Valuation of Biomedical Engineering Industry Under Epidemic: Evidence from Andon Health Company Limited

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Abstract. Contemporarily, under the ravages of the epidemic, nucleic acid testing has become one of the most critical preventive means, hence many nucleic acid testing companies develop rapidly in recent years. In the United States, antigen test kits have been the primary means for the past few years. Meanwhile, in the context of China's gradual liberalization in the future, the test kit will also have a significant market space. This paper selects Andon Health Company Limited as an investigation target to discuss the valuation of the biomedical engineering industry during the epidemic. Based on the industry attributes and the circumstance of the epidemic, this paper concluded that the valuation of Andon Health is not suitable for some traditional value evaluation methods and models. According to the analysis, the valuation method based on the forecast of future cash flow is more suitable for the valuation of biomedical enterprises. Based on to the DCF valuation method, the value of Andon Health in 2022 is predicted to be 11.2 billion CNY. In this case, the current stock market price of the target enterprise is overvalued because of the biomedical enterprises' characteristics. These results guide further exploration for valuing similar biomedical enterprises.

Keywords: Biomedical industry; enterprise valuation; DCF model; Andon Health.

1. Introduction

The COVID-19 pandemic, also known as the coronavirus pandemic, was announced as a pandemic on March 13. Not only leading to an unexpected public health crisis worldwide but also becoming an unprecedented social-economic burden. The World Health Organization (WHO) is urging the international community to conduct large-scale diagnostic testing to combat the spread of the virus and reduce the number of undetected cases since testing is also a valuable tool, aiding researchers in learning the epidemiology of the disease. Moreover, diagnostics play a decisive role in making timely decisions on treatment and isolation of infected people, thereby slowing, or stopping the spread of infectious diseases [1]. During the three years of the epidemic, regular nucleic acid testing was implemented worldwide, especially in China. Despite the global economic downturn, many biomedical engineering companies have emerged in recent years, especially for in-vitro testing. These enterprises in the biomedical engineering industry not only have natural advantages in the epidemic environment but also have an excellent space for development in the future from the perspective of government policies.

The National Development and Reform Commission issued the 14th Five-Year Bio-economy Development Plan. As China's first five-year bio-economy Plan, the Plan proposes the development of bio-medicine, biological agriculture, biomass substitution, and bio-safety. The goal is to accelerate the development of China's biotechnology and biological industry during the 14th Five-Year Plan period, bio-economy will become a strong driving force for high-quality development, and the construction of biosafety risk prevention, control, and governance system will be continuously strengthened [2]. During the 14th Five-Year Plan period, bio-medicine, biomedical engineering, biotechnology services, and other related fields will maintain a growth rate of about 10%, significantly boosting the employment demand for medical devices, medical testing, drug research and development services and other industries, which is one of the new driving forces and new pillars of economic and social development during the 14th Five-Year Plan period [3].

As a biomedical equipment company from China, Andon Health has made a remarkable performance in this epidemic and still has a certain potential. The surge in share prices is one of the most obvious indicators, from the closing price of 6.39 yuan on November 10, 2021, to the all-time high of 88.88 yuan on January 18, 2022. It has risen more than 12 times in just over two months [4]. More noteworthy is iHealth Labs.Inc, an American subsidiary of Andon Health, and its main product, "Domestic OTC test kit for COVID-19 antigen". The company has received not only FDA emergency use authorization but billions of dollars in orders from New York, Massachusetts [5].

With the development of time and the change in the social environment, these biomedical engineering industries are also advancing, and many of the significant changes that have taken place in them may still need more time to attract the public's attention. The traditional enterprise valuation method has some limitations in the valuation of biomedical R&D engineering enterprises. The pricing model of the DCF enterprise value assessment method is more suitable for practical valuation [6]. It can better consider the potential value of enterprises challenging to be evaluated due to the characteristics of biomedical research and development enterprises, and make up for the inflexibility of the traditional single enterprise value assessment method. It is helpful to provide an accurate, reliable, and practical basis for analysis for market investors and strategic decision makers of enterprises. In this case, it is able to improve the value assessment system of the industry, and provide a new attempt for the application of the DCF enterprise value assessment model in the biomedical engineering industry.

