Empirical Study on the Impact of Capital Structure on Profitability in Blockchain Industry-Based on the Data Analysis of 127 Listed Companies

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Abstract. Under the background of the rapid development of the digital economy, a new round of technological revolution represented by blockchain is emerging, and blockchain and other high-tech industries have become the technological support for economic development in the new era, which has attracted the great attention of countries around the world. How does the current capital structure of China's blockchain-listed companies generally affect their profitability? This paper adopts the data indicators of 127 blockchain-listed companies in 2022 for factor analysis and multivariate model regression to further analyze the impact of capital structure on profitability status. The empirical results show that: 1. The gearing ratio and long-term debt ratio of listed companies in China's blockchain industry are negatively correlated with profitability, and the effect of the gearing ratio on profitability is greater compared with the long-term debt ratio; 2. The equity ratio is positively correlated with profitability.

Keywords: equity structure, debt structure, profitability, blockchain, factor analysis, multiple linear regression.

1. Introduction

1.1. Background of the study

Digital economy has become an important engine of global industrial change and economic growth,and digital economy is restructuring the pattern of global industrial development. Digital economy is the road to China's sustainable development in the future,and blockchain technology is the core technology for the development of digital economy. As an emerging technology with great potential,both domestic and foreign countries have shown great enthusiasm for it,from the introduction of policies to the specific support initiatives of various localities,all of which are actively guiding and promoting the rise of blockchain-related industries. in October 2016," blockchain"was written for the first time as a strategic frontier technology into the"Thirteenth Five-Year Plan", which is the first time that blockchain has been included in the"Thirteenth Five-Year Plan"."In October 2019, blockchain was designated as an"important breakthrough in independent innovation of core technologies", and central ministries and commissions such as the Ministry of Justice, the Ministry of Rural Development and Agriculture, and the Ministry of Education have explicitly proposed to promote the application of blockchain in the fields of judiciary,agriculture, education, etc. Beijing and Shanghai have also actively guided and promoted the rise of blockchain-related industries. In April 2020, the National Development and Reform Commission (NDRC) officially announced that blockchain would be included in the scope of"new infrastructure"to promote the rapid development of blockchain technology application and industrial integration;in June 2021, the Ministry of Industry and Information Technology(MIIT)issued the"Guidelines on Accelerating the Promotion of Blockchain in China". In June 2021, the Ministry of Information Technology issued the"Guiding Opinions on Accelerating the Application of Blockchain Technology and Industrial Development", which makes it clear that by 2025, the comprehensive strength of the blockchain industry will reach the world's advanced level, and the industry will take shape. Blockchain applications permeate many fields of the economy and society,and a number of well-known products are cultivated in the fields of product traceability, data circulation, supply chain management, etc., and scenario-based

demonstration applications are formed. From the perspective of capital resources, from 2016 to 2018, the number and amount of financing in China's blockchain industry showed a rising trend in general. In 2018, under the impact of the wave of virtual currencies, the bubble of China's blockchain industry swelled extremely fast, and the number and amount of investment and financing in China's blockchain industry reached a peak; after 2018, the market was initially cleared, the bubble weakened, the number and amount of blockchain financing dropped significantly, and the industrial development returned to rationality. In addition, due to the external uncertainty caused by the new crown epidemic,the number of investments declined significantly in 2020 and 2021. Therefore, under the rapidly changing market situation, it is more and more important for the blockchain industry to adjust the financing channels and optimize the capital structure.

