Research on the bonds of Hengrui Pharmaceutical Company

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Abstract. After the outbreak of the epidemic, this paper selects Hengrui (Jiangsu Hengrui Co., Ltd.) medicine as the research object, makes a macroeconomic analysis of the industry, then analyzes the pharmaceutical industry, obtains the development trend of the industry, and puts forward investment strategy suggestions. This paper uses the basic data information of Hengrui pharmaceutical bonds, including yield, bond term, issuance date and cash flow in different months. At the same time, the strength of the pharmaceutical sector index is mainly due to the joint action of factors such as the recovery of profits in the pharmaceutical industry, the gradual weakening of the impact of resistance restriction, and the favorable overall policy in the first half of the year. Macaulay duration model and Fish Weil model are used to support the view of this paper. The strength of the pharmaceutical sector index is mainly due to the joint action of factors such as the recovery of profits in the pharmaceutical industry, the gradual weakening of the impact of drug prohibition orders, and the favorable overall policies in the first half of the year. This paper attempts to help investors have a sufficient understanding of pharmaceutical bonds.

Keywords-Hengrui; epidemic; bond; yield; duration

1 INTRODUCTION

In 2020, global bond issuance surged again to the highest level since 2014 due to the impact of the pandemic and the severe negative impact on the economic situation. In the future, due to the uncertainty of economic recovery and the turbulence of the world political pattern, it is expected that the total amount of global bond issuance will still maintain an overall slow growth after 2022.

Fundamentals of the pharmaceutical industry, overall steady growth, large space for development, urbanization, aging and disease spectrum changes to promote the development of the pharmaceutical industry.

Since the "new medical reform", China has basically established the reform strategy with the "linkage of the three hospitals" as the core, the pharmaceutical industry enjoys national policy support and has a good momentum of development with many participants. There are 85 pharmaceutical bond issuing enterprises with existing bonds. The subjects of pharmaceutical

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bond issuance are mainly private enterprises, many of which are listed companies or the parent companies of listed companies.

The epidemic has boosted medical debt. Outbreak on the influence of different pharmaceutical enterprise is different, for the epidemic prevention and control the necessary medical enterprises, short and will be return to work time, upstream and downstream enterprises recovery, sales are blocked, the influence of such factors as performance will be affected by a certain impact, but medical needs is more rigid, after the outbreak can also rob workers' recover losses, affect relatively controllable.

Since the first case of New Coronavirus pneumonia was discovered in Wuhan in December 12, 2019, the number of confirmed cases has been increasing. It has the characteristics of highly infectious, involving large population and short-term impact.

By analyzing Hengrui bonds in Macaulay model and FW model under different yields to give different results, we can know Hengrui pharmaceutical company bonds by FW model out of data is closer to the bond yields, because FW each phase of the cash flow of the model corresponds to different cash flow, compared with more close to reality, Macaulay's model is more of an ideal state.

2 LITERATURE REVIEW

During the epidemic period, the demand for medicine and medical supplies continued to grow [1]. It is expected that the sales revenue of the pharmaceutical industry and pharmaceutical circulation industry will increase year-on-year in the first quarter of 2020; The state and financial institutions have issued a series of policies such as accelerated examination and approval, targeted financing support and tax incentives to provide a good industry development and financing environment for pharmaceutical enterprises; The issuance of "epidemic prevention and control" bonds will help enterprises refinance, reduce financing costs, or play a positive role in their debt structure adjustment; on the whole, it has a positive impact on the credit level of the pharmaceutical industry. In the long run, pharmaceutical manufacturing enterprises with obvious competitive advantages of core products, diversified products and outstanding R & D ability and pharmaceutical circulation enterprises with perfect sales layout and channel construction will maintain stronger competitiveness and anti-risk ability. In the future, China will strengthen the reserve of medical materials, continuously increase investment in the medical industry, and encourage pharmaceutical enterprises to expand R & D expenditure and improve innovation ability, so as to enhance the competitiveness of China's pharmaceutical industry [2].