In order to further explore the relationship between valuation methods and biomedical enterprise characteristics, this paper will investigate the DCF model for the valuation of biomedical enterprises in terms analyze the current situation of Andon Health and predicting its future. The rest part of the paper is organized as follows. The Sec. 2 will briefly introduce pros and cons of several valuation methods and analyze the general situation of Andon Health in detail to find the best match between valuation methods and the enterprise. The Sec. 3 will predict the future of the enterprise by analyzing its financial status and using the DCF model to evaluate it. The Sec. 4 will review and point out some limitations of this study and make an outlook on the future of related industries based on this research's results. Eventually, a brief summary is given in Sec. 5.

2. Data & Method

2.1 Enterprise Valuation Methods

Traditional enterprise value evaluation methods include market method, income method and cost method, as well as innovative enterprise value evaluation methods such as real option method, Discounted Equity Valuation Analysis (DEVA) method and category-sum valuation method etc. [7]. The first is the multiple-based method, also known as the market-based method. The most typical multiples-based valuation method is P/E analysis, which calculates the ratio of price share to earnings per share:

$$P/E\ Ratio = Earnings\ Per\ Share/Market\ Value\ Per\ Share \tag{1}$$

In addition, there are EV/Sales, price, earnings, and EV/EBITDA methods. The first step using this valuation method is to find similar companies in the same industry group with similarities in terms of the industry type, geographical distribution, and enterprise scale. One needs to calculates the P/E value of each reference comparison enterprise. Furthermore, the P/E price of the target company can be calculated after taking the average value. However, this method is primarily related to the company's recent earnings, and the recent earnings of the same reference company can also significantly impact the valuation.

Secondly, the cost replacement method is widely used, but it is mainly applied to real estate and other industries and is less common in corporate finance. The main concept of the cost replacement method is that the value of a business is the cost to replace it with an equivalent new one.

$$Value = Replacement - Depreciation + Land\ Value \tag{2}$$

The formula shows that this method is more applicable to tangible assets and is undoubtedly not applicable to the valuation of enterprises in biomedical-related industries that need to master the core technology, patents, and other intangible assets.

Third, the DCF (Discounted Cash Flow) valuation method is the utilizing approach for this study. Based on the Intrinsic Value of the enterprise, this method focuses on the internal operation and reduces the impact of the external environment on the enterprise valuation.

$$DCF = \sum \frac{CF_n}{(1+r)^n} \tag{3}$$

The academia has a set of primary enterprise value evaluation methods and models, which have laid a solid foundation for applying enterprise value evaluation. However, different methods and models have different conditions, advantages, disadvantages, and applicability. Therefore, in evaluating enterprise value, people should comprehensively consider the characteristics of enterprises in different industries and the advantages and disadvantages of each model. The suitability of each model is to determine the evaluation method and model as well as modify and improve the evaluation model when necessary to make the evaluation results more reliable and in line with the social background.

2.2 Background of Andon Health

Andon Health Co Ltd. (hereinafter referred to as Andon Health) was established in 1995 and restructured into a joint-stock company in 2007, integrating research and development, production, and domestic and international sales, providing home medical and electronic health products worldwide. On June 10, 2010, Andon Health was listed in Shenzhen Medium and small A-shares, becoming the first listed company in the domestic blood pressure monitor industry. In 2011, it launched its own brand iHealth health series, and set up an American branch to officially enter the U.S. market. During the COVID-19 pandemic, Andon Health, especially its branch subsidiary iHealth, yield unusually brilliant results. On November 6, 2021, the product "COVID-19 Antigen rapid self-test kits" of the US subsidiary of Andon Health was authorized for emergency use by the FDA. In April 2022, it was authorized by Health Canada. From the closing price of 6.39 CNY on November 10, 2021, to the all-time high of 88.88 CNY on January 18, 2022, the stock price of Andon Health increased by more than 12 times in about two months, which can be called "lottery-like stock" [4]. In the last year alone, the profit growth rate of Andon Health was 2099%. As an enterprise in the biomedical engineering-related industry, the performance of Andon Health in recent years is closely related to the COVID-19 epidemic, which also exposed the shortcomings of other traditional valuation methods. Under the background of the long-lasting epidemic with profound impact on relevant industries, finding and formulating appropriate valuation models for relevant industries can be beneficial to subsequent in-depth researches.

