phased results have been achieved and a certain amount of investment has been obtained from well-known investment institutions. Pharmaceutical enterprises need to obtain at least one approval document for phase II clinical trial of class I new drugs, and other enterprises must have obvious technical advantages and meet the corresponding conditions. In January 2020, Zejing pharmaceutical officially landed on the STAR Board, and a shares ushered in the first unprofitable enterprise.

As an important enterprise type of listed companies on China's STAR board, pharmaceutical manufacturing enterprises often have the characteristics of high scientific and technological level and key core technology. However, as a typical technology driven enterprise, pharmaceutical manufacturing enterprises often need to invest a lot of resources in the early stage of the commercialization process of technology and R&D investment, which is reflected in the fact that some pharmaceutical manufacturing enterprises listed on the STAR board did not realize profit at the time of listing, which leads to the lack of application scenarios of the traditional profit-based valuation methods.

In addition, the value creation of pharmaceutical manufacturing enterprises listed on STAR board depends significantly more on intangible assets and R&D investment that does not form intangible assets. The general production factors of pharmaceutical manufacturing enterprises are the intangible assets and R&D investment of the company's technology. The contribution of traditional fixed assets such as plant, equipment and land is low, which leads to the low suitability of asset-based valuation methods. At the same time, the establishment time of pharmaceutical enterprises listed on the STAR board is generally short. The emergence time of a large number of emerging technologies and even emerging segment products and markets is generally short while the update iteration speed is fast. This makes it difficult for enterprises to obtain long-term data and comparable information, and further enlarges the difficulty of enterprise valuation. To sum up, how to effectively evaluate the value of pharmaceutical manufacturing enterprises listed on the STARboard has become an urgent problem to be solved.

2. Applicability analysis of valuation method for pharmaceutical manufacturing enterprises listed onthe STAR board

2.1 Traditional valuation method

Whether asset-based method, income-based method or relative value method, there are application obstacles in the valuation of pharmaceutical manufacturing enterprises listed on the STAR board. On the one hand, the R&D cycle of pharmaceutical manufacturing enterprises listed on the STAR Board is quite long, and the historical financial data fluctuates greatly. The future business direction and ability of such enterprises are very uncertain, and their future income may increase explosively. The traditional enterprise valuation methods can not reflect their real potential and economic value. On the other hand, the intangible assets that are very important to the pharmaceutical manufacturing enterprises listed onthe STAR board have strong specificity and non-replicability. It is difficult to measure the value of such intangible assets, and it is difficult to measure their enterprise value from the perspective of replacement cost. Finally, the pharmaceutical manufacturing enterprises listed onthe STAR Board are greatly affected by industry rules. And the business model and profit model show high dynamics, and the leading factors of enterprise value creation also have high variability. Therefore, there are many obstacles in the application of traditional enterprise valuation methods in pharmaceutical manufacturing enterprises listed on the STAR Board.

2.2 Market price/R&D expenditureratio method and market price/intangible assets ratio method

Based on the applicability limitations of traditional valuation methods, some scholars have proposed two new methods for the valuation of technology driven enterprises: market price/R&D expenditure ratio method and market price / intangible assets ratio method. market price/R&D expenditure ratio method refers to the ratio of the company's market value to the R&D expenditure in the last 12 months. It reflects the arithmetic relationship between the company's value and the company's R&D investment, and also reflects the characteristics of R&D investment as an important value driving factor of technology driven enterprises to a certain extent. The market price/R&D expenditure ratio method emphasizes R&D investment and scientific and technological innovation ability, which can get rid of the discomfort and limitations of traditional enterprise valuation methods for technology driven enterprise valuation, and reflect its valuetruly and objectively. market price/R&D expenditure ratio method can also help enterprises pay attention to R&D investment and highlight the core characteristics of technology driven.