1.2. Significance of the study

Capital structure refers to the combination structure of all the capital value of the enterprise in a broad sense, and a narrow sense, it refers to the proportion relationship between the long and short-term liabilities and equity capital of the enterprise, whether it is reasonable or not will have a direct impact on the enterprise's operating performance and long-term development.Conversely, profitability is the embodiment of an enterprise's comprehensive ability to earn profits. At present, the blockchain industry is in the early stage of development, the underlying key technologies still have difficulties that have not yet been overcome, the relevant industry pattern has not yet matured, and the commercialization from technology to application scenarios is still in the process of advancing, so how to achieve the optimal capital structure to adapt to the needs of the development of the blockchain industry is an urgent problem to be solved. Through empirical evidence, this paper analyzes the impact of the capital structure of blockchain-listed companies on profitability and puts forward targeted suggestions to promote the profitability of China's blockchain-listed companies according to the results of the study, to enhance the comprehensive strength of the blockchain-listed companies, promote the in-depth integration of the blockchain and the economy and society, and help the construction of digital China.

2. Status of the blockchain industry

2.1. Current status of capital structure

Table 1 provides a descriptive statistical analysis of the capital structure of 127 sample companies in 2022, as shown in the following table: among all the capital structure measures of blockchain-listed companies, the maximum value of the gearing ratio is 0.935, and the minimum value is 0.046, and the maximum value of the equity ratio is 0.952, and the minimum value is 0.065, which shows that there is a large difference in the capital structure among the blockchain companies. The highest mean value is the equity ratio, reaching 0.598, which is more moderate, indicating that most enterprises are more stable in operation and have stronger solvency; the smallest mean value is the long-term debt ratio, reaching 0.073, and the long-term debt ratio of the blockchain companies is generally lower, indicating that the enterprises have stronger solvency and shareholders rights and interests are better protected. And from the standard deviation of each indicator, the least discrete is the long-term debt ratio.

Table 1. Descriptive statistics of capital structure

	Gearing	Interest rate	Long-term debt ratio
Average value	0.401509	0.598385	0.073162
Standard deviation	0.1970384	0.1970632	0.0918194
Minimum value	0.0456	0.0653	0
Maximum values	0.9348	0.9524	0.6551

2.2. Current status of profitability

Table 2 provides a descriptive statistical analysis of the profitability of the 127 sample companies in 2022, as shown in the following table: among all blockchain-listed companies' profitability measures, the mean value of net assets per share is the highest among the indicators reflecting profitability, reaching 5.848, and the mean value of gross profit margin is relatively high, reaching 0.30907, which indicates that the companies are generally able to control the cost well and priced reasonably, enhancing the profitability of the company in the production and sales process. The smallest average value is the net profit margin,reaching-0.02208, while its maximum value is 0.6815 and the minimum value is-1.1135, indicating that there are large differences in the level of operation and management among blockchain enterprises, and some enterprises are in financial loss. The maximum value of return on net assets is 0.3106, the minimum value is-1.3090, and the mean value is-0.01303. The return on net assets of blockchain-listed companies is generally low, indicating that most blockchain enterprises are weak in the ability to utilize their capital to obtain investment income and that the profitability of shareholders' equity is poorer; and that the mean value of the return on total assets is 0.00177, indicating that the asset of most blockchain enterprises utilization efficiency is low, the profitability of total assets is low, and the overall profitability and competitive strength is weak. And in terms of the standard deviation of each indicator, the one with the smallest degree of dispersion is the return on assets.

Table 2. Profitability descriptive statistics

	Average value	Standard deviation	Minimum value	Maximum values
Earnings per share	0.1567	0.83123	-3.72	3.1
Net asset per share	5.8482	4.91967	-0.19	25.13
Return on net assets	-0.013034	0.1804759	-1.309	0.3106
Return on total assets	0.001776	0.0740863	-0.2082	0.1962
Return on invested capital	0.005273	0.107261	-0.4093	0.2592
Gross margin	0.309076	0.1728483	-0.0009	0.7885
Net interest rate	-0.022086	0.2370848	-1.1135	0.6815
Operating profit margin	-0.006551	0.2208041	-0.9575	0.7855
Return on assets	0.008591	0.0740563	-0.1874	0.2457