2.3 Analysis of the Applicability of Biomedical Enterprise Evaluation Methods

According to the characteristics of medical and bioengineering-related industries, multiple-based methods (e.g., P/E and cost reconstitution) are obviously not applicable. The dramatic changes that the pandemic has brought to the types of industries involved will clearly bias estimates. The emphasis on intangible assets in this type of industry also makes the replacement cost method unsuitable. For biomedical-related enterprises, using discounted cash flow valuation method to predict free cash flow (FCFF) overcomes the defects of the multiple-based valuation method, focuses on key parameters that can accurately predict, and reduces the impact of huge changes in external factors on the predicted value. Meanwhile, the parameters of the model should be improved to reduce the impact of parameter measurement errors on the results so that the combined model is more suitable for the value evaluation of biomedical enterprises, and the enterprise value evaluation results obtained will have more practical and guiding significance. Therefore, this paper will focus on Andon Health Co Ltd and study the application of discounted cash flow valuation method in enterprise valuation in this industry.

3. Empirical Analysis

3.1 Financial Analysis

Firstly, this study conducts financial analysis on the financial report data of the case enterprise Andon Health. By analyzing the financial index data of the case enterprise Andon Health in the past five years, this research can find that Andon Health is in a good state at each index level. In terms of growth capacity, Andon Health's net profit has grown at a ratio of 2 to 4 times in the past three years, and its total operating revenue has grown at a rate of +119% in the past year. Both are positive, and the value is high, which shows that Andon Health has not only achieved revenue and profit increase, indicating that Andon Health has performed well during the epidemic and maintained stable growth in the adverse economic environment. The operation level of Andon Health is relatively stable, and the company is in the stage of rapid growth. In terms of profitability, the gross profit margin of Andon Health sales increased at a rate of +534% in 2020 and +37% in 2021, respectively, at a high-profit level, indicating that the current profit status of the case enterprise is good. The high-profit level and regular operating cost can lay a solid foundation for the stable development of the enterprise. In terms of debt-paying ability, the total current assets and total liabilities of Andon Health can be seen that the enterprise's current asset liquidity and short-term debt-paying abilsity are strong, and there is no risk of insufficient liquidity. The asset-liability ratio of enterprises is 12.39%, also at a stable and safe level.

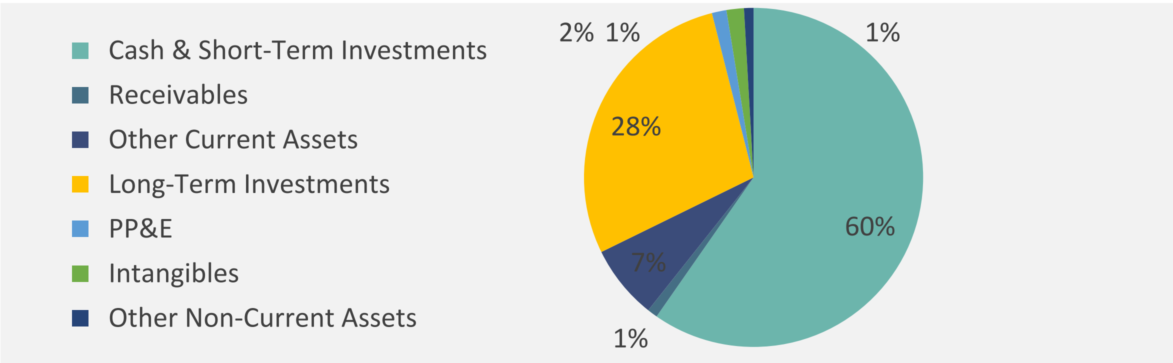

Fig. 1 Balance Sheet Decomposition: Assets.

