

# Evaluation of Data Asset Value Based on Hierarchical Analysis Method

-- Take Z E-commerce Enterprise as An Example

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**Abstract:** Data assets are an important part of the intangible assets of e-commerce companies. Compared with ordinary intangible assets, it is more difficult to confirm its costs, distinguish their income more difficult, and lack trading cases in the market. Therefore, it is difficult to pass the traditional cost method, The income method and market law directly evaluate the value asset value of the enterprise. Therefore, for data assets, a more scientific and reasonable evaluation system is needed to be established. The article takes Beijing Z Technology Restrictions as an evaluation case, adopts the idea of continuous cutting difference, and first uses the method of domestic value evaluation of corporate value -the income method to calculate the overall value of Z Technology Co., Ltd., and then calculate the company's combination of intangible assets Value, finally uses layered analysis to calculate the score rate of data assets, so as to obtain the value of data assets. It is hoped that the evaluation of data asset value in the article can bring a certain reference to the data asset value evaluation work in practice.

**Keywords:** Data asset value; Hierarchical analysis method; Continuous cut -off; E-commerce enterprise.

## 1. Introduction

As big data is widely used in various industries, the value of big data resources has also been gradually developed. Therefore, the value assessment of data assets will also become increasingly important. General e-commerce companies use data assets to make precise marketing to users, thereby promoting users to buy their products and increase their operating income. By accurate marketing for users, it can bring the same effect as promoting a large amount of advertising to a certain extent to reduce its sales cost. The most important thing is that in the era of big data, data capital can enhance the company's comprehensive competitiveness and enhance the company's industry status. Therefore, evaluating the value asset value of e-commerce enterprises can help enterprises objectively understand the value of their own data assets, avoid the situation of overestimating or underestimating their own data assets, which is conducive to the value of enterprises paying attention to the value of data assets. It can provide a certain value basis for enterprises to carry out relevant data asset decisions.

## 2. Status of Research at Home and Abroad

Foreign scholars have long believed that data should be treated as an asset a long time ago. Rehman (2016) believes that the data value of the enterprise will be affected by collecting costs, management costs, and data quality [1]; Gunther (2017) research found that the realization of the value of data assets of enterprises will be associated with interconnection and sharing. The influence [2]. In terms of evaluation methods, most foreign scholars use option models as evaluation methods. Mantti G (2014) improved the smallest Tworam Monte Carlo (LSM model) and improved the scope of the model evaluation [3]. FURTADOL and Dutraml (2016) proposed the value of using LSM models to evaluate data assets [4].

Zhu Yangyong (2018) proposed that information assets and digital assets were unified as data assets, and believed that data assets had attributes of existence, information and physics [5]. Wu Po (2021) believes that there is no uniform standard in policies and regulations in enterprises, industries, and countries. In the future, data asset -based will be an inevitable development trend. Measurement and accounting are very important [6].

In terms of evaluation methods, Huang Le (2018) starts from the value -influencing factors of data assets, and combines three basic methods to build a new evaluation model [7]. Wang Jing and Wang Juan (2019) use the hierarchical analysis method to create the value influencing factor evaluation system of data assets, and use the B-S model to calculate and evaluate data asset simulation [8]. Closer Shanshan (2020) proposed that the Cime model was used for data asset evaluation, and provided a reference for the establishment of the data asset evaluation system [9].

In summary, most scholars at home and abroad believe that data can be identified as an asset, that is, data assets, and management should be strengthened. Usually use option pricing models to evaluate data assets; my country's data market is not well developed, so it is not suitable for adopting to use it. Evaluate data assets based on option pricing models. This article will combine the influencing factors of data asset value, use the income method and combine the layer analysis method to evaluate the value of data assets, and provide evaluation ideas and methods for data asset value.

## 3. Overview of Data Asset Evaluation

### 3.1. The concept of data asset evaluation

The concept of data assets today does not form an authoritative definition. The article believes that data assets refer to some basic information of the legal person or natural person with customers such as search records, telephones, and some pictures. Compared with physical assets, data assets are data resource assets that use documents as carriers. Essence

Data asset assessment refers to the evaluation of estimated data assets to evaluate and conclude, so that its value can be reflected in the form of currency, and provides a value reference for the client with a specific purpose.