3. Empirical analysis of the impact of capital structure on profitability

3.1. Research hypothesis

3.1.1. Research hypotheses on the impact of debt structure on profitability

The impact of debt structure on profitability is mainly manifested in the following 2 ways:1)Modified MM theory, under the consideration of income tax, since the interest on debt is a tax-exempt expense, it can be deducted from pre-tax profit, thus indirectly increasing the profit and value of the company. However, the trade-off theory points out that the debt ratio is not as high as it should be. When it reaches a certain peak, the loss of debt enhancement will exceed the tax deduction gain from raising debt, which will increase the company's financial risk and the risk of bankruptcy. ② Signaling Theory: Investors can only measure the value of the enterprise based on the enterprise's public balance sheet and other statement data and dividend policy because of information asymmetry. Generally speaking, when the enterprise agent increases the debt structure, it indicates that the enterprise's capital structure improves, thus releasing a better signal of enterprise value to attract investment, which will further enhance the enterprise value, so the debt on the company's profitability should have a positive effect. Therefore, debt should have a positive effect on the profitability of the company.

From the data on the gearing ratio of blockchain-listed companies, the profitability of companies with a gearing ratio above 70%is generally weaker, such as American Apparel Company whose gearing ratio is as high as 93.48%, and its return on net assets is-130.90%; while the profitability of

companies with gearing ratio between 20%and 40%is generally better, for example, the top five companies in terms of return on total assets'gearing ratio are 36.23%,25.81%,30.22%,18.13%, and 22.85%respectively.In summary, this paper proposes hypothesis H_1.

H_1:When the gearing ratio of blockchain-listed companies is between 20%and 40%, gearing ratio is positively correlated with profitability.

3.1.2. Research hypotheses on the effect of equity structure on profitability

Agency cost theory suggests that based on information asymmetry, corporate shareholders, creditors, and operating agents have conflicting interests driven by their respective goals and objectives, generating a series of agency costs such as monitoring costs, constraint costs, and residual losses. According to the theory of control, the ultimate true operational controller of the enterprise depends on the checks and balances between managers, shareholders, and competitors. When shareholders' power is concentrated, it may create greater supervisory pressure on managers, thus urging them to improve management methods, reduce corporate agency costs, and improve corporate profitability. However, over-concentration of shareholdings may also result in the majority shareholders being driven by the goal of realizing their interests to encroach on the interests of minority shareholders, thus hindering the development of the company and reducing its profitability.

From the data on the equity ratio of blockchain listed companies, the profitability of companies with an equity ratio between 30%and 60%is generally weak, and the profitability of companies with an equity ratio between 60-80%is generally strong. For example, the equity ratios of the top three companies in terms of return on net assets are 63.69%,74.07%, and 69.93%, respectively; In comparison more than half of the companies in the top ten companies in terms of return on total assets have equity ratios that lie in the range of 60%-80%. In summary, this paper proposes hypothesis H_2.

H_2:When the equity ratio of listed companies in the blockchain industry is between 60%and 80%, the equity ratio is positively related to profitability.

3.2. Description of data indicators

As of the end of 2022, there were a total of 239 listed companies in China's blockchain industry, and to ensure the accuracy and effectiveness of the relevant data, this paper conducted the following screening when selecting the research samples: Due to the diversification of the operations of many blockchain listed companies, this paper only selected listed companies with a three-star correlation with blockchain information technology and above; excluded the companies that were dealt with by ST; and ruled out companies that had incomplete data on the indicators or companies with outliers. Therefore, this paper finally selected 127 listed companies as the empirical research object, with 2022 as the research period. The data used in the study are mainly from the financial terminal of GF Securities, and the data processing is done by using EXCEL and SPSS26.0 software.

