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A study of corporate merger and acquisition valuation based on data mining techniques: an empirical analysis in the context of big data

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Abstract In the context of big data era, the traditional valuation methods for company mergers and acquisitions have limitations and are difficult to comprehensively consider the uncertainties in enterprise value. Based on the background of big data, this study combines data mining technology and real options theory to construct an assessment model for M&A valuation. Firstly, an empirical study is conducted on information technology service company S through financial index analysis, and data mining technology is used to analyze its four financial indexes, namely, development ability, solvency, operation ability and profitability; secondly, a real option valuation model is used to make valuation calculations. The results show that the valuation result of the real option valuation model in the M&A valuation of S Company is 5,711,100,000 yuan, which is 165.31% value-added over the book value of 2,152,600 yuan; the discrepancy rate compared with the valuation result of the income approach of 5,680,000 yuan is only 0.55%; and the discrepancy rate compared with the pricing of 5,780,000 yuan of the actual deal is 1.19%, which is lower than that of the income approach of 1.73%. The study concludes that the real option valuation model not only considers the uncertain assets not reflected in the book value of the enterprise, but also considers the option value in the M&A transaction, and its valuation results are closer to the actual transaction pricing, which can be used as an effective supplement and validation of the traditional valuation method, and provide a more scientific and reasonable theoretical basis and methodological tools for the company's M&A decision-making under the background of big data.

Index Terms Data mining, Corporate mergers and acquisitions, Real options, Valuation model, Big data, Financial indicators

I. Introduction

Company mergers and acquisitions is the abbreviation of company mergers and acquisitions. Company mergers and acquisitions is a necessary way for companies to control costs internally, seek resource integration externally, improve the layout of the industrial chain, and realize diversified development [1], [2]. We will encounter a lot of M&A cases around us during the market boom period, there are vertical upstream and downstream of the industry, as well as horizontal expansion, and there are also foreign companies occupying the domestic market through mergers and acquisitions, all of which are different manifestations of M&A methods [3]-[5]. Corporate mergers and acquisitions bring the effect of economies of scale and market power to the company at the same time, but also bring the reduction of relative related costs [6]. In the completion of corporate mergers and acquisitions and reorganization of this step, mergers and acquisitions activities in the vital link is how to the enterprise on the price of the agreement, the choice of pricing method is the focus of the problem, coupled with the reasonable price of the negotiation and determination of the transaction price of these three factors, can promote the rapid development of the enterprise [7]-[10]. The impact of unreasonable pricing methods is to end up in failure in terms of corporate M&A transactions, and the normal operation of the enterprise will be implicated by the later long-term operation, but also negatively affects the development of the enterprise [11]-[13]. Therefore, scientific and reasonable valuation of company M&A directly becomes the basis of M&A decision-making, but also the key to determine the success or failure of the investment [14]. The basic value judgment of M&A decision is whether it can create more value after controlling or acquiring the target company, and both the acquirer and the counterparty can obtain positive returns is the basic premise of M&A valuation and smooth implementation [15]-[17]. The study of the company's value assessment method especially for unlisted companies, has a practical significance to guide investors.

In the context of global economic integration, corporate mergers and acquisitions (M&A) have become an important strategic choice for rapid expansion and integration of resources. Corporate M&A valuation is the core