### 3.2. The characteristics of data assets

3.2.1 Outside. Compared with ordinary assets, data assets are more difficult to quantify, and their value is difficult to reflect in asset-liabilities.

3.2.2 Future income uncertainty. The same set of data is used in different ways in different ways, and the economic benefits brings will be different. At the same time Essence

3.2.3 Time. Any assets will lose value. A set of data may bring a lot of economic benefits to users at the beginning, but over time, the economic interests that the data can bring gradually decrease and slowly lose their value.

3.2.4 Difference. E-commerce enterprise data analysis is particularly important to accurately push the products needed by users, and this part of the data that can be accurately pushed may only occupy a small part of the overall data assets; It may be very high, so there is a difference in value density in data assets.

## 4. The Choice of Data Asset Value Assessment Method of E-Commerce Enterprises

The cost method is to evaluate the value of intangible assets through cost channels. Data asset itself is a branch of intangible assets, so it has the weak correspondence and cost incompleteness of cost and value. This makes the value of the cost method assessing the value of intangible assets often has a certain deviation. In addition, data assets are more complicated than the cost of ordinary intangible assets, and data assets are often not reflected on the balance sheet, so it is more difficult to reset costs. get. Therefore, the cost method does not apply the value evaluation of data assets.

Market law is a method of evaluating data asset value from a market perspective. According to the influencing factors of data asset value, the market law can use the market law to compare, analyze and adjust the price of data asset transaction in comparable cases, and reflect the value of the evaluation data asset by comparison prices. Having an open and active data market is the most basic prerequisite for evaluating data assets by market law. However, since there is no complete data asset trading market in my country and lack of active trading markets and comparable cases, the market law is not suitable for the value assessment of data assets.

The income method is to predict the future income of assets to be estimated, and then use the time value principle of monetary funds to discount it as the evaluation value. When evaluating the data assets of the income method, the source of data assets is directly or indirectly generated. The value implementation method includes data analysis and big data push. The income method can respond to the value of data asset principal and accurate, and it is also easy to be accepted by the parties of the trading.

The premise of using the income method is that the future income of the object to be estimated can be measured in currency and can measure the future risk of the object to be estimated. However, the future income of data assets is difficult to be determined. Therefore, it is difficult to directly evaluate data assets by using the income method. In other methods, it is feasible to indirectly obtain the value of data

assets.

## 5. Empirical Analysis

### 5.1. Case introduction

The Z e-commerce company was established in November 2011 and was listed in Shenzhen on July 15, 2019. The company's main business is information promotion services and Internet effect marketing platform services.

### 5.2. Evaluation ideas

This article selects the financial statements of Company Z 2016-2020, using the third-stage model in the income method to obtain corporate value. The first phase is from 2021 to 2025 for a clear prediction period. The second stage is from 2026 to 2028 as a transition period. The company's operating conditions will gradually stabilize; Expect. Through the inversion algorithm, the value of the enterprise's intangible asset group is obtained, and finally the contribution rate of data assets is calculated through the analysis method, and the value of data assets is indirectly measured. The evaluation benchmark date is scheduled to be on January 1, 2021.

The corporate value evaluation model is as follows

$$OV = \frac{\sum_{t=1}^n D_t}{(1+R_e)^t} + \frac{\sum_{t=n}^m D_t}{(1+R_e)^t} + \frac{D_{avg}}{R_e(1+R_e)^{n+m}} + D_c$$

Among them: OV represents the overall value of the enterprise; n represents the prediction period; M represents the transition period; T represents the life limit; DAVG represents the perpetual period of net profit; Re means the cost of equity capital; DC represents the fair value of the claim; Essence

### 5.3. Evaluation process

#### 5.3.1. Calculation of corporate value

(1) Corporate net profit forecast

① Business income forecast

Company Z's operating income growth rate is extremely high from 2016-2017, and the growth rate has gradually stabilized after 2018, maintaining at a range of 30%-40%. Therefore, the average operating income growth rate of 2018-2020 is selected to predict operating income. The transition period will slowly grow from 2026 to 2028, that is, the growth rate of operating income growth from 2026 to 2028 will be 26.53% and 17.69%, respectively. , 8.85%.