During the epidemic period, with the growth of demand for medicine and medical supplies, the state and financial institutions issued a series of policies and measures to provide a good industry development environment and financing environment for pharmaceutical enterprises. It is expected that the sales revenue of pharmaceutical industry and pharmaceutical circulation industry will increase in the same proportion in the first quarter of 2020; Industry reform brings challenges, which is expected to drive the improvement of concentration in the long run. The profits of relevant industries have slowed down as a whole [3]. In recent years, policies such as medical cost control and volume procurement have been continuously promoted, which has been favorable for research and development for a long time, and the main body with strong

financial strength has increased the market share. However, the reform period has brought some uncertainty to the profits of enterprises. Since the outbreak of New Coronation pneumonia, its prevention and control work is continuing [4]. The demand for related treatment, preventive medicine and medical prevention and control materials has also increased [5]. The related industries of medicine and medical supplies have already resumed work in advance and increased production intensity [6]. The sales revenue of pharmaceutical industry and pharmaceutical circulation industry will be improved significantly. It is expected that the sales revenue of the pharmaceutical industry and pharmaceutical circulation industry will increase year-on-year in the first quarter of 2020, and the sales of various sub industries will increase year-on-year to varying degrees [7]. Considering that the pharmaceutical industry is in the period of accelerated reform, although it may benefit from the demand driven by the epidemic in the short term, most private enterprises in the pharmaceutical industry, although the leverage ratio is low, but the debt structure is mainly short-term, and the experience in 2003 shows that the demand driven by the SARS epidemic is temporary, it is still recommended to control the duration of this round of pharmaceutical industry allocation [8]. In addition, in terms of excess interest margin. The pharmaceutical industry has higher excess interest margin and higher allocation cost performance of long-term bonds within two years. In the short term, it will focus on supporting medical enterprises with epidemic prevention, smooth financing and certain competitive advantages in subdivided fields. In the long run, the industry reform is conducive to the leading enterprises with large-scale, obvious resource advantages, strong R & D ability and strong capital strength, so as to further improve the market share [9]. It is suggested to pay attention to the investment opportunities of such subjects.

Overall, the epidemic has boosted the demand for drugs and medical prevention and control materials in the short term [10]. The sales revenue of the pharmaceutical industry and pharmaceutical circulation will increase year-on-year, and the pharmaceutical enterprises that produce and sell the products needed for epidemic prevention and control will benefit from it. During the epidemic period, a series of policies and measures urgently issued by the state and financial institutions provided a good industry development environment and financing environment for pharmaceutical enterprises; The issuance of "epidemic prevention and control" bonds may be conducive to the debt structure adjustment of pharmaceutical enterprises and reduce financing costs. Pharmaceutical bonds also usher in an opportunity for development, which has a certain positive impact on the development of bonds in the pharmaceutical industry [11].

3 MODEL

In this section, two different duration will be introduced.

3.1 Macaulay duration

The concept of duration was introduced by Macaulay in his monumental work on yields, Some Theoretical Problems Raised by Changes in Interest Rates, Bond Yields, and Stock Prices in the United States Since 1856, when he studied the average maturity of railroad bonds. Macaulay defines duration as the weighted average of the time it takes for a bond to generate cash flows in the future. The weight is the proportion of the present value of cash flows in each period to the total present value of cash flows. The formula is:

$$D = \frac{\sum_{t=1}^{n} \frac{tC_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{C_t}{(1+r)^t}} \quad (1)$$

Where D is Macaulay duration; it is the cash flow of the t period; is the period of receipt of cash flow (t = 1, 2...n); n is the number of times cash flow occurs; r is the rate of return due.

From formula (1), knowing the Macaulay duration for all cash flow is to use the same discount rate, this means that only when the term structure of interest rates is flat, Macaulay duration is the most strict and effective, but in practice, flat rate curve is a kind of very special cases, most of the time is not flat.

Based on that, we can look at the FW duration (FW duration), it is a way to discount the cash flows through estimates of future interest rates, and we can see from the formula that each of its cash flows corresponds to a different estimate of the interest rate. It avoids the problem of a flat interest rate curve, which I think is more realistic than the Macaulay duration model.

