

# Research on the Model and Application of Data Asset Value Evaluation

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**Abstract:** In the era of digital economy, the marketization of data factor has become an important feature, attracting the attention of governments and scholars. As of January 1, 2024, data resources have been formally included in the financial statements and become an important asset of enterprises. This paper starts from the dimension of value formation of data assets and takes the income approach as the core, closely combines the characteristics of the application software industry, and builds a targeted data asset value assessment model. At the same time, the optimization model is applied to the excess return of X Company's data assets, thereby evaluating the value of X Company's data assets.

**Keywords:** Data assets, Value assessment, Case study.

## 1. Introduction

In 2023, according to the "Digital China Development Report", the scale of China's digital economy has exceeded the 50 trillion yuan mark, accounting for 41.5% of GDP, ranking second in the world, and data assets have become an important engine to promote economic growth. From 2020 to 2024, the number of research on data assets at home and abroad has shown a significant increase. Scholars have given a new interpretation to the definition and characteristics of data assets, regard data assets as an independent component of intangible assets, and advocate that data assets should be separately divided according to the uniqueness of different industries. In the process of exploring the evaluation methods of data asset value, many scholars tend to take the income method as the cornerstone and integrate multiple methods such as multi-period excess return method, real option method and analytic hierarchy process for comprehensive consideration.

At present, intangible assets and current assets in the application software industry account for a relatively high proportion, and the future operation forecast is highly subjective. Besides, data assets are an important part of intangible assets, and there are still significant shortcomings in their management. Enterprises themselves are faced with many challenges in the recognition and accounting of data assets. In view of this situation, this paper closely focuses on the unique attributes of the application software industry, synthesizes the applicability of various valuation methods, builds a model based on the multi-period excess return method to evaluate the value of the case company X, and evaluates the data asset by estimating the contribution rate and discount rate of the data asset and other parameters. This paper aims to provide strong support for data asset management in application software industry.

## 2. Related Concepts and Features

### 2.1. Concepts and Characteristics of Data Assets

Data and information are closely connected, and information depends on data. Therefore, data assets must have the dual attributes of data and assets. Only when the data is

processed and analyzed by information technology and converted into information that has practical help for the future production and operation of the enterprise, and is expected to bring cash inflow to the enterprise, can it be regarded as a real data asset. According to the relevant definition of accounting, data must meet the following three basic conditions to become an asset: the ownership of the data asset is clear and clear; Data assets have economic profitability; Data assets are derived from past transactions or events of the enterprise.

Compared with traditional intangible assets, data assets have the following characteristics. The first is value-added. The process of data mining can give birth to new and more valuable data sets. This process not only significantly broadens the scale boundary of data, but also realizes the depth jump of data value by improving the quality level of data. At the same time, the amount of data held by enterprises has always been in a continuous growth trend. The second is timeliness, whose value will gradually decline over time, that is, the economic benefits generated by the application of the same data asset at different time points are highly dynamic and uncertain. In addition, the diversity of uses, data assets across multiple industries and fields, to achieve a wide range of applications and value transformation, which also makes data assets become a highly flexible and adaptable new intangible assets, for the enterprise innovation and development and value creation to provide a broader space and possibilities. Finally, there are risks. For Internet enterprises, data assets are accompanied by certain risks in the process of application. Because many users have given high attention to the security protection of their own data, once the user's privacy data is leaked, it will be very likely to cause widespread panic, and then seriously damage the reputation and image of the enterprise.

### 2.2. Value Realization Mechanism and Evaluation Method of Data Assets

(1) The value of data assets

The process of transforming data from its original form - a collection of materials that reflect information about the objective world - into a controllable, usable, and quantifiable resource is named "data capitalisation". This process is the prerequisite for data to obtain its inherent value, which mainly

includes four dimensions: intrinsic value, that is, the information and knowledge content contained in the data itself; Market value, the potential exchange value of the index data displayed in the trading market; Economic value, focusing on the direct economic benefits that can be generated by data analysis and application; And performance value, reflected in the efficiency and results achieved by data-driven decision optimization and process improvement.

(2) Value realization mechanism of data assets

There are two types of value realization mechanisms for data assets: internal enablement and external commercialization. Internal empowerment refers to the transformation of data resources into a powerful support for internal operation and management through in-depth analysis and mining. Data assets, as a key element of enterprise competence, can significantly enhance the dominant position of enterprises in market competition by deeply integrating into existing products and services, thus helping enterprises to obtain excess returns. External commercialization refers to the behavior of enterprises to sell the data held as a commodity on the open market. In the era of digital economy, the increasing importance of data assets in various industries and the growing demand for data have spawned many companies focused on selling data information. Data trading activities usually rely on professional data trading platforms, which take data resources and data services as the trading object, and the participants include data suppliers, data demand parties, data trading platforms, evaluation agencies, service agencies and other relevant external departments.