link in M&A transactions, which is directly related to the success or failure and effect of M&A transactions. Traditional enterprise value assessment methods mainly include the income method, market method and asset-based method, although each of these methods has its own advantages, there are certain limitations in the application process. The income approach relies too much on the prediction of future cash flow, which makes it difficult to accurately assess the enterprise value under the high uncertainty environment; the market approach is affected by the selection of comparable companies, which limits its applicability; and the asset-based approach tends to neglect the enterprise's future development potential and the value of intangible assets. Especially for knowledge-intensive enterprises such as information technology service enterprises, whose value largely comes from intangible assets and growth potential not reflected in the books, traditional valuation methods are difficult to comprehensively and accurately assess the true value of such enterprises. The arrival of the big data era brings new opportunities and challenges to the field of enterprise valuation. On the one hand, the accumulation of massive data and the advancement of analyzing technology make it possible to assess the enterprise value based on richer information sources; on the other hand, how to extract valuable information from the complex and changeable data and construct scientific and reasonable valuation models is still an urgent problem to be solved in theory and practice. As an innovative valuation method, the real options theory breaks through the limitations of the traditional discounted cash flow method, takes the flexibility of management decisions and strategic value into consideration, and is able to better assess the value of the enterprise in a high uncertainty environment. However, parameterization of real options models has been a difficult application, and data mining techniques can precisely make up for this deficiency. This study will start from the combination of data mining and real options theory to explore how to construct a more scientific and reasonable company M&A valuation model in the context of big data. Firstly, we sort out the relevant theories and methods of M&A valuation to lay the theoretical foundation for the subsequent research; secondly, we construct the M&A valuation model based on the real options theory, and make clear the method of determining the parameters of the model; thirdly, we take the information technology service enterprise S as the object of the research, and analyze the financial indexes of the enterprise by using the data mining technology, and input the relevant parameters into the real options valuation model for the valuation calculation; finally, the real options valuation model is used to calculate the valuation of the enterprise. Finally, the valuation results of the real options valuation model are compared and analyzed with the valuation results of the traditional income approach and the actual transaction pricing to verify the validity and reasonableness of the model and put forward relevant suggestions. Through this study, it is expected to provide new theoretical perspectives and methodological tools for the valuation of M&A under the background of big data, and help enterprises make more scientific and reasonable M&A decisions.

II. Real Options Valuation Modeling for Corporate M&A Valuation

II. A.Big data-based business valuation

The use of big data allows for quick and accurate evaluation of corporate brand value, more accurate valuation of companies, helps companies measure the financial impact of brand investments, and helps corporate management to explore ways to enhance their brands. Moreover, it can inspire investor confidence, as well as facilitate sound decision-making for resource allocation. The accounting system for business results should be responsive to the changing times and establish new methods for intangible asset identification and recognition. Intangible asset identification and recognition is complex, and establish the method of identifying and recognizing intangible assets of enterprises under the perspective of big data. Customer assets are more important in the development of enterprises, mining for financial big data, we can get the main customer resources. Using big data to help businessmen assess customer value, which is very important for the enterprise financial management work, the use of data mining to analyze the customer value begins, such as customer loyalty, willingness to pay, satisfaction with the enterprise, willing to continue to choose the retention rate and other indicators, constructed the enterprise customer value evaluation model, the model will be considered into the process of enterprise value assessment. In this paper, we try to use data mining as the technical basis to construct the evaluation model for the valuation of company mergers and acquisitions.

II. B.Mergers and acquisitions and valuation and their underlying methodologies

II. B. 1) Mergers and acquisitions and valuation

(1) Theory of mergers and acquisitions

Mergers and acquisitions include both mergers and acquisitions, that is to say, inter-enterprise mergers and acquisitions are the acquisition of assets or shares of another legal entity by a corporate legal entity on the basis of equality and voluntariness, equal price and compensation in a specific economic manner. Merger is an act of combining two or more separate companies or enterprises into one company. The act of merger means that the merging party purchases the equity or assets of the merged party with its own monetary funds or marketable

securities, or issues shares to the shareholders of the merged party in exchange for their shares in the merged party, in order to acquire the assets and liabilities of the merged party. Acquisition, on the other hand, is an investment behavior in which an enterprise acquires all or part of the assets or equity of an acquired enterprise by acquiring the property or shares of another enterprise in order to achieve a certain business objective. Acquisition has both economic and legal significance: from the economic point of view, the essence of the acquisition is the acquisition of control, which refers to the loss of control over the company's operations by the original investors. From the legal point of view, the essence of the acquisition is the purchase of the shares of the acquired company. According to the provisions of the Securities Law, the acquisition refers to the behavior of acquiring the shares of a listed company with the shares held by the company in the form of a tender offer.

(2) Value Appraisal Theory

Value appraisal is to regard the appraised object as an organism, according to the property owned and disposable by the company held or controlled by the appraised object, to adopt a scientific appraisal method with the business purpose of maximizing the value of the company, and to make an overall evaluation and estimation of the overall economic value of the enterprise at a certain point of time in the future, on the basis of comprehensively considering the profitability of the enterprise during the future operation period. The evaluation of a company's assets Compared with the evaluation of individual assets of a company, the evaluation of the overall value of an enterprise is a holistic, multi-perspective, uncertain and systematic exercise.