3.2 Fisher Weil duration

The FW duration is a way of discounting cash flows from an estimate of future interest rates

$$D_{F-W} = \frac{\frac{1xC_1}{(1+r_1)} + \frac{2xC_2}{(1+r_1)(1+r_2)} + \ldots + \frac{nxC_n}{(1+r_1)(1+r_2)\ldots(1+r_n)}}{P} \quad (2)$$

Where r1、r2、r3.....are the estimate of future interest rates

By comparing these two formulas, the Macaulay duration for all cash flow is to use the same discount rate, this means that only when the term structure of interest rates is flat, Macaulay duration is the most strict and effective, but in practice, flat rate curve is a kind of very special cases, most of the time is not flat.

Based on that, looking at the formula (2), it is a way to discount the cash flows through estimates of future interest rates, and from the formula that each of its cash flows corresponds to a different estimate of the interest rate. It avoids the problem of a flat interest rate curve, which I think is more realistic than the Macaulay duration model.

However, every financial model has the problem of factor simplification, so FW model cannot provide effective immunization strategy when the interest rate curve is not parallel.

4 DATA

This paper focus on Hengrui Pharmaceutical Co., Ltd. which is a pharmaceutical health enterprise engaged in pharmaceutical innovation and high-quality drug research and development, production and promotion. It is a well-known supplier of anti-tumor drugs, surgical drugs and contrast agents in China. It is also the leading unit of the National Anti-tumor

Drug Technology Innovation Industry-University-Research Alliance. It has established a national targeted drug engineering technology research institute. Research center and postdoctoral research workstation. At present, the company has more than a dozen preparation products such as injections, oral preparations and inhalation anesthetics on the market in Europe, the United States and Japan, realizing the large-scale sales of domestic injections in the European, American and Japanese markets.

Next, Looking at the bond information of the two companies

Table 1. The Bond of Hengrui Pharmaceutical

	Credit rating	Bond term	Release date	Bond issuance interest rate
Hengrui	AA+	Three years	October 16, 2017	5.7%

Source: Hengrui [12]

It can be seen from the Table 1 that the bond credit rating of HENGHUI pharmaceutical bond is AA +, which was issued on October 16, 2017, with a bond term of 3 years and a bond interest rate of 5.75.

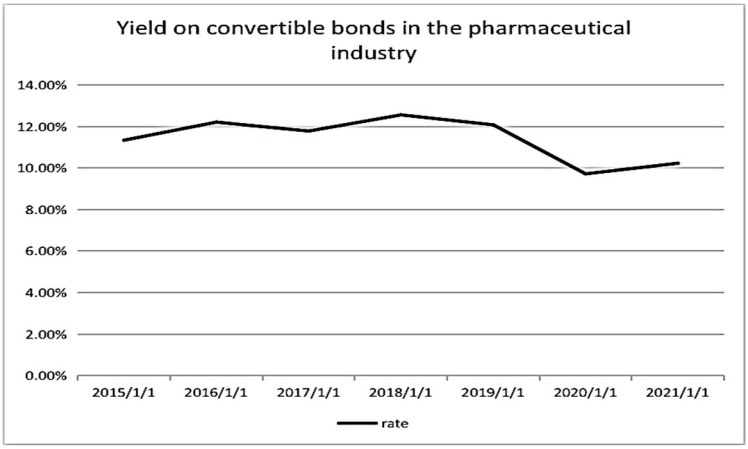

Figure 1. Yield on bonds in the pharmaceutical industry

Source: Eastmoney [13]

In this paper, the yield on convertible bond is used to represent the industry yield. On the whole, from this figure 1.the convertible bond yield of the pharmaceutical industry has been stable at about 12%. In the past two years, due to the impact of the epidemic, the bond yield of the pharmaceutical industry has changed to a certain extent. In 2020, the debt repayment pressure of the pharmaceutical industry will increase. The sales of many optional medical services and drugs unrelated to the epidemic will be greatly impacted. However, due to the rigid characteristics of pharmaceutical demand, the yield rate is slowly rising and tends to be stable. Looking at the whole situation, pharmaceutical biology is a typical weak cycle industry, which has the characteristics of large demand rigidity and small elasticity. At the same time, the overall industry is greatly affected by the medical reform policy. The current medical reform policy makes the pharmaceutical industry as a whole face industrial upgrading, and the concentration

of enterprises in the pharmaceutical industry and pharmaceutical commercial field will gradually increase.