(3) Evaluation methods of data assets

The basic evaluation methods are cost method, income method and market method, but according to the application of the evaluation practice, there are some derivative methods, and the three basic methods need to be adjusted appropriately according to the situation of the evaluation object and the value type in the evaluation process. Data assets belong to intangible assets, so the applicability of each method is analyzed from the perspective of intangible assets.

Cost method: measure acquisition cost and operation cost; Not yet applied to the evaluation of data assets.

Marketing method: Applies when there are many comparables and available data.

Income method: Incremental income method can measure the incremental income of data assets; The excess return method applies to the valuation of data assets.

Real option method: It is suitable for the value evaluation of enterprise investment, especially when the income uncertainty is strong.

Because data assets are enabled internally by the enterprise itself, that is, enterprises use data assets to achieve corporate profits, improve investment reporting, and bring expected earnings. Therefore, when the assessed object is the enterprise's own data assets, the contribution of data assets to the enterprise's revenue should be considered, and the income method is more applicable in this case. Income method can reflect the incremental income brought by data assets to enterprises from the perspective of income, and can reflect its real value. In practical application, it is necessary to choose the corresponding method according to the situation: incremental income method is suitable for when the incremental income of data assets can be effectively quantified; Excess return method is widely used in data assets, but it also needs reasonable adjustment model to predict excess return.

### 3. Evaluate the Scheme Design

#### 3.1. Construction of Multi-Period Excess Return Model

The core step of using the multi-period excess return method is to predict the future excess return of the enterprise, that is, the relative increase of the enterprise's operating efficiency after the asset is put into use. Generally, the income and cost data after the investment of assets are directly deducted from the income and cost data before the investment of assets. However, the operation of an enterprise is affected by many factors, and the influence of each asset is different, so the actual income brought by the asset cannot be objectively evaluated by simply making a difference. Therefore, it is necessary to optimize the calculation method of excess return. At present, the main methods of recognizing excess return include sharing method and difference method, but they are not reflected in the statement, and the actual estimation is difficult. Therefore, the contribution value of other assets can be backsqueezed and then the contribution value of data assets can be calculated, so this paper adopts the difference method to calculate excess return. The basic calculation formula of multi-period excess return method of difference method is as follows:

$$V = \sum_{t=1}^n \frac{(R_1 - R_2 - R_3 - R_4)_t}{(1+i)^t} \quad (2-1)$$

Among them:

V—The value of the data asset being assessed

$R_1$ —Total enterprise value

$R_2$ —Income contribution of fixed assets

$R_3$ —Income contribution from current assets

$R_4$ —Income contribution of other intangible assets

i—Discount rate

However, the key and difficult points in the application of this model are determined. The intangible assets owned by an enterprise can be divided into two parts. One part of the intangible assets is listed in the balance sheet, which is called the intangible assets in the statement. Another part of intangible assets can not be reflected in the balance sheet, called off-balance sheet intangible assets. The intangible assets on the balance sheet can be found directly through the balance sheet, which is easier to measure, while the intangible assets off the balance sheet is more difficult to measure. Therefore, in the optimization of the model, the intangible assets in the table are used to replace other intangible assets

Replace with. Secondly, it is necessary to calculate the income of specific asset complex including data asset before dividing the income brought by data asset, so it is necessary to use the analytic hierarchy process to calculate the income contribution weight  $\alpha$  of data asset in the specific asset complex, so as to calculate the excess income brought by data asset. The optimized model is as follows:

$$V = \sum_{t=1}^n \frac{(R_1 - R_2 - R_3 - r_4)_t * \alpha}{(1+i)^t} \quad (2-2)$$

Among them:

$r_4$ —Income contribution of intangible assets on the statement

$\alpha$ —Contribution rate of data assets

#### 3.2. Measurement of Free Cash Flow

The measurement of the company's free cash flow needs to rely on the financial statements and make use of the internal

relationship between the accounts of the financial statements, so that the measured data will not deviate from the basic business laws and violate the financial principles.