② Business cost prediction

Company Z has increased operating costs in the past five years, and the proportion of operating income has increased. With the company's operating costs in the past three years, the average proportion of operating income is 29.14% as the proportion of operating costs in each year from 2021 to 2025. Perform the operating costs of Company Z in the future.

③ Business tax and additional prediction

Company Z meets the provisions of the two preferential policies of the General Administration of Taxation of the Ministry of Finance No. 13 and No. 13, 2020, and the company's operating tax and added value are low in 2020, but because preferential policies are not continuous, this time, this time, this time, this time, this time Business tax and additional forecasts are predicted based on the average proportion of operating income from 2016 to 2019.

④ Forecast for expenses and R & D expenses during the period

The prediction of sales expenses, management costs and R

& D expenses is predicted to account for the average proportion of operating income in the past five years. In recent years, the proportion of financial expenses of Company Z has changed a lot about the proportion of operating income. Therefore, it is not possible to predict the proportion of financial costs to operating income and calculate the average financial expenses over the years as the forecast value.

⑤ Extra -business revenue and expenditure forecast

The company's outside business income comes from the funding of the party building activities, and the out -of -business expenditure is the public welfare donation expenditure, which is not sustainable. Therefore, the prediction of external income and external expenditures this time is 0 yuan.

⑥ Credit impairment loss and investment income forecast

The company's credit impairment loss comes from the account receivable and other bad debt preparations for

receivables and other receivables; the company's investment income comes from the holding of wealth management products, so credit impairment losses and investment income are sustainable. The credit impairment loss of credit impairment is predicted to predict future credit impairment losses in the future. There is a certain decline in investment income in the proportion of operating income. It is predicted that this time it will predict future investment income with the average proportion of investment income in the past two years.

⑦ Income tax expenditure forecast

Company Z is a high -tech enterprise and calculates the company's income tax at a preferential tax rate of 15%.

⑧ net profit forecast

According to the data predicted earlier, the net profit of Company Z from 2021 to 2025 can be predicted. The prediction results are shown in the following table:

**Table 1.** 2021 to 2025 net profit forecast unit: 10,000 yuan

Subject \ Time	2021	2022	2023	2024	2025	2026	2027	2028	Sustainable period
1.Total operating income	123127.96	166678.32	225632.45	305438.64	413472.29	523166.49	615714.64	670205.39	670205.39
2. Total operating costs	105603.26	142907.63	193406.55	261766.94	354306.40	448268.26	527543.16	574218.84	574218.84
Of which:									
Operating costs	35879.49	48570.06	65749.29	89004.82	120485.83	152450.72	179419.25	195297.85	195297.85
Business tax and surcharges	2708.82	3666.92	4963.91	6719.65	9096.39	11509.66	13545.72	14744.52	14744.52
sales expense	31737.46	42963.00	58159.02	78729.86	106576.62	134851.39	158706.61	172752.14	172752.14
Management costs	16393.26	22191.55	30040.70	40666.10	55049.70	69654.39	81976.25	89231.15	89231.15
Financial expenses	134.31	134.31	134.31	134.31	134.31	134.31	134.31	134.31	134.31
R & D expense	18318.98	24798.40	33569.60	45443.16	61516.41	77836.71	91606.02	99713.16	99713.16
Credit impairment loss	430.95	583.37	789.71	1069.04	1447.15	1831.08	2155.00	2345.72	2345.72
Investment income	824.96	1116.74	1511.74	2046.44	2770.26	3505.22	4125.29	4490.38	4490.38
3. Business profit	18349.66	24887.44	33737.63	45718.14	61936.15	78403.44	92296.77	100476.92	100476.92
Non-operating income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Operating expenses	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
The total profit	18349.66	24887.44	33737.63	45718.14	61936.15	78403.44	92296.77	100476.92	100476.92
Income tax expense	2752.45	3733.12	5060.64	6857.72	9290.42	11760.52	13844.52	15071.54	15071.54
Net profit	15597.21	21154.32	28676.99	38860.42	52645.73	66642.93	78452.26	85405.38	85405.38

(2) RE's calculation

①Determine the risk -free return rate RF

According to the information of the Wind financial data terminal query, the average rate of yields in the expiration of Treasury bonds 10 years or more from the assessment is 3.29%. This time, it will be used as a risk -free return.