5 RESULT

In this section, this paper will draw different conclusions by analyzing the different yields of Hengrui bonds under Macaulay model and FW model.

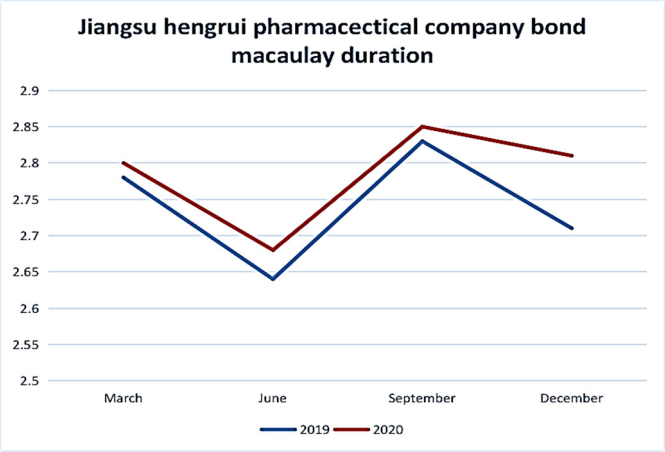

Figure 2. Jiangsu Hengrui pharmacectical company bond Macaulay duration

Table 2. Hengrui Pharmaceutical's net cash flow

	March	June	September	December
2019	157430.6	135674.8	227729.84	147254.12
2020	161125.72	146548.98	238936.52	155289.91

Source: Eastmoney

Now, look at the Macaulay duration of Hengrui Pharmaceutical Company bonds in 2019 and 2020. From the bond information, it shows that the yield of The long-term bonds of Hengrui Pharmaceutical Company is 5.7%. Since the Macaulay duration uses the same yield rate for all cash flows, the yield rate of the bond itself is used in the calculation process. And using the cash flow about the Hengrui Pharmaceutical Company bonds in table 2, we can get the data in figure 2 through formula (1). In figure 2,the Macaulay duration of 2019 is generally lower than that of 2020. Due to the impact of the epidemic, the cash flow fluctuates greatly, and the curve fluctuates accordingly. In 2020, the epidemic slows down and cash flow rises, and Macaulay duration is naturally higher than that of 2019.

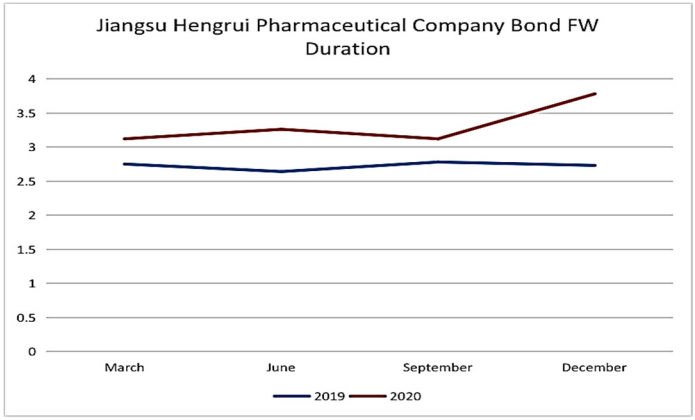

Figure 3. Jiangsu Hengrui pharmaceutical company bond FW duration

Table 3. Hengrui Pharmaceutical's net cash flow

	March	June	September	December
2019	157430.6	135674.8	227729.84	147254.12
2020	161125.72	146548.98	238936.52	155289.91

Table 4. Hengrui Pharmaceutical's rate

rate	March	June	September	December
2019	5.7%	5.23%	4.98%	5.56%
2020	6.2%	5.35%	4.79%	5.23%

Source: Hengrui

Next, let's look at the FW duration of Hengrui Pharmaceutical.We use the cash flow of table 3 and the interest rates of different time periods in table 4 to be substituted into formula (2) to obtain the data of figure 3.From figure 3, we can see that the CURVE of FW duration is relatively flat and the fluctuation range is small. The DURATION of the FW in 2020 is higher than that in 2019, and the duration of the FW in 2020 has a steady upward trend.