Free cash flow = EBIT - Working capital investment - Income tax - capital expenditure + depreciation and amortization

= (Operating income - Manufacturing expenses - Corporate taxes and surcharges - Administrative expenses - selling expenses - finance expenses) - Working capital investment - Income tax - capital expenditure + depreciation of fixed assets + amortization of intangible assets

### 3.3. Contribution Value of Fixed Assets

The fixed assets shall be depreciated from the date of purchase until the book value reaches zero or reaches the salvage value standard of the enterprise. When calculating the income brought by fixed assets, the contribution of fixed assets generally includes the depreciation compensation of fixed assets and the return on investment of fixed assets, which can be calculated by adding the two together. The specific calculation process is as follows:

Annual income of fixed assets = depreciation compensation + return on investment (2-3)

Depreciation compensation for fixed assets = annual depreciation of old fixed assets + depreciation of new fixed assets (2-4)

Return on investment in fixed assets = Return on investment in fixed assets x average annual amount of fixed assets (2-5)

As the fixed assets usually have a long duration in the enterprise, the rate of return can be taken as the bank loan rate of more than 5 years, and the average annual amount of fixed assets is the average of the balance at the beginning of the year and the balance at the end of the year.

### 3.4. Contribution Value of Current Assets

Current assets are the assets owned by a business in one year or one accounting cycle. Because current assets exist for a short time in the production and operation activities of enterprises, their value impairment is very small. Therefore, only the investment return of current assets is considered in the calculation.

Annual income of current assets = Return on investment of current assets x average annual income of current assets (2-6)

Since the current assets of enterprises are mostly in the form of cash on hand or short-term bank deposits, the return on investment of current assets can be taken as the one-year bank loan interest rate, and the average annual amount of current assets is the average of the balance at the beginning of the year and the balance at the end of the year.

### 3.5. Contribution Value of Intangible Assets in The Statement

Intangible assets in the statement refer to all kinds of intangible assets listed in the balance sheet of an enterprise, especially goodwill. As an intangible asset, goodwill is complicated to measure its income, so this paper does not consider business goodwill for the time being. Intangible assets should be amortized each period in the operation of an enterprise. The calculation process of the income contribution of intangible assets in the statement is also the sum of depreciation compensation and investment return, as follows:

Annual contribution of intangible assets = amortization compensation of intangible assets + Return on investment of intangible assets (2-7)

Amortization compensation for intangible assets = Annual amortization of existing intangible assets + amortization of newly acquired intangible assets (2-8)

Return on investment of intangible assets = average annual balance of intangible assets x return on investment of intangible assets (2-9)

Because intangible assets often play a role in the enterprise for a long time, the income period is longer. Therefore, it can be calculated with reference to the return on investment of fixed assets, that is, the bank loan interest rate of more than five years.

### 3.6. Discount Rate

The discount rate of data assets can be calculated by risk accumulation method, capital asset pricing model (CAPM) and return splitting method.

(1) The risk accumulation method is the sum method. The risk-free rate of return and the risk-based rate of return are obtained respectively, and the discount rate of data assets is obtained by adding the sum. The risk-free rate of return can be used as the government bond yield. The risk rate of return needs to consider the various risks generated in the use of data assets, and multi-party information needs to be checked in practical application. Finally, the specific value is determined by the appraiser according to the actual situation.

The CAPM model calculates the risk return rate in the discount rate through the coefficient:

$$R_e = R_f + \beta * (R_m - R_f) \quad (2-10)$$

Among them:

$R_e$ ——Rate of return on enterprise risk assessed

$R_m$ ——Social average risk rate of return

$R_f$ ——Risk-free rate of return

$\beta$ ——Risk coefficient

(2) The rate of return splitting method refers to the inverse derivation of the return on investment of data assets through the weighted average return on assets of enterprises. The specific calculation formula is as follows:

$$i = \frac{WARA - W_e * i_e - W_f * i_f}{W_j} \quad (2-11)$$

Among them:

WARA——Weighted average return on assets

$W_e, W_f, W_j$ ——The proportion of fixed assets, current assets and all kinds of intangible assets in total assets

$i_e, i_f$ ——Rate of return on investment of current assets and fixed assets

## 4. Case Analysis

### 4.1. Company Introduction

X is a leading enterprise in the field of office document processing in China. Its main business systems are divided into office services and advertising promotion, which account for more than 95% of the total revenue of the enterprise. Office services mainly rely on products to provide many paid value-added items for individual users and enterprise users, such as membership services, document typesetting services. The advertising promotion service relies on its huge number

of users and its own advantages as a user service port to carry out advertising.

For X, the key to the sustainable development of the enterprise lies in the fact that as the entry point of enterprise services in the office field, it has a wide user base and a huge traffic base, and distributes both PC and mobile terminals. Monthly active users on mobile grew from 13 million in January 2012 to 274 million in September 2020, while monthly active users on PC also reached 172 million. At the same time, the company also cooperates with more than 800 ecological partners to provide professional services such as account system, intelligent recommendation, membership system, etc. The partners enrich the functions of the products through applications, such as chart show, questionnaire star, translation dog, etc.