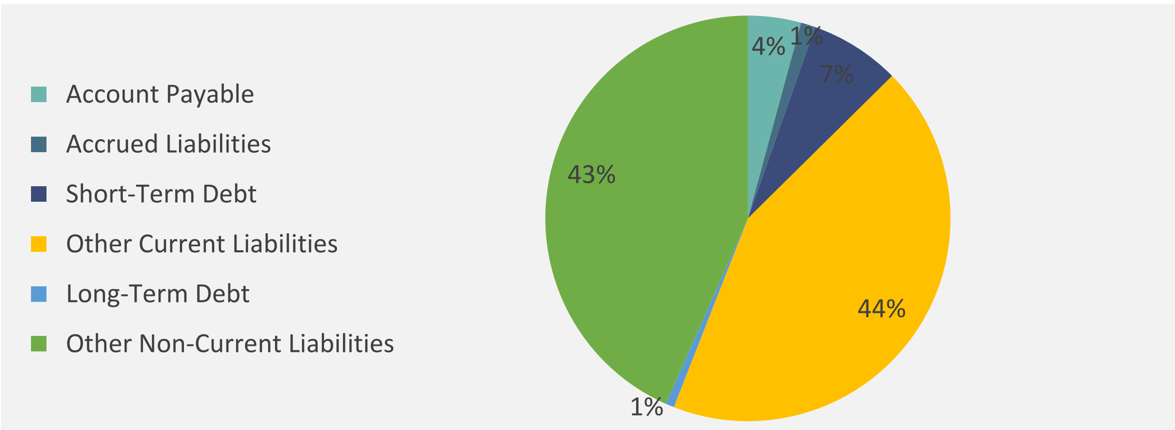

Fig. 2 Balance Sheet Decomposition: Liabilities.

Secondly, this study analyzes the asset and liability structure of the case enterprise Andon Health. As of the fourth quarter of 2022, the composition of Andon Health's assets and liabilities is shown in the Fig. 1 and Fig. 2. By analyzing the asset structure and liability structure of Andon Health, the author finds that the ratio of assets and liabilities is at a relatively safe level, and the ratio of current assets to assets and current liabilities to liabilities is relatively reasonable. It shows that the case enterprise Andon Health has been able to keep in line with the national biomedical industry policy for more than ten years since its listing, and its development is stable and excessive (i.e., in rapid growth). As a leading biomedical engineering enterprise, it has good financial indicators, indicating that the current financial status is stable, operating status is good, profitability is strong, and future development prospects are unlimited. Therefore, this paper uses the valuation model of DCF to explore its value and verify the rationality and applicability of the model.

3.2 Valuation Analysis

For evaluating the current asset value of the case enterprise Andon Health, this paper chooses the DCF model, precisely the enterprise's free cash flow discount method. The corporate FCFF of Andon Health for 2017-2021 is obtained based on the calculation formula of corporate free cash flow in Andon Health's 2017-2021 financial statement, all of the data is shown in in Table 1. Observing the cash flow sequence of the case enterprise, the overall cash flow of Andon Health increased rapidly from 2017 to 2021. By analyzing the cash flows of the previous five years, the cash flows of the sixth year can be analyzed. Similarly, the cash flow of the sixth year is put into the model, and the cash flow of the next five years is simulated by repeated calculation. The prediction results are also shown in Table 1 and visualized in Fig. 3.

Table 1. DCF Financials (Source: www.alphaspread.com).