II. B. 2) Basic M&A valuation methodology

(1) Income approach

In the actual merger and acquisition valuation, the more common income method: discounted dividend method and discounted cash flow method.

a) Dividend discount method

Dividend discount model (DDM) [18], that the value of the investment in the stock is the present value of all future dividends, expressed in the following formula:

$$V = \sum_{i=1}^{\infty} \frac{D_i}{(1+r)^i} \tag{1}$$

where V = stock value, D_i = expected dividend per share in year i, and r = cost of equity capital.

b) Discounted cash flow method

The discounted cash flow method is to adjust the company's projected cash flows over a future period of time to a value at the present point in time at an appropriate discount rate. The more commonly used discounted cash flow methods are the discounted free cash flow model for businesses (FCFF) and the discounted free cash flow model for equity (FCFE).

(a) The discounted free cash flow model of the firm (FCFF) [19]. This method can be considered as the cash flows controlled by all investors of funds. Investors who provide funds include common stockholders, preferred stockholders, and creditors of interest-paying debt. The basic formula of the discounted free cash flow model of a firm is as follows:

$$V = \sum_{i=1}^{n} \frac{FCFF_i}{(1+WACC)^i} \tag{2}$$

where, V = overall firm value, $FCFF_i$ = firm free cash flow in year i, $WACC$ = WACC.

(b) Discounted free cash flow model of equity (FCFE) [20]. This model considers the shareholders as the acquirers of the company's residual income and the value of the company is attributed to the value of shareholders' equity and excludes the value associated with debt. The cash flow in the discounted free cash flow model of equity is mainly all the money that is left in the company after all the operating expenditures, repayment of liabilities and investment expenditures are completed. The formula for calculating the discounted free cash flow model for equity is:

$$\begin{aligned} \text{Equity free cash flow} = {} & \text{net profit} + \text{depreciation/amortisation} \\ & -\text{increase in working capital} \\ & -\text{capital expenditure} \\ & -\text{repayment of debt principal} \\ & +\text{new issue of debt} \end{aligned} \tag{3}$$

(2) Market Approach

The basic principle applied by the market approach is the principle of market substitution, which means that an ordinary investor must not pay more for an asset than the present value of a similar product in the market. In this way, the value of the target enterprise can be determined by using the same economic indicators to establish a link with the value of a similar appraised company and the value of a comparator, using the following formula:

$$\frac{V_1}{x_1} = \frac{V_2}{x_2} \quad V_1 = \frac{V_2}{x_2} * X_1 \tag{4}$$

where v/x is the relative value ratio, V_1 is the value of the target company, V_2 is the value of the comparable company, and X is the economic parameter chosen for its value ratio calculation.

(3) Asset-based approach

The so-called asset-based method refers to the method of estimating the value of each asset and liability identifiable on or off the balance sheet of the appraised entity at the appraisal basis and calculating the value of the appraised entity on the basis of the net amount of assets less liabilities.

The asset-based approach is based on the theory of asset substitution [21]. If there are assets or liabilities that have a significant impact on the value of the unit under appraisal and are difficult to identify and estimate, the applicability of the asset-based approach should be considered. If the value of the business is assessed on a going concern basis, the underlying asset-based approach should not be used as the sole valuation method.

II. C.Real Options Theory and Valuation Modeling

II. C. 1) Real options theory

Real options are derived from finance and are options where the underlying security is a physical commodity, neither stocks nor futures, and are a flexible investment strategy for managers, allowing them to randomly change their strategy in response to uncertain business environments and to choose the right investment opportunities based on market movements.

The basic feature of real options is to view the business as a buy option. Moreover, the characteristics of internet companies, such as unpredictable cash flow, uncertain business environment and high growth potential, make internet companies encounter some difficulties when using financial indexes to measure the gap between the share price and the net assets per share, while the real options model can solve this problem well. At the same time, when using other models for enterprise value assessment, it is often easy to ignore the future potential of the assessed enterprise and the uncertainty of the investment environment in which it is located, and the real options valuation model just makes up for this aspect.

In 1973, Prof. Black of Chicago and Prof. Scholes of Stanford proposed real option pricing models, which can be basically divided into two categories: the B-S model and the binomial tree option model.