Many financial indicators reflect the profitability of a company and there is a strong correlation between them, if only a single indicator is used for the study of profitability there is a certain one-sidedness, and it is difficult to make a comprehensive interpretation of the profitability of the enterprise. Therefore, this paper solves this problem by adopting the factor analysis method to provide a comprehensive score of corporate profitability. Based on the representativeness and availability of data, this paper selects equity ratio, asset liability ratio and long-term responsible ratio as explanatory variables to measure the capital structure, and by constructing the principal component analysis model of profitability, it analyzes the 127 blockchain listed companies ‘earnings per share, net assets per share, return on net assets, return on total assets, return on invested capital, gross profit margin, net profit margin, operating profit margin, and compensation rate of assets Nine financial indicators are correlation analyzed, principal components are extracted, and the composite score of the principal components is used as an explanatory variable to measure profitability, and finally a panel regression analysis is conducted based on the composite computed score and the capital structure data, and then the impact of the capital structure of blockchain-listed companies on profitability is further dissected based on the results of the panel regression. The relevant variables are explained as follows.

Table 3. Interpretation of relevant variables

Variable type	Variable name	Notation	Variable Calculation Formulas
Profitability	Earnings per share	Y_1	Net profit/total shares
	Net asset per share	Y_2	Total shareholders 'equity/total shares
	Return on net assets	Y_3	Net profit/average balance of shareholders 'equity
	Return on total assets	Y_4	Net profit/average balance of total assets
	Return on invested capital	Y_5	Operating profit before interest and after tax/invested capital
	Gross margin	Y_6	(Main operating income-main operating costs)/main operating income
	Net interest rate	Y_7	Net profit/main operating income
	Operating profit margin	Y_8	Operating profit/operating income
	Return on assets	Y_9	(Total profit+finance costs)/average total assets
Capital structure	Gearing	X_1	Total liabilities/total assets
	Long-term debt ratio	X_2	Total non-current liabilities/total assets
	Interest rate	X_3	Total shareholders' equity/total assets

The empirical part of this paper is divided into two parts: ① Factor analysis: since there are more profitability indicators, this paper adopts the factor analysis method, which calculates the profitability composite score of 127 listed banks according to the analyzed coefficients, and the profitability level of listed companies is measured by this composite score. ② Multiple linear regression analysis: the comprehensive calculation score as F, capital structure as X (capital debt ratio X_1; long-term debt ratio X_2; equity ratio X_3) into the multiple linear regression model, and then further analyze the impact of the capital structure of the blockchain company on the profitability of the situation according to the results of multiple linear regression.

3.3. Factor analysis

3.3.1. Extraction of principal components

In this paper, nine profitability analysis indicators are selected to evaluate the profitability of listed companies, and these profitability analysis indicators are analyzed by correlation matrix, and the results are shown in Table 4:The strongest correlation is between the return on total assets and the return on assets, whose correlation coefficient can be up to 0.971.The weakest correlation is between the net assets per share and the gross profit rate, whose correlation coefficient can be up to 0.245.And the correlation coefficients of all correlation coefficients are greater than 0.2, the correlation between indicators is strong, so these indicators of profitability are very suitable for factor analysis.

Table 4. Phase matrix

	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9
Y_1	1	0.555^{**}	0.635^{**}	0.753^{**}	0.734^{**}	0.409^{**}	0.714^{**}	0.655^{**}	0.674^{**}
Y_2	0.555^{**}	1	0.339^{**}	0.363^{**}	0.334^{**}	0.245^{**}	0.283^{**}	0.340^{**}	0.366^{**}
Y_3	0.635^{**}	0.339^{**}	1	0.823^{**}	0.885^{**}	0.284^{**}	0.747^{**}	0.755^{**}	0.789^{**}
Y_4	0.753^{**}	0.363^{**}	0.823^{**}	1	0.965^{**}	0.349^{**}	0.869^{**}	0.871^{**}	0.971^{**}
Y_5	0.734^{**}	0.334^{**}	0.885^{**}	0.965^{**}	1	0.275^{**}	0.825^{**}	0.815^{**}	0.946^{**}
Y_6	0.409^{**}	0.245^{**}	0.284^{**}	0.349^{**}	0.275^{**}	1	0.391^{**}	0.394^{**}	0.282^{**}
Y_7	0.714^{**}	0.283^{**}	0.747^{**}	0.869^{**}	0.825^{**}	0.391^{**}	1	0.954^{**}	0.782^{**}
Y_8	0.655^{**}	0.340^{**}	0.755^{**}	0.871^{**}	0.815^{**}	0.394^{**}	0.954^{**}	1	0.837^{**}
Y_9	0.674^{**}	0.366^{**}	0.789^{**}	0.971^{**}	0.946^{**}	0.282^{**}	0.782^{**}	0.837^{**}	1