In addition, for technology driven enterprises, some scholars point out that there should be a stable relationship between intangible assets formed by R&D investment and enterprise value based on similar logic. Therefore, the market price/intangible asset ratio method is introduced. On the one hand, the intangible assets of pharmaceutical manufacturing enterprises listed on the STAR board mainly rely on their own research and development. Therefore, in such enterprises, self created intangible assets account for a large share of intangible assets. On the other hand, because the specific rights of intangible assets are only related to the specific subjects to which they belong. For pharmaceutical manufacturing enterprises listed on the STAR Board, the specific rights of intangible assets have a strong monopoly and can directly or indirectly bring economic benefits to the enterprise. This economic benefit is usually excess profit and exceeds the profit level of other general enterprises, which also represents the value of pharmaceutical manufacturing enterprises. Intangible assets are an important part of the value of pharmaceutical manufacturing enterprises listed on the STAR board. Analyzing intangible assets is particularly important for clarifying the enterprise value.

3. Case analysis

3.1 Selection of sample enterprises and their R&D investment status

Pharmaceutical manufacturing enterprise listed on the STAR board are typical technology driven enterprises, which have the characteristics of high technology content, high operation risk and high expected return. It is particularly important to choose an appropriate enterprise valuation method to provide useful information for decision-makers. Based on this, this paper selects six pharmaceutical manufacturing enterprises listed on the STAR Board in 2020 as the analysis samples, among which Nanxin pharmaceutical, Dongfang biology and Tebao biology are profitable enterprises at the time of listing, while Zejing pharmaceutical, baiaotai biology and Shenzhou biology are still at a loss at the time of listing. Although investors generally recognize the extreme importance of R&D investment for pharmaceutical manufacturing enterprises listed on the STAR board, their R&D investment still shows significant differences, as shown in Table 1.

Table1: Analysis of R&D expenses of sample enterprises

No.	Corporate Name	R & D Expenses (10000 Yuan)	R & D expenses/operating revenue (%)	R & D expenses/net assets (%)
Profitable enterprise				
1	Nanxin	7176.49	7.08%	20.09%
2	Dongfang	3175.56	8.64%	12.50%
3	Tebao	5340.56	7.32%	9.48%
Unprofitable enterprise				
4	Zejing	18384.15	/	249.28%
5	Baiaotai	63651.11	90930.15%	100.93%
6	Shenzhou	51617.57	19564.58%	1483.09%
Industry average of A-share comparable listed companies		6862.78	15%	4%

In view of this paper's attempt to evaluate the effectiveness of the market price/R&D expenditureratio method, this paper analyzes the distribution characteristics of R&D expenses of the sample enterprises. At the same time, this paper selects A-share listed companies, such as Rejing biology, Shenlian biology, Borui medicine, Microchip biology, Huaxi biology, Haohaishengke and Shuoshi biology, as A-share comparable companies. From the results listed in Table 1, it is not difficult to find that the pharmaceutical manufacturing enterprises listed on the SATR board that have made profits at the time of listing have significantly lower R&D intensity than those that have not made profits at the time of listing, regardless of the proportion of R&D expenses to operating revenue or net assets. In absolute terms, the R&D investment of profitable case enterprises is lower. Therefore, the use of the market price/R&D expenditure ratio method must respect the profitability of enterprises. Due to its own industry characteristics, the pharmaceutical manufacturing industry has invested a lot of capital expenditure for product research and experiment, and some enterprises have not carried out commercial production and sales of their products. Compared with the six enterprises listed in 2020, Zejing pharmaceutical, Baiaotai biologyand Shenzhou biology still suffered losses when they were listed. For Nanxin pharmaceutical, Dongfang biology and Tebao biology, the proportion of R&D expenses to operating income is lower than the average value of comparable companies in the same industry, but the proportion of R&D expenses to net assets is higher than the average value of comparable companies in the same industry.

2.2Enterprise valuation and deviation rate under multiple methods

In this paper, the market price/R&D expenditure ratio method (PR), the market value/intangible assets ratio (PI), price to earnings per share ratio (PE), price to sales per share ratio (PS) and price to book value per shareratio (PB) are used to evaluate the value of the sample enterprises when they are listed, and the deviation between the valuation and the enterprise market value when they are listed is calculated.

2.2.1Market price/R&D expenditure ratio method

Table 2 shows the results of the valuation using the market price/R&D expenditure ratio method.