②Determine  $\beta$  coefficient

The  $\beta$  coefficient is a risk coefficient that refers to the company's risk sensitivity to market risks. The  $\beta_T$  is 1.473 through the Wind information terminal query. The market value is eliminated to get  $\beta_U = 1.455$ . The data combined with the Wind consultation terminal query is available for the formula:

$$\beta_e = 1.455 \times (1 - (1-15\%) \times 11867.91/806839.32) = 1.437$$

③The average market yield RM is determined

The average return of the 5 -year CSI 300 index based on the Wind Consultation terminal query as the average income of the market portfolio RM = 5.37%.

④Determine the company's unique risk return rate RS

The listing time of Z is relatively short, and its own scale is not large. The corresponding scale risk is small, and the scale risk is 2%; Z's main business scope is single, and its company has good operating conditions in recent years The operating risk is set to 2%. The company's unique risk RS finally took 4%. The yield of all the equity capital of the company is::

$$RF+(RM-RF) \times \beta+RS = 3.29\%+(5.37\%-3.29\%) \times 1.437+2\%= 10.28\%$$

(3) Determination of the fair value of claims

Credit value (DC) generally includes the long -term liabilities of the enterprise. Calculated based on the data in the financial statements, the fair value of the debt is 176.8543 million yuan

(4) Evaluate the overall value of the enterprise

The forecast period is 5 years, n takes 5; T means a period of time, the return rate of equity capital cost is 10.28%. DT represents the net profit of the first year. DAVG represents the permanent period of net profit.

$$V = 111472.48 +115644.85 +379834.83 +17685.43 =$$

62463759 (10,000 yuan)

(5) Compared with the market value of Company Z

According to the Flush inquiry, the closing price of Company Z on January 1, 2020 was 90.43 yuan, the total shares were 88.744 million, and the circulation stocks were 31.316 million. Conclusion, 34.13% of the discounts of liquidity [10], combined with the company's 2020 annual report:

$$\begin{aligned} \text{Fair equity value} &= \text{closing price} \times \text{circulation stock} + \text{closing price} \times \text{limited sales stock} \\ &\quad \times (1 - \text{discount rate}) \\ &= 90.43 \times 3131.6 + 90.43 \times (8874.4 - 3131.6) \times (1 - 34.13\%) = 62526.760 \text{ (10,000 yuan)} \end{aligned}$$

Therefore, the market value of Company Z was 6429.53 million yuan.

It is generally believed that the absolute value of the evaluation value and the market value error is reasonable within 20%. The evaluation value of 624.63759 million yuan and the market value of 642.953 million yuan, which was only 2.85%, the difference was small and within the reasonable range. Therefore, the value of the company Z's company was rational.

### 5.3.2. The calculation of combination of intangible asset value

Because the cost of intangible assets and value is weak, it is not appropriate to use the book value in the balance sheet as the value of the intangible assets. In addition to the intangible assets, corporate value is composed of two parts: mobile assets and fixed assets. Therefore, according to the company's reports, the mobile assets and fixed assets were 16,0273,400 yuan and 333,347,500 yuan, respectively. Finally, the value of intangible assets was 4312.623 million yuan.

### 5.3.3. Data asset value calculation

(1) Classification of combination of intangible assets

Considering the business model and profit model of Company Z, the intangible asset group is divided into four categories: data assets, portfolio labor, customer relationship, and brand. The combination of labor is an irreversible asset, which is generally reflected in goodwill. Z belongs to the e-commerce industry, and its income is mainly composed of shopping guide commission income and advertising marketing income. Therefore, customer relationships have great influence on Z's income. The company's brand quality is related to its management level. It will affect the trust of customers, which will indirectly affect the probability of

customers to purchase the company's recommended products, thereby affecting the company's final income. Therefore, the relationship between the brand and the customer is also the company's intangible assets important part. Of course, in addition to the above -mentioned several intangible assets, there are other types of intangible assets such as "domain name", but because of their contribution to the company's contribution, this evaluation has not been included in the system.