**. At the 0.01 level (two-tailed), the correlation was significant.

After the initial test using a correlation matrix, this paper further adopts the fitting test before factor analysis-KMO and Bartlett's test to analyze the appropriateness of principal component analysis. The KMO statistic is used to observe the value of the correlation coefficient and partial correlation

coefficient, which can reflect the strength of correlation of the original variables, and its value ranges between 0 and 1, when the KMO is less than 0.5, the variables are not suitable for factor analysis, and the results of factor analysis are better. It ranges from 0 to 1. When KMO is less than 0.5, it indicates that the variables are not suitable for factor analysis; the larger the KMO value is, the stronger the correlation of the factors is, the more suitable it is for factor analysis and the better the results of factor analysis are; on the contrary, the smaller the KMO value is, it indicates that the original variables are not suitable for factor analysis. Bartlett's spherical test is to test whether the correlation coefficient matrix is a unit array, that is, to test whether each variable is independent, if the original hypothesis is rejected, it means that each variable is not independent, and factor analysis can be done. According to the test results reflected in Table 5, the KMO value is 0.725, which indicates that the original variables selected in this paper are suitable for factor analysis; the Sig. of Bartlett's spherical test takes the value of 0.000, which indicates the rejection of the hypothesis, and it also proves that the indicators are suitable for factor analysis.

Table 5. KMO and Bartlett's test

Kmo sample suitability quantity		0.725
Bartlett's test of sphericity	Approximat echi-square (math.)	1767.477
	Degrees of freedom	36
	Significance	0.000

This paper adopts the maximum variance method to extract the common factor, as shown in Table 6, the principal component factor that extracts the information of each profitability index is relatively high, and the extraction ratio of the return on total assets is the highest, reaching 0.960.The extraction ratio of the gross profit margin is the lowest, reaching 0.531.The degree of the original information contained in all the indexes is expressed by the extracted common factor is more than 50%, which indicates that the extraction effect is relatively good, and the common the factor the ability to explain each indicator is stronger and the explanation of the original information is more adequate.

Table 6. Common factor variance

	Initial	Extraction
Earnings per share	1	0.762
Net asset per share	1	0.669
Return on net assets	1	0.783
Return on total assets	1	0.96
Return on invested capital	1	0.944
Gross margin	1	0.531
Net interest rate	1	0.845
Operating profit margin	1	0.851
Return on assets	1	0.895

The main explanatory factors are screened, and the results are shown in Figure 7: Based on the factor extraction condition with an eigenvalue greater than 1, this paper extracts two common factors, the first one with an eigenvalue of 5.400 and the variance contribution rate of 60.001%, and the second one with eigenvalue of 1.840 and the variance contribution rate of 20.441%, with the cumulative variance contribution rate of 80.442%, which explains 80.442%of information content of the original nine The cumulative variance contribution rate is 80.442%, which explains 80.442%of the information content of the original 9 indicators and can well reflect the company's comprehensive profitability, and thus can replace the original 9 financial indicators that reflect the company's profitability.