Table 2: Valuation results pharmaceutical manufacturing enterprises listed on STRA board: PR method

	Market Value（m）	Valuation（m）	Deviation rate (take absolute value)	Deviation rate (not taking absolute value)
Profitable enterprise				
Nanxin	911260.19	1570581.81	72.35%	72.35%
Dongfang	1751760.45	694982.51	60.33%	-60.33%
Tebao	1436004.22	1168786.92	18.61%	-18.61%
Average			50.43%	-2.19%
Unprofitable enterprise				
Zejing	1790160.32	4023390.80	124.75%	124.75%
Baiaotai	2492761.41	13930109.77	458.82%	458.82%
Shenzhou	3180997.07	11296558.47	255.13%	255.13%
Average			279.57%	279.57%

The six enterprises in Table 2 are pharmaceutical manufacturing enterprises listed on the STAR board in 2020. The enterprise valuation is calculated based on the average of the market price/R&D expenditure ratio of enterprises in the same industry of A shares, and compared with the total market value of the enterprise on the date of listing. It is found that there are great differences in the valuation effectiveness of enterprises by using the market price/R&D expenditure ratio method. From the perspective of distribution, the deviation rate of market price/R&D expenditure ratio method is far greater than that of profitable enterprises in unprofitable enterprises, and the deviation rate is close to 300%. For profitable enterprises, the absolute difference between the valuation level and the actual value obtained by using the market price/R&D expenditure ratio method is about 50%, and the average difference is only -2% regardless of the absolute value. This shows that the basic premise of using market price/R&D expenditure ratio method is that the enterprise is profitable, and the use of market price/R&D expenditure ratio method by unprofitable enterprises is not a reasonable choice.

2.2.2 Market value/intangible assets ratio method

There is no doubt about the importance of intangible assets for pharmaceutical manufacturing enterprises listed on the STAR board. In particular, its intangible assets mainly come from self-development, which is the specific carrier and embodiment of the capitalization of R&D expenses. The economic benefits generated by intangible assets are the main source of economic benefits for pharmaceutical manufacturing enterprises listed on the STAR board. Table 3 shows the results and deviations of valuation using the market value / intangible assets ratio method.

Table 3: Valuation results pharmaceutical manufacturing enterprises listed on STRA board: PI method

	Market Value（m）	Valuation（m）	Deviation rate (take absolute value)	Deviation rate (not taking absolute value)
Profitable enterprise				
Nanxin	911260.33	1302076.65	42.89%	42.89%
Dongfang	1751767.10	248719.61	85.80%	-85.80%
Tebao	1436004.00	3342368.43	132.75%	132.75%
Average			87.15%	29.95%
Unprofitable enterprise				
Zejing	1790160.33	2311111.96	29.10%	29.10%
Baiaotai	2492761.07	4231109.15	69.74%	69.74%
Shenzhou	3180997.59	510085.06	83.96%	-83.96%
Average			60.93%	4.96%

Through the analysis, it is found that the deviation degree between the market value/intangible assets ratio method and the actual market value of the company presents a completely different distribution compared with the deviation degree of the market price/R&D expenditure ratio method. The valuation accuracy of unprofitable enterprises is significantly higher than that of market price/R&D expenditure ratio method, but the valuation accuracy of profit enterprises is lower than that of market price/R&D expenditure ratio method. For unprofitable enterprises, the main reason for the continuous loss of enterprises is that the products are in the R&D stage, and the R&D expenditure investment needs to be continuously increased. At this time, the enterprise may not have formed intangible assets. However, once intangible assets are formed, they will become the core factor driving the enterprise value, which directly leads to the higher applicability of the market value/intangible assets ratio method. For profitable enterprises, intangible assets have begun to bring economic benefits to enterprises. With the continuous commercialization of products, the market and investors pay more attention to and rely on the continuous R&D investment that does not form intangible assets, which makes the applicability of the market research rate method stronger.

Therefore, the market value/intangible assets ratio method can well interact with the market research ratio method to provide more objective evidence for enterprise valuation.

