Frontiers in Economics and Management Volume 5 Issue 3, 2024
ISSN: 2692-7608 DOI: 10.6981/FEM.202403_5(3).0001

Study on the Valuation of Data Assets

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Abstract

Since 2015, technologies such as big data, Internet of Things, artificial intelligence, and 5G have shown blowout development, continuously empowering the global economy, culture, education, healthcare and other fields. Throughout the world, data has become an important hand for countries around the world to develop a new economy in the data era.In 2020, China's State Council formally listed data as the fifth major factor of production after land, labor, capital and technology, and China entered a new era oriented by data factors. Since the new era, with the continuous innovation and development of technology, China has gradually accumulated a huge amount of data, and these huge data elements are mostly raw data, which can only be correctly utilized to its maximum value by deep mining and fine processing. This paper takes data assets and their value assessment methods as an entry point, explores the concept, classification, characteristics and value drivers of data assets, studies the adaptability of traditional methods to data asset value assessment, and thus analyzes the problems that may exist in the current data asset value assessment.

Keywords

Big Data; Data Assets; Valuation.

1. Introduction

In 2020, China's State Council issued the Opinions of the Central Committee and State Council of the Communist Party of China on the Establishment of a More Perfect Institutional Mechanism for Market-based Allocation of Resources. This document argues that data is the fifth major factor of production alongside land, labor, capital, and technology. China's economy has entered a new era with data as an important orientation, and the data era belonging to China has officially arrived. Accordingly, the evaluation, transaction and management of data factors have gradually become an important topic in the construction of digital China. As a production factor, the kernel of data factor is to improve production efficiency and resource allocation efficiency. Data asset, as a stage product of re-releasing the value of data factor, aims to maximize the core value of data factor, give full play to the multiplier effect of data factor on other factors, and promote the development of the data factor market towards a sound market that is more standardized, more transparent and more fair. In the process of data assetization, the assessment of the value of data assets is the basis for the circulation of data elements, and whether the assessment of data assets is good or bad profoundly affects whether the price of data assets can reflect their fair value in the market.

This article mainly uses the methods of literature analysis, analytical induction and comparative analysis. The article defines the concept of data assets, and through extensive reading of literature, it divides the categories of data assets according to the application industry, development stage, source object and data ownership of data assets, and at the same time, it summarizes the eight attribute characteristics of data assets by combining the characteristics of data and intangible assets. And it also disassembles the value composition of data assets and gets the driving factors that affect the value of data assets.

ISSN: 2692-7608 DOI: 10.6981/FEM.202403_5(3).0001

The purpose of this paper is to define the concept of data assets, classify data asset categories, summarize the characteristics of data assets, and dismantle the value drivers. Based on this, the paper compares the advantages and disadvantages of the three traditional valuation methods, namely the market method, the income method and the cost method, and explores the adaptability of the three methods in the process of data assetization.

2. Overview of Data Assets

2.1. Definition of Data Assets

The definition of a data asset is a data resource recorded electronically that is formed by past transactions or events of an enterprise, is legally owned or controlled by the enterprise, and is expected to bring economic benefits to the enterprise in a certain period of time in the future. The following conditions shall be met for the recognition of a data asset:

(1) Formed by past transactions or events of the enterprise. Data assets are limited to data that exist in reality and have been acquired; data expected to be generated in the future are not included;

(2) Legally owned or controlled by the enterprise. Legally compliant data sources and provenance are key, and enterprises cannot consider data resources that have been illegally acquired through improper means, are subject to property rights disputes, or are beyond their control as data assets;

(3) Expected to provide economic benefits to the business over a period of time in the future. Data assets are expected to bring ongoing economic benefits to the enterprise in the future, whether in direct or indirect form. However, data that lacks economic value, cannot predict future economic benefits under current technological conditions, or cannot be used on an ongoing basis cannot be considered a data asset;

(4) Recorded electronically. Professionals are able to identify, record and measure data assets through inventory, registration and other management tools, and data resources stored in manual records are not considered data assets.

2.2. Classification of Data Assets

Table 1. Classification of data assets

Delineation criteria	concrete content
By Application Industry	Financial Industry Data Assets
	Telecommunications industry data assets
	Government agency data assets
	Transportation Industry Data Assets
	Other industry data assets
By stage of development	Raw data assets
	Roughing data assets
	(Finished (pre-commercial) data assets
	First look at application scenarios data assets
	Economic Benefits Realization Initial Data Assets
	Realization of commercialized data assets
By source object	Data assets derived from people
	Data assets derived from things
	Data assets derived from events
By data ownership	Private data assets
	Public data assets

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Data assets exist in a rich variety of forms, including but not limited to text, digital, picture, audio, video and other formats. In order to better distinguish data assets, they are divided according to four dimensions: application industry, development stage, source object and data ownership, as shown in the following table.

2.3. Characterization of Data Assets

Data assets have eight major attribute characteristics. According to the "Asset Appraisal Expert Guideline No. 9 - Data Asset Appraisal" ("Guideline No. 9") issued by the China Asset Appraisal Association ("CAA"), the attributes of data assets are categorized into five major attributes: non-physicality, dependence, diversity, processability, and volatility of value. The five main attribute characteristics of data assets are non-physicality, dependence, diversity, processability, and value volatility. In addition, there are three other attribute characteristics of data assets, namely, multiple derivability, shareability and zero-cost replicability.