Table 7. Total variance explained

Ingredient	Initial eigenvalue			Extract the sum of the squares of the loads			Rotational load sum of squares		
	Total	Percentage of variance	Cumulative%	Total	Percentage of variance	Cumulative%	Total	Percentage of variance	Cumulative%
1	6.227	69.187	69.187	6.227	69.187	69.187	5.4	60.001	60.001
2	1.013	11.255	80.442	1.013	11.255	80.442	1.84	20.441	80.442
3	0.803	8.92	89.362						
4	0.342	3.804	93.166						
5	0.305	3.39	96.556						
6	0.241	2.682	99.238						
7	0.046	0.512	99.75						
8	0.017	0.194	99.944						
9	0.005	0.056	100						

The results of the rotated component matrix are shown in Table 8:Principal factor 1 mainly affects seven variables such as return on capital, return on total assets, return on assets, net interest margin, operating profit margin, return on net assets, and earnings per share, of which, principal factor 1 has the greatest influence on return on invested capital, with a loading of 0.952, followed by return on total assets and return on assets, with a loading of 0.944,0.923; main factor 2 mainly affects the two variables of net assets per share and gross profit margin, with loadings of 0.802 and 0.709 respectively. in the table, the loadings of the nine variables are all greater than 0.5, so the two main factors can explain the original variables better.

Table 8. Component matrix after rotation

	Ingredient	
	1	2
Return on invested capital	0.952	
Return on total assets	0.944	
Return on assets	0.923	
Net interest rate	0.880	
Operating profit margin	0.880	
Return on net assets	0.861	
Earnings per share	0.638	0.596
Net asset per share		0.802
Gross margin		0.709

3.3.2. Profitability composite score

Finally, based on the matrix of component score coefficients in Table 9, the principal component expression can be determined as(ZY_i is the standardized value of Y_i):

$F_1=0.006ZY_1-0.195ZY_2+0.190ZY_3+0.197ZY_4+0.219ZY_5-0.165ZY_6+0.177ZY_7+0.172ZY_8+0.206ZY_9$

$F_2=0.318ZY_1+0.638ZY_2-0.086ZY_3-0.062ZY_4-0.121ZY_5+0.557ZY_6-0.040ZY_7-0.027ZY_8-0.099ZY_9$

Table 9. Matrix of component score coefficients

	Ingredient	
	1	2
Earnings per share	0.006	0.318
Net asset per share	-0.195	0.638
Return on net assets	0.190	-0.086
Return on total assets	0.197	-0.062
Return on invested capital	0.219	-0.121
Gross margin	-0.165	0.557
Net interest rate	0.177	-0.04
Operating profit margin	0.172	-0.027
Return on assets	0.206	-0.099

After calculating the scores of the principal component factors F1, F2, and using the variance contribution ratio of the principal component factors as the weights, the composite score of the profitability of the listed companies in the outgoing blockchain industry is calculated by the following formula: $F=(60.001\%F_1+20.441\%F_2)/80.442\%$

From Table 10, Table 11, and Table 12, it can be found that:①The top3 comprehensive scores of profitability of listed companies in the blockchain industry are, in order, Ziguang GuoWei, Zhongke Jiangnan, and Antong Holding. Their gearing ratios are 36.23%,30.22%, and 25.81%, respectively, which are in the range of 20%-40%, which suggests that when a company's gearing ratio is in the range of 20%-40%, its profitability is generally stronger, consistent with hypothesis H_1 in the previous section. Among the top5 listed companies in the blockchain industry, Oriental Fortune has the highest gearing ratio of 69.23%, and its return on net assets is the lowest among the five companies; Sanwei Xin'an has the lowest gearing ratio of 4.56%, and its return on net assets is 19.32%, which is relatively high, suggesting that the higher the gearing ratio of a listed company in the blockchain industry, the weaker its profitability is likely to be. ② The equity ratios of top3 listed companies in the blockchain industry are 63.69%,69.93%, and 74.07%in order, indicating that when the equity ratio of listed companies in the blockchain industry is located in the range of 60%-80%, their profitability is generally strong, which is consistent with the hypothesis of H_2. Among the top5 listed companies in the blockchain industry, Oriental Fortune's equity ratio is the lowest, reaching 30.77%, and Sanwei Xin'an's equity ratio is the highest, as high as 95.24%, which indicates that in the blockchain industry, when a company's gearing ratio is high and its equity ratio is low, or its gearing ratio is extremely low and its equity ratio is extremely high, the company's profitability will be affected to some extent negatively.