3.2.3 P/E ratio, P/S ratio and P/B ratio method

Finally, this paper uses the traditional relative valuation method, namely P/E ratio, P/S ratio and P/B ratio, to evaluate the value of the case enterprise, and gives the deviation rate without taking the absolute value, as shown in Table 4.

Table 4: Valuation results pharmaceutical manufacturing enterprises listed on STRA board: PE/PS/PB

	Deviation Ratio(P/E)	Deviation Ratio(P/S)	Deviation Ratio(P/B)
Profitable enterprise			
Nanxin	147.28%	281.41%	-72.00%
Dongfang	2.28%	-28.13%	-89.64%
Tebao	3.50%	74.13%	-71.97%
Average	51.02%	109.13%	-77.87%
Unprofitable enterprise			
Zejing	-	-	-97.06%
Baiaotai	-	-99.90%	-81.93%
Shenzhou	-	-99.72%	-99.22%
Average	-	-99.81%	-92.74%

It can be seen from the results listed in Table 4 that although the P/E ratio is not applicable to enterprises that have not realized profits, it is still a reasonable valuation method for enterprises that have made profits. The average deviation of P/E ratio is about 50%. If we only focus on Dongfang biology and Tebao biology, the accuracy of valuation is very high, which is the lowest deviation rate among all methods. This shows that for profitable enterprises, the deviation rate between the valuation of P/E ratio and market value is low, which is more in line with the actual situation of the enterprise. Therefore, it can be concluded that the index of P/E ratio is more suitable for the valuation of profitable enterprises. In comparison, the effectiveness of P/S ratio is difficult to be reflected. It can be seen from the data in Table 4 that the valuation of unprofitable enterprises using the P/S ratio method is generally low because their sales revenue is also not high. However, for profit-making enterprises, the conclusions obtained by the P/S ratio method are not unified and have great differences. Finally, from the application results of the P/B ratio method, the valuation results are all lower than its market value, and this undervaluation no longer distinguishes between profitable and unprofitable enterprises. This shows that for the pharmaceutical manufacturing enterprises listed onSTAR board, the net assets can not fully reflect the driving factors of enterprise value.

3.3 Comparison and summary

Through the comparative analysis of the application of market price/R&D expenditure ratio method, market price/intangible assets ratio method, P/E ratio method, P/S ratio method and P/B ratio method, this paper finds that although the pharmaceutical manufacturing enterprises listed on STAR board are typical technology driven enterprises, profitability still plays an important role in the value judgment of the market and investors. For profitable enterprises, the deviation rate of P/E ratio valuation is low, and the valuation is closer to the actual market value of the enterprise. Compared with the P/E ratio method, the valuation results of the market price/R&D expenditure ratio method has a large deviation rate, indicating that investors still believe that there is some uncertainty about whether a large amount of R&D expenses can bring sustainable income and cash flow in the future. The market price/intangible assets ratio method can provide correction for the market price/R&D expenditure ratio method. For unprofitable enterprises, the deviation rate of market price/R&D expenditure ratio method is large and significantly higher than the market value of enterprises, which shows that the market can not fully accept the view that R&D can create value, and there are still doubts about whether R & D investment can finally realize the commercialization intention. The market price/intangible assets ratio method deviates less from the market price/R&D expenditure ratio method, which shows that the formation of intangible assets reduces the risk of the enterprise to a certain extent, so the valuation is more precise. The effectiveness of P/S ratio method and P/B ratio method remains to be verified.

4. Conclusion and Prospect

This paper selects six pharmaceutical manufacturing enterprises listed on the STAR board as the research object and sample enterprises, and makes clear their applicability through the application of various valuation methods.

The research results show that although the pharmaceutical manufacturing enterprises listed on STAR Board have the basic characteristics of technology and R&D driven, the effectiveness of P/E ratio is still the highest for profitable enterprises. The effectiveness of the market price/R&D expenditure ratio method is constrained by the enterprise's profitability. When the company's profit turns negative to positive, it will also reduces the valuation deviation rate of the market price/R&D expenditure ratio method. Therefore, for the valuation of pharmaceutical manufacturing enterprises listed on STAR board, we should build a reasonable method matrix and choose different valuation methods according to the different conditions and stages of the enterprise, especially the profitability.

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