	Historical Financials					Forecasted Financials				
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Revenue	592	559	702	2,001	2,391	3,367	4,503	5,717	6,873	7,799
Net Income	-166	13	66	242	909	550	711	884	1,029	1,129
FCFE	86	-284	-64	345	-54	448	581	729	853	942

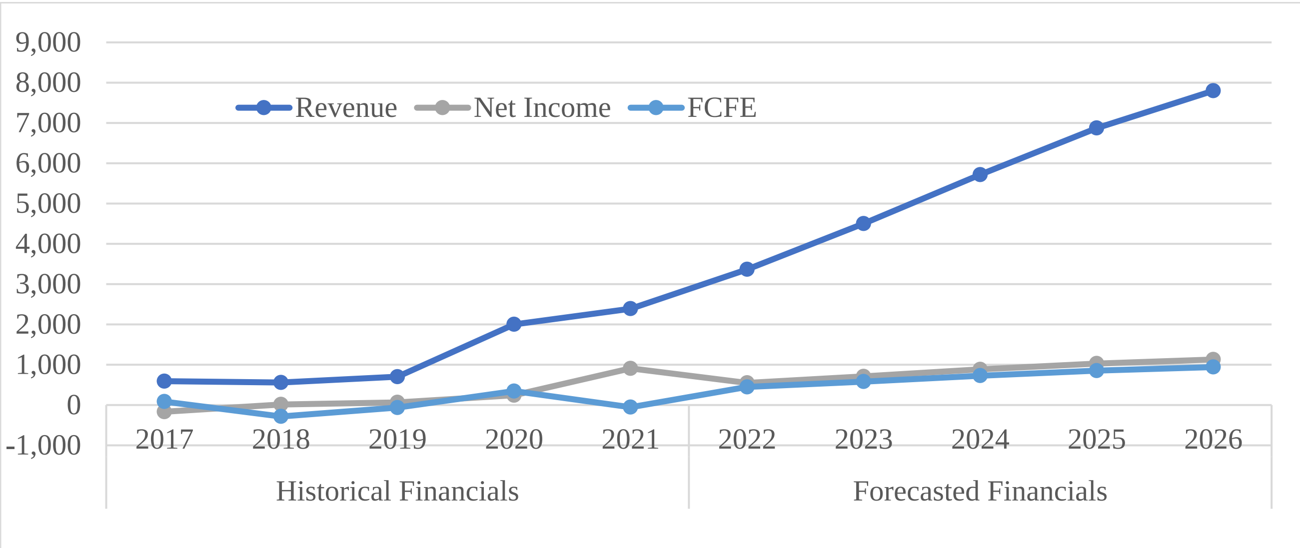

Fig. 3 Valuation Analysis: Visualizing FCFF.

Table 2. DCF Model (unit: millions)

Andon Health Co. Ltd.	2022	2023	2024	2025	2026	Terminal
Revenue	3,367	4,503	5,717	6,873	7,799	8,323
Growth	40.5%	33.7%	27.0%	20.2%	13.5%	6.7%
Net Margin	16.34%	15.79%	15.47%	14.97%	14.48%	14.0%
NET INCOME	550	711	884	1029	1129	1164
Net CapEx	-104	-131	-157	-178	-189	-188
% Of Revenue	-3.09%	-2.91%	-2.75%	-2.59%	-2.42%	-2.26%
Debt Ratio	1.07%	1.07%	1.07%	1.07%	1.07%	1.07%
Net CapEx Financed by Equity	-102	-130	-155	-176	-187	-186
FCFE	448	581	729	853	942	978
Discount Rate	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%
Present Value	415	499	581	630	645	8 492

By observing the predicted value of FCFF, the free cash flow of Andon Health will grow at a fast rate in the next five years, which is in line with the above evaluation and analysis of Andon Health. The next five years belong to the growth period of Andon Health, in which the free cash flow of the enterprise proliferates, and the profitability is greatly enhanced. For selecting discount rates in the DCF model, this paper intends to use the weighted average cost of capital of enterprises. The Weighted Average Cost of Capital (WACC) is calculated by including all funding sources. The Cost of Equity is 7.88% and WACC is 7.86%. Based on the cash flow in the previous five years, the enterprise is valued by converting the present value. The Terminal Value is used to calculate the enterprise value after five years. The results of the DCF valuation model are shown in Table 2. If the present value of Andon Health enterprise is estimated to be 11.2 billion CNY, the EV of 11.2 billion CNY of the enterprise, and the outstanding shares of the enterprise are 456000000, the stock price 002432 DCF Value of Andon Health enterprise should be 24.65 CNY. The stock trades at a 59% premium to the Nov 27, 2022, market price of $60.75.