II. C. 2) Real option valuation models

(1) B-S option pricing model

Black-Scholes option pricing model is proposed for the first time by two professors, Fisher Black and Mellon Scholes, later referred to as the B-S model [22], the proposed model marks the establishment of the modern option theory, but also for the later in the cross-border mergers and acquisitions of enterprise value assessment research and development of a deep foundation. The B-S model has a more stringent basic assumptions:

a) The B-S model is constructed based on a stochastic process, so the stock price wanders randomly and obeys a lognormal distribution.

b) The investor can borrow any money at the risk-free rate, which is known and remains constant.

c) The option is a European call option and the option cannot be executed at will before expiration.

d) The option does not pay dividends until the expiration date.

e) There is no tax or transaction cost impact during the transaction.

f) Short selling is allowed, and the short seller immediately gets the price on the day of short selling.

B-S option pricing model formula is:

$$C_0 = S_0\left[N(d_1)\right] - PV(X)\left[N(d_2)\right] \tag{5}$$

$$PV(X) = Xe^{-r_c t} \tag{6}$$

$$d_1 = \frac{\ln\left(\frac{S_0}{PV(X)}\right)}{\sigma\sqrt{t}} + \frac{\sigma\sqrt{t}}{2} \tag{7}$$

$$d_2 = \frac{\ln\left(\frac{S_0}{PV(X)}\right)}{\sigma\sqrt{t}} - \frac{\sigma\sqrt{t}}{2} \tag{8}$$

where, C_0 =European call option price, S_0 =current stock price, X =exercise price, $PV(X)$ =expected present value of the exercise price, r_c =risk-free interest rate, t =time to expiration of the option in years, $e^{-r_c t}$ =present value coefficient under continuous compounding, σ =standard deviation of stock returns in years with continuous compounding, and $N(d)$ =probability of deviation less than d_1 or d_2 in a standard normal distribution.

When using the B-S model for cross-border M&A enterprise value assessment, S_0 usually refers to the current market value of the target company, X is the agreed M&A price, S_0 is positively correlated with the value of the target assets, and X is negatively correlated with the value of the target assets. t is the time from the date when the enterprise is willing to carry out the M&A to the finalization of the M&A and the completion of the integration with the target company, which is usually a long period, usually 1-5 years, depending on the progress of the acquisition by both parties. σ can be regarded as the volatility of the target company's share price, which is obtained by calculating the annual daily closing price of the target company. r_c is the fixed rate of return without default risk in the region where the target company is located, which is usually expressed as the yield to maturity of the government bonds of the acquired country with the same or similar maturity date as the maturity date of the option.

Advantages of the B-S option pricing model: 1. It breaks through the boundaries of the cash flow generated by the underlying enterprise, and introduces the flexibility of potential decision-making as an option. 2. It fully takes into account the impact of the dynamic external environment on the value of the enterprise, and can be a more realistic and comprehensive estimation of the value of the enterprise. 3. It is suitable to be used in cases of mergers and acquisitions with high operational uncertainty, the need for managers to have a certain degree of flexibility of choice, and the greater complexity of the particularity of the case of the enterprise. The value of the enterprise can be estimated more realistically and comprehensively. 3.

(2) Binomial Tree Option Pricing Model

The binomial tree option pricing model differs from the B-S model in that the B-S model obeys a lognormal distribution, while the binomial tree model obeys a binomial distribution, which means that there are two possibilities of rise and fall in the value of the underlying asset under the binomial tree model, and the two-period option binomial tree is shown in Figure 1. Assuming an upward multiplier of u, there is a probability of P for the end of the period to rise, and the value of the asset after the rise is $S_u = u * S_0$. Similarly, assuming a downward multiplier of d, there is a probability of $1-P$ for the end of the period to fall, and the value of the asset after the fall is $S_d = d * S_0$, $d = 1/u$. At this point, the option price at the end of the period is $MAX(S-X, 0)$.