(2) The calculation of data asset contribution rate

The proportion of various intangible assets is determined by layer analysis. The level analysis method refers to the decomposition of the goal as a different composition factor. According to the interdependence and affiliation between factors, the factors are combined into each level, and then a analysis structure model with multiple levels is generated. Eventually, the problem is attributed to the relative power value of the minimum factor to the overall goal.

Generally, the value of intangible assets is reflected in the three aspects of increasing income, reducing costs, and increasing comprehensive competitiveness of enterprises. Combined with the analysis of the division of intangible assets of the Z group above, a hierarchical analysis model is established to combine the value of intangible assets (V) As the target layer, to increase income (n), reduce costs (p), improve comprehensive competitiveness (Q) as the standard layer, four types of intangible assets (A: data assets, B: customer relationship, C: combination labor, D: Brand)

This article adopts the "1-9 standard method", and according to the importance of the previous level, the indicators of the same level are scored two or two. In order to determine the questionnaires to experts, asset appraisers, and college teachers for more than three years of employment e-commerce companies, and finally received ten questionnaires. Statistize the evaluation results of various experts and establish a judgment matrix V on each layer. After calculating the maximum characteristic value of the matrix is 3.0092, the consistency test for it can be seen that the RI (3) value is 0.52, and the consistency test of matrix V is inspected. Essence

Therefore, matrix V consistency test passes to determine that the matrix is effective. At this time, the weight vector requested is as follows:

Similarly, the three judgment matrix N, P, and Q of the indicators of the object layer on each indicator of the object layer, after the above steps, the final result is as shown in the following:

**Table 2.** The results of each indicator of each indicator of the object layer

Node item	Data asset	Customer relationship	Combined labor	Brand	CR	RI	CR	Consistency test
Increase income	0.1603	0.4668	0.2776	0.0953	0.0117	0.89	0.0131	pass
Reduce the cost	0.2776	0.0953	0.1603	0.4668	0.0117	0.89	0.0131	pass
Improve comprehensive competitiveness	0.2797	0.1142	0.4704	0.1358	0.0582	0.89	0.0654	pass

$$\text{Data asset contribution rate} = 0.1623 \times 0.297 + 0.2776 \times 0.1634 + 0.2797 \times 0.5396 = 24.45\%$$

Scholars such as Zhou Qin (2016) studied the value contribution rate of data assets to e-commerce enterprises, and obtained the division rate range of data assets from 23.0% to 28.8%, which has certain representativeness. Essence Compared with it, the result of this request was in this interval, so in the end, this article used 24.45% as the contribution rate of Z data assets in combination intangible assets [11].

(3) Data asset value calculation

$$\begin{aligned} \text{Data asset value} &= \text{combination of intangible asset value} \times \text{data asset contribution rate} \\ &= 431262.30 \times 24.45\% = 10544363 \text{ (10,000 yuan)} \end{aligned}$$

## 5.4. Case Revelation

This case uses continuous cutting -edge ideas, and uses the income method to combine the hierarchical analysis method

to evaluate the data assets of Company Z.

5.4.1 Different enterprises have different assets, and the division of intangible assets of each company should be dependent on the company's specific situation. This assessment divides the out-of-the-surface extra-scale combination of the outlet of Z into data assets, portfolio labor, customer relationship and brand. It can be used as a reference for similar companies.

5.4.2 For enterprises with data assets, they should increase their importance to data assets, increase the utilization of data assets, and make it an important source of enterprises in the era of big data to improve their comprehensive competitiveness.

5.4.3 In the era of big data, if you want to build a data in China, it is necessary to build a complete and mature data trading market. A mature data trading market can promote data asset transactions, and it is also convenient for enterprises to manage their data assets and promote the development of related industries.

## 6. Conclusion

Nowadays, with the continuous development of technology, the application of big data in various industries is becoming more and more common. For e-commerce companies, there will be more and more demand for data asset value assessment in the future; although there are fewer practices for such business, the China Evaluation Association has noticed the data asset evaluation business. At present, Chinese assets are currently assets. The appraiser association has issued expert guidelines on data asset evaluation. It is believed that in the near future, data asset assessment will be included in the asset evaluation standards. A good idea and reference.

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