## 4.2. Free Cash Flow Forecast

According to the financial statements of X Enterprise Group, the basic financial data from 2019 to 2023 can be obtained. By using unary linear regression, the operating income and other related indicators of X enterprise from 2024 to 2028 can be predicted. According to the national policy, the income tax rate of high-tech enterprises is 15%, so the income tax rate in this case is 15%.

## 4.3. Forecast the Contribution Value of Each Asset

According to the data disclosed by Eastern Wealth Network, the distribution of X's assets in the past five years can be obtained, and the contribution value of each asset can be predicted based on it.

### (1) Forecast current asset contribution value

Since the listing of the company, the transaction financial assets have increased and the total assets of the company have increased. Meanwhile, the company seeks for comprehensive development and develops towards the direction of enterprise-level office software by virtue of its own user port advantages. Therefore, it is predicted that the total assets of the company will show a steady rise in the future. Take the average of 41.87% of the increase of assets in the income of the enterprise in the past five years to predict the total assets in the next five years. Since the proportion of current assets in total assets has remained above 90% in the past five years, it is estimated that the annual increase of current assets will account for 39% of the income, and the return on investment of current assets will refer to the one-year loan interest rate of 4.35%.

### (2) Forecast the contribution value of fixed assets

This paper takes the depreciation ratio of 1.58% disclosed in the 2023 annual report as the depreciation ratio of 2024-2028; Since the annual report does not disclose the proportion of expenditure on the purchase of fixed assets, this paper takes peer enterprises as a reference and estimates the proportion of expenditure on fixed assets to be 45%; The interest rate of the loan with a maturity of more than 5 years is used as the return on investment, and the value is 4.90%.

### (3) Forecast the contribution value of intangible assets in the statement

According to the 2023 annual report, the intangible assets in the table are software patents, Copyrights, outsourcing software licenses, etc., and the amortization of intangible assets is 0.28% of the value disclosed in the 2023 annual report of the enterprise. Since the amount of expenditure for intangible assets is not disclosed, the total capital expenditure

deducting the expenditure of fixed assets is regarded as the capital expenditure of intangible assets in the statement, so the proportion of intangible assets in the statement is 55%, and the return rate is the same as above.

## 4.4. Discount Rate

### (1) Calculate the risk rate of return

In this paper, the 5-year Treasury bond yield rate is selected as the risk-free yield rate, and the value is 2.89%. Through the Guotai'an database, the average return rate of Shanghai Stock Exchange Index 10-year index is taken as the average market risk return rate, and the value is 8.07%. According to the flush financial data terminal, the company's beta value of nearly one year is 1.055, and the final calculated risk return rate is 8.35%.

### (2) Calculate the discount rate of data assets

In this paper, the intangible asset risk premium method is used to measure the discount rate of target data assets, and the specific risk of data assets is considered on the basis of the enterprise's own risk return rate, and the enterprise discount rate is calculated by adding the two. Based on the situation of peer companies and the data protection of current large Internet companies, the specific risk return rate of enterprise data assets is determined to be 6.24%.

Finally, the discount rate of this case = the overall enterprise investment risk return rate + the data asset specific risk return rate = 14.59%

## 4.5. Calculation of Data Assets

By bringing in the above data, the value of X Company's data assets is 758.9965 million yuan.

## 5. Evaluation Results

According to the company's annual report for 2023, the data shows that the monthly active users of the mobile platform have reached 248 million, while the monthly active users of the PC side are 154 million, and the two data are added together, the overall monthly active users are as high as 412 million. Based on this large user base, it is reasonable to assume that the total data of Company X is about 400 million records. Further, if the value of each piece of data is estimated at 1.8 yuan, the following economic analysis can be performed. The annual report also revealed that the company spent 97.6 million yuan on publicity and promotion in 2023. It is worth noting that the total number of monthly active users across the mobile platform's product line increased by about 100 million during the year. From this, we can calculate that the promotional cost for each new monthly active user is about 1 RMB. Combining this cost with the construction cost and management cost invested by the enterprise to build and manage its own information system, we can conclude that the comprehensive cost of each new user of the enterprise is about 2 yuan. This calculation result is consistent with the conclusion obtained through case evaluation, thus verifying the practical feasibility and accuracy of the model used. According to the evaluation results, the value of data assets of X company accounts for about 11% of its total book assets, which indicates that data assets have a high value content. However, the development and utilization of data assets by enterprises is not enough. Specifically, the percentage of paying users is still relatively low compared to the company's overall monthly active users.

Looking ahead, as the strategic layout in the "cloud" space gradually unfolds, enterprises should pay more attention to

the value of data assets, and actively take measures to increase the number of paying users and pay conversion rates. Through these efforts, we can not only ensure the preservation and appreciation of data assets, but also provide strong support for the sustainable development of enterprises.

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