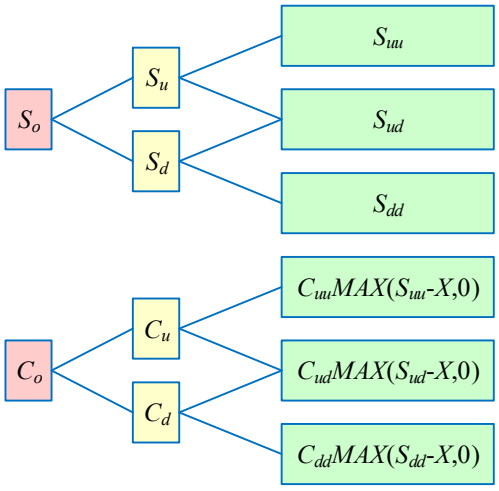

Figure 1: Two period option binary tree

An important assumption of the binomial tree model is that investors are risk-neutral [23]. This means that for the same expected return, the risk-neutral investor will be neutral to investment options with different risk levels, i.e., he will not prefer or dislike any of them, and the investor will choose the portfolio that optimizes the weighting of return and risk, then the discount rate at this point is equal to the risk-free rate. At this point, $r = p*(u-1)+(1-p)*(d-1)$, which leads to $p = \frac{1+r-d}{u-d}$, $1-p = \frac{u-1-r}{u-d}$, the option value at the beginning of the period C_0 is obtained by discounting at the risk-free rate after calculating the desired option value for the current year through the option value at each node at the end of the period, with the following expression:

$$C_0 = \frac{p*C_u + (1-p)*C_d}{1+r} \tag{9}$$

$$C_0 = \frac{\left(\frac{1+r-d}{u-d}\right)*C_u + \left(\frac{u-1-r}{u-d}\right)*C_d}{1+r} \tag{10}$$

$$u = e^{\sigma\sqrt{n}} \tag{11}$$

$$d = \frac{1}{u} = e^{-\sigma\sqrt{n}} \tag{12}$$

where, C_0 = the beginning value of the option, C_u = the value of the option after the rise, C_d = the value of the option after the fall.

After comprehensive consideration, this paper chooses the B-S model as the valuation assessment model of the company M&A in this paper.

III. Empirical analysis of M&A valuation

III. A. Analysis of financial indicators

This paper takes information technology service enterprise S as the research object for empirical research, and takes company Q in its same industry as the reference object, and uses data mining technology to analyze four financial indicators, namely, development ability, solvency, operation ability and profitability, of enterprise S in the recent three years (2022-2024).

III. A. 1) Development capacity analysis

The results of the comparison of the development ability of S company in 2022-2024 are shown in Table 1.The growth rate of net profit of S company is more than 25% in all three years, which indicates that S company has good development ability. From the growth rate of revenue, core profit and net profit, the trend is gradually declining, the main influencing factor is that the growth rate of cost is higher than the growth rate of revenue, and the cost is mainly determined by factors that are difficult for enterprises to control such as manpower in the general environment. The future need to strengthen the control of costs and expenses, take benefits from management. Benchmark enterprise Q company revenue and profit growth in the past two years are larger, but less than half the volume of the S company, catching up still need time. The two companies have exceeded the industry average in all indicators.

Table 1: S company 2022-2024 development ability comparison results

	Year	Revenue/10^4 yuan	Revenue growth rate	Net profit/10^4 yuan	Net profit growth rate
S company	2022	264.85	45.6%	62.34	25.4%
	2023	334.75	26.4%	78.89	26.5%
	2024	441.38	31.9%	99.74	26.4%
Q company	2022	106.48	35.8%	15.46	20.6%
	2023	152.03	42.8%	20.14	30.3%
	2024	192.14	26.4%	25.69	27.6%
Industry average	2022	26.54	25.8%	3.26	32.6%
	2023	37.85	42.6%	4.85	48.8%
	2024	45.62	20.5%	3.95	-18.6%

III. A. 2) Debt service capacity analysis

The comparative results of solvency of S company in 2022-2024 are shown in Table 2. The comparative value of the recognized current ratio is 2, the comparative rate of quick ratio is 1, and the comparative value of gearing ratio is 50%. From the data, it is seen that all the indexes of S Company have reached the excellent value, and it has a very good financing ability, which lays a solid financial foundation for it to develop the market and product outreach. The quick ratio of Dahua is lower than the comparative value, which indicates that the short-term solvency of Company Q is weakened and there is a certain financial risk.

Table 2: S company 2022-2024 solvency ability comparison results

	Year	Liability ratio	Quick ratio	Debt to asset ratio
S company	2022	2.58	2.26	35.6%
	2023	3.05	2.22	41.2%
	2024	2.56	2.01	41.0%
Q company	2022	2.18	1.69	43.5%
	2023	2.03	1.45	45.8%
	2024	1.82	1.35	51.6%
Industry average	2022	2.86	1.98	38.7%
	2023	2.71	1.82	38.5%
	2024	2.69	1.49	44.6%

III. A. 3) Operational capacity analysis

The results of the comparison of operating capacity in 2022-2024 of Company S are shown in Table 3.Company S has strong asset management and control, and all the indicators are better, realizing the operating policy of taking benefits from the norms.The turnover rate of each asset of Company Q is significantly lower than that of Company S. The results of the comparison of the operating capacity of Company S are shown in Table 3.