3.3 Risk Analysis

Trough the interpretation and modeling analysis of the financial statements, the current financial status of Andon Health enterprise is relatively stable, and the asset structure is relatively healthy. However, the future of the epidemic is difficult to predict, and Andon Health and other relevant enterprises, which have achieved such substantial growth based on the epidemic, should make timely risk planning. Some analysts believe that after the stock price rose many times, the good cash of nine medical. Due to the unpredictability of the development of the epidemic, changes in market demand, and changes in the market competition environment, it is doubtful whether the future performance can continue to maintain rapid growth. Data show that as of March 22, the US FDA has approved 45 EUA (emergency use authorization) numbers for COVID-19 antigen tests, including 14 home self-testing products involving 13 companies [8]. On the other hand, looking at the main business of Andon Health. Andon Health has been engaged in-home medical equipment business for 26 years, with blood pressure monitors, blood glucose meters, and thermometers as the main products. In the first half of 2021, the revenue of the iHealth series, smart IoT, and consumer products was 304 million yuan, down 61.63% from the same period in 2020, showing weak growth [9].

4. Limitations & Propsects

Owing to the high growth of the biomedical industry, the high proportion of intangible assets, and the high relevance of the policy and social environment, the value evaluation has certain limitations. On this basis, adjusting and using the DCF model can overcome the defects of other methods and make a more accurate prediction. Based on the analysis of the case enterprise, the valuation results obtained are in line with the common situation of theoretical analysis, so the model in this paper has certain rationality and reference value. However, this study still has the following defects:

- Some of the data is imperfect.
- Some calculations and estimates are simplified in the valuation process.
- No combination and comparison of more valuation methods.
- It is not easy to fully meet the strict assumptions in the evaluation practice. This study only provides some ideas and references for biomedical engineering-related enterprise value evaluation research.

In recent years, the biomedical and health industries have become the primary development field of our country, and innovation and research are the top priority of the development of China's pharmaceutical industry. Nowadays, biomedical research and development enterprises have become a critical area of investment, and more and more investors have begun to pay attention to many excellent domestic biomedical research and development enterprises that have been listed to seek financing [10]. As the global COVID-19 epidemic is gradually under control, the market demand for prevention and control products could be reduced. It is worth considering whether Andon Health, which relies on a single product, can make sustainable profits in the future.

5. Conclusion

In summary, based on the theory and method of enterprise value evaluation, this study investigates the current situation of the medical industry and the general situation of Andon Health enterprise. By analyzing and comparing the adaptability of traditional enterprise value evaluation methods to biomedical R&D enterprises, this paper chooses the DCF value evaluation model to evaluate the overall value of biomedical R&D enterprises from two aspects of internal value and potential value. Andon Health, a leader in the domestic biomedical research and development industry, was selected to evaluate it to verify the rationality of the evaluation method. According to the analysis, the main characteristics of biomedical engineering enterprises are analyzed. Traditional analysis methods have one-sidedness, limitation, and uncertainty traits. This study adjusts the DCF model through research to make the model more suitable for biomedical engineering enterprise value evaluation. It is determined that the evaluation method has a reference value. For biomedical research and development enterprises, a comprehensive and targeted enterprise value evaluation method is adopted to provide more reliable value information for investors. Nevertheless, in this study, the data is imperfect and some calculations and estimates are simplified. Besides, this research is still at the theoretical level and has yet to be tested by the market. In the future, the biomedical industry undoubtedly has a bright future. Andon Health will still have stable development through appropriate risk control and technological innovation. Overall, these results offer a guideline for the valuation analysis of biomedical industries.

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