In the Hengrui pharmaceutical company bonds with the Macaulay duration calculated yield and FW the yield of long period come out is different, because the Macaulay duration of its cash flow in each of the interest rate is the same, after the outbreak of the year, the pharmaceutical industry's market interest rates rise about 5% ~11 %, under this background, the long-term yield of FW is closer to reality. In the figure, the yield decreased significantly in 2020 due to the impact of the epidemic, both in the Macaulay duration and the FW duration. In addition, in the case of the same change of cash flow, the interest rate of THE FW duration will change with the change of cash flow, while the interest rate of the Macaulay duration is flat, so I think this is also the reason why the yield rate of THE FW duration is higher than that of the Macaulay duration and the curve is flatter.

6 CONCLUSION

The outbreak of COVID-19 has brought opportunities and challenges to the pharmaceutical industry (medical debt). But in general, COVID-19 has promoted the development of the pharmaceutical industry, and the prospects for the development of pharmaceutical debt are more optimistic and the development momentum is good.

This article uses the basic data information of Hengrui pharmaceutical bonds, including yield, bond term, issuance date and cash flow in different months. At the same time, Macaulay duration model and FW model are used to support the view of this article. That is to say, through the analysis of data and the examination of the model, it is considered that the interest rate and return rate of the pharmaceutical debt with Hengrui medical bonds as an example is quite considerable and the profitability is strong. The issuance of the relevant policies on epidemic prevention brings about the vigorous financing of Medicine, and the reform of the pharmaceutical industry is positive. Indeed, COVID-19 does have an impact on the bond market, but after the crisis, there are all kinds of opportunities. Investing in pharmaceutical bonds will bring returns to investors.

Investors who fell after investing in pharmaceutical bonds will pay attention to this article. The suggestion is to choose the leading stocks of the industry first, which will be the best choice with both attack and defense. On the one hand, its early decline is deep, and the current valuation has a high margin of safety. On the other hand, the performance growth of leading stock companies is relatively certain. Even if there is a sharp price reduction of drugs in the future, it will be relatively less affected, and the hedging effect will be more obvious. Second, do not give up those short-term profit opportunities. Especially for those stocks with event and trend investment opportunities, we should actively pay attention to and participate in them. China's medical reform policies have been introduced one after another, which is undoubtedly a good year for the pharmaceutical sector. At the same time, it is also necessary to remind investors that while paying attention to the hot spots in the market, they should not forget to be vigilant against the risk of excessive speculation.

REFERENCES

[1] A. Zheng, “Research on risk analysis and management of pharmaceutical enterprises,” Research on industrial innovation, pp. 142-143，2020.

[2] X. Zheng, “New Coronavirus pneumonia has different effects on the pharmaceutical industry,” China economic time report, 2020.

[3] J. Lou, “Current situation and development trend of China's biomedical industry mass standardization,” 2019.

[4] Xinhua. Million people united as one man to overcome difficulties -- Xinhua News Agency revisited academician Nanshan Zhong about New Coronavirus infection pneumonia and [EB/0L], 2020.

[5] Open letter from the editorial department of clinical medicine of traditional Chinese medicine to authors and readers [EB / OL], 2020.

[6] H. Yang, L. Zhang, er al. “Application of hospital pharmacy posts, pharmacists and logistics personnel in the background protection strategy of new coronavirus sensing control [EB / OL],” 2020.

[7] Ax and X. Zheng, “explore the function of think tank in the editorial department of scientific and technological journals based on brand awareness -- taking medical progress as an example,” Editorial journal, pp. 59-62，2019.
[8] M. Yu, “Transformation and development of content productization and brand operation of popular science journals” Research on Chinese Sci tech journals, vol. 24, pp. 633-638, 2018.
[9] Y. Gao, “accelerating the scientific and technological innovation of traditional Chinese medicine to promote the construction of a healthy China,” Research on traditional Chinese medicine, vol.33, pp. 6-10, 2020
[10] Z. Zhao, “impact on China's economy and Countermeasures,” China business theory, pp. 19-21, 2020.
[11] G. Xie, “Analysis of crowding of coronavirus disease in China's bond market in 2019,” Journal of Hubei University of Economics (HUMANITIES AND SOCIAL SCIENCES), pp. 34-37, 2020.
[12] Heng Rui Medicine. two thousand and twenty.
[13] The data comes from Eastmoney.