Table 3: S company 2022-2024 operation ability comparison results

	Year	Inventory turnover rate	Accounts receivable turnover rate
S company	2022	5.82	4.11
	2023	5.54	3.42
	2024	5.21	3.36
Q company	2022	4.35	2.56
	2023	4.21	2.24
	2024	4.44	2.63
Industry average	2022	3.75	13.25
	2023	4.08	3.89
	2024	4.02	3.56

Table 4: S company 2022-2024 profitability ability comparison results

	Year	Sales gross profit margin	Net profit margin	Return on equity
S company	2022	42.12	25.96	36.48
	2023	43.68	25.91	36.21
	2024	46.85	24.56	36.53
Q company	2022	36.85	12.54	22.16
	2023	37.15	12.42	23.57
	2024	37.86	11.63	24.32
Industry average	2022	32.62	9.58	11.62
	2023	32.34	10.26	10.27
	2024	35.47	4.89	-15.24

III. A. 4) Profitability

The results of the comparison of profitability of company S in 2022-2024 are shown in Table 4. The indicators, decreasing year by year, means that the competition in the market for similar products produced by the enterprise

has increased. In the case of gross profit margin, core profit margin decline, the enterprise in order to obtain a stable growth of core profits, must be internal and external big hand, external must work on expanding market share, technological innovation, product renewal, enhance or consolidate the core competitiveness of the enterprise, internal to strengthen the internal management, to improve the management of costs and expenses, from the management of the benefits.

Financial Statement Data Mining Summary:

(1) In terms of profit quality. In terms of scale, S Company's net profit has increased year by year, although there is a fear of slowing down, but the overall profitability is very strong.

(2) In terms of cash flow, investment activities are consistent with the development strategy of the enterprise, cash flow from operating activities, investment activities and financing activities are adapted to each other, flowing smoothly, and the quality of cash flow is very good.

(3) In terms of asset quality, the overall asset quality of S Company fully meets the business activities of the enterprise, with strong profitability and turnover.

III. B. Analysis of valuation results

III. B. 1) Valuation results

Five parameters, namely, the value of the underlying asset, the exercise price, the price volatility of the underlying asset, the risk-free rate of return and the exercise period, are input into the real option valuation model, and the estimated values of the five parameters are obtained after calculations and analysis, on the basis of which the valuation of Company S can be calculated according to the real option valuation model.

Through the analysis and calculation of the above parameters, each parameter of the real options of Company G is obtained as shown in Table 5.

Table 5: S company physical options parameter (10^4 yuan)

Model parameter	Parametric estimate
Underlying asset value	358.56
Execution price	153.45
The price volatility of the underlying asset	48.78%
Risk-free yield	3.5748%
Line term	4

By substituting each parameter into the formula of the real option evaluation model, the option value of Company S was calculated to be 2.1255 million yuan. Therefore, the valuation result of Company S considering real options is:

$$\begin{aligned} V &= V_1 + V_2 \\ &= 358.56 + 212.55 \\ &= 571.11 \end{aligned} \tag{13}$$

Under the real option evaluation model, the evaluated value of Company S is 5.7111 million yuan.

III. B. 2) Comparative analysis and validation of valuation results

(1) Comparative analysis of valuation results

The valuation result of Company S using the income approach is 5.68 million yuan, and the valuation result of the real option evaluation model is 5.7111 million yuan. The valuation results of the two methods differ by 31,100 yuan, with a difference rate of 0.55%. The specific situation is shown in Table 6.