Table 10. Blockchain listed companies top5

Company identification	ZiGuang Guowei	Zhongke Jiangnan	Antong Holdings	Oriental Fortune	Sanwei Xin'an
Aggregate score	2.01	1.61	1.57	1.18	1.17
Comprehensive ranking	1	2	3	4	5

Table 11. Top5 Profitability of Blockchain Listed Companies

	ZiGuang Guowei	Zhongke Jiangnan	Antong Holdings	Oriental Fortune	Sanwei Xin'an
Earmings per share	3.10	2.67	0.54	0.65	1.82
Net asset per share	11.21	14.31	2.26	4.93	24.48
Return on net assets	0.3106	0.2254	0.2690	0.1440	0.1932
Return on total assets	0.1962	0.1522	0.1941	0.0429	0.0878
Return on invested capital	0.2592	0.2302	0.2591	0.0434	0.0927
Gross margin	0.6380	0.5844	0.3058	0.6650	0.7547
Net interest rate	0.3708	0.2864	0.2552	0.6815	0.3155
Operating profit margin	0.4048	0.3123	0.2716	0.7855	0.3264
Return on assets	0.2138	0.1564	0.2457	0.0487	0.0896

Table 12. Capital structure of top5 listed companies in blockchain industry

	ZiGuang Guowei	Zhongke Jiangnan	Antong Holdings	Oriental Fortune	Sanwei Xin'an
Gearing	0.3623	0.3022	0.2581	0.6923	0.0456
Interest rate	0.6369	0.6993	0.7407	0.3077	0.9524
Long-term debt ratio	0.1354	0.0014	0.0727	0.0602	0.0099

3.4. Multiple linear regression analysis of capital structure on profitability

In this paper, the profitability composite score of 127 listed companies in the blockchain industry is taken as the dependent variable F. The gearing ratio and long-term debt ratio, which measure the bond structure, are taken as the independent variables X_1 and X_2, respectively. The equity ratio, which measures the equity structure, is taken as X_3, and the multivariate linear regression model is set up to further study the impact of the capital structure on the profitability. The model expressions are as follows: $F=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\varepsilon$ (where$\beta_0$represents the constant term, β_1, β_2, and β_3 represent the regression parameters of the independent variables, and ε represents the random variables).

After analyzed by SPSS multiple linear regression, the model expression is: $F=-0.509-5.504X_1-0.642X_2+0.929X_3$, the overall decidable coefficient R^2 is 17.2%, indicating that the degree of influence of the three factors, namely, the gearing ratio, the long-term gearing ratio, and the equity ratio on the profitability is roughly 17.2%. And the regression results show that the significance level of the model's multiple linear regression results is 0.010, which is lower than the significance level of 0.05, indicating that the model as a whole is significant. However, due to the existence of multicollinearity between the gearing ratio and long-term gearing ratio, the accompanying probability of the t-test value of both the gearing ratio and long-term gearing ratio is greater than 0.05, which indicates that both the gearing ratio and long-term gearing ratio are not significant at the 5%confidence level.

From the regression results, ① the gearing ratio is negatively correlated with the company's profitability. For every unit increase in gearing ratio, profitability will be reduced by 5.504 units, and its impact on profitability is the greatest; ② long-term gearing ratio is also negatively correlated with the company's profitability, every increase in long-term gearing ratio, profitability will be reduced by 0.642 units;③equity ratio is positively correlated with the profitability of the company, for every unit increase in equity ratio, the profitability will increase by 0.929 units accordingly.