As can be seen from Table 6, the valuation results of the real option evaluation model differ slightly from those of the income approach. However, compared with the book value on the evaluation base date, the growth rates of the valuation results of both methods are relatively high. This is the same as the actual situation of the merger and acquisition valuation of information technology service enterprises. Compared with the book value of S Company on the assessment base date of 2.1526 million yuan, the income method valuation result of 5.68 million yuan has increased by 3.5274 million yuan, with an increase rate of 163.87%. This is mainly because Company S, as an information technology service enterprise, has broad prospects for future development and stable operations, but there are also many uncertain asset values that are not reflected in the company's books. Compared with the book value of 2.1526 million yuan on the assessment base date of Company S, the valuation result of the real option assessment model, 5.7111 million yuan, has increased by 3.5585 million yuan, with an increase rate of 165.31%. This is mainly because the adoption of the real option evaluation model not only takes into account the value of the

uncertain assets that Company S, as an information technology service enterprise itself, has not been reflected in the book value, but also considers the value of the option portion existing in this merger and acquisition transaction.

Table 6: S company valuation results (10^4 yuan)

Item	The value of the reference date of the datum	Valuation result	Added value	Value-added rate
Earnings method valuation result	215.26	568.00	352.74	163.87%
B-S model valuation result	215.26	571.11	355.85	165.31%
The difference rate	0.55%			

(2) Verification and analysis of valuation results

The collected information indicates that the actual transaction price of the merger and acquisition of Company S was 5.78 million yuan. The actual transaction pricing was compared respectively with the valuation results of the income approach and the real option evaluation model. The specific situation is shown in Table 7.

It can be seen from Table 7 that the actual transaction pricing differs from the valuation result of the income approach by 100,000 yuan, with a difference rate of 1.73%. The actual transaction pricing differs from the valuation result of the real option evaluation model by 68,900 yuan, with a difference rate of 1.19%. The valuation results of the two methods are relatively close, and the difference rates from the actual transaction pricing are both within 2%, which is within a reasonable range. In merger and acquisition transactions, since both parties of the transaction will refer to the results of third-party valuation verification, but they will not be completely consistent with the results of third-party valuation verification, it is a common situation that there is a certain rate of difference, as long as it is within a reasonable range. It can be seen from this that both the valuation results of the income approach and those of the real option evaluation model are reasonable. Compared with the valuation results of the income approach, the valuation results of the real option evaluation model are closer to the actual transaction pricing of the merger and acquisition of Company S, indicating that the real option evaluation model can serve as an effective supplement and verification to the traditional valuation methods.

Table 7: S company valuation results verification analysis (10^4 yuan)

Item	Actual transaction pricing	Valuation result	Difference value	Difference rate
Earnings method valuation result comparison	578.00	568.00	10.00	1.73%
B-S model valuation result comparison	578.00	571.11	6.89	1.19%

IV. Conclusion

Through the empirical analysis of information technology service enterprise S company, this paper verifies the applicability and validity of the real option valuation model based on data mining technology in the valuation of company mergers and acquisitions. The valuation result of the real option valuation model is 5,711,100 Yuan, and the difference rate is only 0.55% compared with the valuation result of 5,680,000 Yuan from the income approach, and it is closer to the actual transaction pricing of 5,780,000 Yuan of Company S, with a difference rate of 1.19%. Comparing the difference rate of 1.73% between the income approach and the actual transaction pricing, the real options model shows higher accuracy. The real options valuation model not only takes into account the value of uncertain assets not reflected in the book value that exist in S Company itself as an information technology service enterprise, but also considers the value of options that exist in the M&A transaction, thus making the valuation results more comprehensive and accurate. When valuing companies in the information technology field, the assessment of the development capability of the company is particularly important, and the net profit growth rate of S Company from 2022 to 2024 is maintained at over 25%, showing good development potential. The real options valuation model can better incorporate this growth potential into valuation considerations, thus producing more realistic valuation results. The real options valuation model based on big data mining technology provides a new theoretical perspective and methodological tool for the valuation of M&A, which can be used as an effective supplement to and validation of traditional valuation methods. The future research direction can further improve the method of determining the model parameters, explore the application scenarios of more industries, and improve the universality and accuracy of the model.

References

[1] Henningsson, S., Yetton, P. W., & Wynne, P. J. (2018). A review of information system integration in mergers and acquisitions. Journal of information Technology, 33(4), 255-303.