4. Conclusions of the study and recommendations for countermeasures

4.1. Conclusions of the study

4.1.1. Differences in debt structure are negatively correlated with profitability

From the empirical results, the two data indicators measuring the debt structure, asset-liability ratio and long-term liability ratio are negatively correlated with profitability, which is inconsistent with the research hypothesis H_1 and the absolute value of the regression coefficient of the asset-liability ratio is 5.504, and the absolute value of the regression coefficient of the long-term liabilities ratio is 0.642, and the effect of the asset-liability ratio on the profitability is much larger than that of the long-term liabilities ratio, so the blockchain listed companies to adjust the asset-liability ratio has a greater impact on the company's profitability, and appropriately increasing the proportion of short-term liabilities and reducing the proportion of long-term liabilities will have a certain positive impact on the company's profitability. Although the empirical results show that the lower the asset-liability ratio and long-term liability ratio, the higher the company's profitability, in reality, it is not the lower the liability ratio, the better, the appropriate proportion of liabilities can play the role of interest tax reduction and financial leverage to improve the company's operating performance.

4.1.2. Differences in equity structure are positively correlated with profitability

From the empirical results, the equity ratio, a data indicator that measures the equity structure, is positively correlated with profitability, consistent with the research hypothesis H_2 that the higher the equity ratio, the higher the profitability. From the data of blockchain industry, it can be found that the equity rate of Meibang Clothing is the lowest, which reaches 6.53%.Its comprehensive score of profitability is also the lowest, and the equity rate of Sanwei Xin'an is the highest, which is as high as 95.24%.Its comprehensive score of profitability is 1.17, which is ranked the fifth among all the blockchain enterprises, so the higher the equity rate of the blockchain enterprises is, the more likely to enhance the profitability of the company.

4.2. Recommendations for countermeasures

4.2.1. Controlling debt ratios and optimizing the debt structure

According to the analysis of empirical results, gearing ratio and long-term debt ratio are negatively correlated with profitability, but according to the data on the gearing ratio of the blockchain industry, it can be seen that about 80%of blockchain enterprises have gearing ratio in the range of 20%-70%, so enterprises should not only be alert to the possibility of extremely high bankruptcy cost and agency cost offsetting the return of debt financing brought by too high gearing but also avoid the gearing ratio is too low to meet the possibility of business production as well as reproduction. Blockchain enterprises should all the more recognize that the blockchain industry belongs to the high-tech industry, which often faces greater financial risks and market risks than traditional general enterprises, and its key financing behaviors tend to be shorter in the cycle and change very quickly. Therefore, blockchain enterprises should reasonably control their debt ratios, appropriately increase the proportion of short-term liabilities and reduce the proportion of long-term liabilities, maximize the optimization of the debt structure, and enhance the company's profitability. Ability.

4.2.2. Enhance enterprise value and strengthen business management

The empirical results show that the equity ratio is positively correlated with profitability, and the higher the equity ratio, the higher the profitability of the company. The equity rate of a company is closely related to its equity financing ability, and the stronger the company's equity financing ability, the higher its equity rate is. If a listed company wants a long-lasting, sound, and sustainable equity financing ability, it must focus on enhancing enterprise value, strengthening enterprise operation and management, enhancing investor confidence, and letting investors look favorably at the company's future. Blockchain-listed companies can adopt a product differentiation strategy, increase technology investment, improve product quality and performance, make their products more superior to similar

products, increase enterprise core profit, and enhance enterprise value. The high-risk nature of the blockchain industry requires blockchain-listed companies to broaden a variety of fundraising channels, select appropriate fundraising strategies, fundraising timing, scale, price and issuance methods, etc., to reduce the cost of equity financing as much as possible, and to strengthen the management of assets, enhance the efficiency of the utilization of assets, to achieve the optimal level of capital structure as much as possible, and to improve the level of corporate profitability.

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