[2] Cumming, D., Jindal, V., Kumar, S., & Pandey, N. (2023). Mergers and acquisitions research in finance and accounting: Past, present, and future. European Financial Management, 29(5), 1464-1504.
[3] Masulis, R. W., & Simsir, S. A. (2018). Deal initiation in mergers and acquisitions. Journal of Financial and Quantitative Analysis, 53(6), 2389-2430.
[4] Lee, K. H., Mauer, D. C., & Xu, E. Q. (2018). Human capital relatedness and mergers and acquisitions. Journal of financial Economics, 129(1), 111-135.
[5] González-Torres, T., Rodríguez-Sánchez, J. L., Pelechano-Barahona, E., & García-Muiña, F. E. (2020). A systematic review of research on sustainability in mergers and acquisitions. Sustainability, 12(2), 513.
[6] Benitez, J., Ray, G., & Henseler, J. (2018). Impact of information technology infrastructure flexibility on mergers and acquisitions. MIS quarterly, 42(1), 25-A12.
[7] Aydin, N. (2017). Mergers and acquisitions: a review of valuation methods. International Journal of Business and Social Science, 8(5), 147-151.
[8] Toll, C., & Hering, T. (2017). VALUATION OF COMPANY MERGER FROM THE SHAREHOLDERS'POINT OF VIEW. Amfiteatru Economic, 19(46), 836.
[9] Alexandridis, G., Antypas, N., & Travlos, N. (2017). Value creation from M&As: New evidence. Journal of Corporate Finance, 45, 632-650.
[10] Tampakoudis, I., & Anagnostopoulou, E. (2020). The effect of mergers and acquisitions on environmental, social and governance performance and market value: Evidence from EU acquirers. Business Strategy and the Environment, 29(5), 1865-1875.
[11] Welch, X., Pavićević, S., Keil, T., & Laamanen, T. (2020). The pre-deal phase of mergers and acquisitions: A review and research agenda. Journal of Management, 46(6), 843-878.
[12] Rozen-Bakher, Z. (2018). Comparison of merger and acquisition (M&A) success in horizontal, vertical and conglomerate M&As: industry sector vs. services sector. The Service Industries Journal, 38(7-8), 492-518.
[13] Sha, Y., Kang, C., & Wang, Z. (2020). Economic policy uncertainty and mergers and acquisitions: Evidence from China. Economic Modelling, 89, 590-600.
[14] Li, K., Qiu, B., & Shen, R. (2018). Organization capital and mergers and acquisitions. Journal of Financial and Quantitative Analysis, 53(4), 1871-1909.
[15] Chinta, P. C. R. (2023). Leveraging Machine Learning Techniques for Predictive Analysis in Merger and Acquisition (M&A). Journal of Artificial Intelligence and Big Data, 3(1), 10-31586.
[16] Kang, H. G., Woo, W., Burton, R. M., & Mitchell, W. (2018). Constructing M&A valuation: how do merger evaluation methods differ as uncertainty and controversy vary?. Journal of Organization Design, 7, 1-46.
[17] Zhang, H., Pu, Y., Zheng, S., & Li, L. (2024). AI-Driven M&A Target Selection and Synergy Prediction: A Machine Learning-Based Approach. Journal of Artificial Intelligence General science (JAIGS) ISSN: 3006-4023, 6(1), 359-377.
[18] Roy Bornilla Gacus & Jennifer E Hinlo. (2018). The Reliability of Constant Growth Dividend Discount Model (DDM) in Valuation of Philippine Common Stocks. International Journal of Economics & Management Sciences,7(1),1-9.
[19] Danyang Jiang. (2024). Investment Analysis Report based on the Application of Free Cash Flow Valuation Method (FCFF) -- Take Three Squirrels for Example. Scientific Journal of Economics and Management Research,6(4).
[20] Joao Marques Silva & Jose Azevedo Pereira. (2017). Over-Valuation: Avoid Double Counting when Retaining Dividends in the FCFE Valuation. International Journal of Financial Research,8(4),107-107.
[21] Wreford Alice,Birt Linda,Whitty Jennifer A.,Hanson Sarah,Conquer Susan & Wagner Adam P. (2024). Cost and economic evidence for asset-based approaches to health improvement and their evaluation methods: a systematic review. BMC Public Health,24(1),814-814.
[22] Yuelong Feng,Xindong Zhang,Yan Chen & Leilei Wei. (2025). A compact finite difference scheme for solving fractional Black-Scholes option pricing model. Journal of Inequalities and Applications,2025(1),36-36.
[23] Yeh ICheng & Lien CheHui. (2020). Evaluating real estate development project with Monte Carlo based binomial options pricing model. Applied Economics Letters,27(4),307-324.