2.3.1. Non-physical

Data assets do not have a physical form and need to exist on a physical carrier. The non-physical nature of a data asset also means that it is non-consumable, i.e., the data are not worn out, consumed, etc., as a result of use, and therefore the data asset can be used indefinitely during its lifetime.

2.3.2. Dependency

Data must be stored in a certain medium. There are various types of media, such as paper, disk, tape, CD-ROM, hard disk, and even chemical or biological media. The same data can exist in different forms on multiple media at the same time.

2.3.3. Diversity

Data assets are characterized by a diversity of manifestations and fusion forms. Data can be expressed in the form of numbers, tables, images, text, optical and electrical signals, and even biological information. In addition, the fusion of database technology and data, digital media and digital production techniques also produces a variety of data assets.

2.3.4. Processability

Data can be maintained, updated, and supplemented to increase the volume of data; it can also be deleted, merged, and aggregated to eliminate redundancy; and it can be analyzed, refined, and mined to obtain deeper data resources through processing.

2.3.5. Value Volatility

The value of data assets is affected by a number of different factors, including the value density of the data, the capacity of the data, the business model of the data application, and other factors. These factors are constantly changing over time; certain data may be of low value now but explode in value geometrically as times go by. In addition, as technology advances or similar databases evolve, data assets may experience intangible wear and tear, which manifests itself as a gradual decrease in value.

2.3.6. Multiple Derivability

The same data set can be processed at multiple levels and dimensions, thus breeding different levels of data value. By effectively utilizing the multiple derivativeness of data, enterprises are able to conduct in-depth, multi-dimensional mining of the potential value of data assets, thereby enriching the entire data asset ecosystem and promoting the realization of data-driven enterprise strategic objectives.

2.3.7. Shareability

The shared nature of data assets means that they can be exchanged, transferred and utilized infinitely, enabling cross-individual sharing. The same data sets can be synchronized to serve a

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multitude of independent entities, and the utilization of these data by individual entities may inspire unique value.

2.3.8. Zero-cost Replicability

The initial investment in data assets is mainly concentrated in the data collection and R&D stages, resulting in relatively high costs for emerging data assets. However, as the cost of product replication gradually tends to zero, the marginal cost of data assets in the later stages decreases significantly, so that there can be huge cost differences between homogeneous data assets.

3. Common Valuation Methods for Data Asset Valuation

3.1. Generative Logic for the Valuation of Data Assets

In the era of data economy, the importance of value enhancement and circulation efficiency of data elements is self-evident. There are three value release processes for data elements: data resourceization, data assetization, and data capitalization. The three value releases enable data elements to change from disorganized, low-value raw data to organized, high-potential-value data resources, then to high-value data assets that can be circulated and traded, and ultimately to become data capital that continues to expand the value of data in the form of credit facilities.

In order to enable accelerated assetization and productization of data elements, to further release the potential value of data elements, to make the circulation, trading and utilization of data more efficient, standardized and in-depth, and to quantify the value of data elements in the process of data assetization, data asset value assessment has become a reality.

3.2. Drivers Affecting the Value of Data Assets

Data elements in the process of assetization should go through a series of data processing, such as acquisition, cleaning, labeling, mining, analysis, storage, etc., in which the risk, quality, development and application of data are inextricably linked to the value of data assets, and the impact of these drivers on the value of data assets is also very profound, so it is very important to clarify the drivers of the value of data assets for the deconstruction of the value of data assets. Clarifying the drivers of data asset value plays an important role in deconstructing the value of data assets, and is also one of the prerequisites for data asset value assessment.

Table 2. Drivers affecting the value of data assets

Deconstructive dimension	Concrete content
Risk dimension	Legal risk
	Moral hazard
Quality Dimension	Validity
	Accuracy
	Completeness
	Safety
The development dimension	Initial Development
	Medium-term Development
	Subsequent Developments
Application dimension	Rarity
	Multidimensionality
	Timeliness
	Scenario Economics

ISSN: 2692-7608 DOI: 10.6981/FEM.202403_5(3).0001

3.3. Adaptability Analysis of Traditional Valuation Methods

As there are many similarities between the characteristics of data assets and intangible assets, the valuation methods of data assets are also more often borrowed from the valuation methods of intangible assets. According to the regulations of the China Asset Appraisal Association on the valuation methods for data assets and intangible assets, there are three main types of valuation methods: the cost method, the income method and the market method.

3.3.1. Cost Method

The cost approach is a set of valuation methods designed along the lines of the replacement of data assets. The value of a data asset is obtained by deducting the functional and economic depreciation from its replacement and reconstruction cost as a starting point. There are three conditions for the application of the cost method: (i) the data asset is in use or has reached its intended useable state; (ii) the data asset can be replaced or reconstructed through relevant means; and (iii) the functional and economic depreciation of the data asset can be measured reliably.

The advantage of the cost approach is that it incorporates the depreciation and wear and tear of data assets into the scope of value assessment, which provides a more feasible way of assessing the value of data assets when the initial costs of data assets account for a large proportion of the overall value and when data assets have not yet generated revenues and the trading market is not mature. However, the cost approach has limitations in that it takes into account the depreciation of data assets, but there are still difficulties in measuring these depreciations reliably, and the initial operating costs actually account for a certain portion of the overall value, which the cost approach fails to take into account.

3.3.2. Income Approach

The income approach is a set of valuation methods designed along the lines of discounting the expected future earnings of data assets. The income approach model is basically consistent with the discounted cash flow model, so the income approach has three conditions for application: (i) the expected future income can be measured reliably in monetary terms; (ii) the income period of the expected future income can be determined; and (iii) the risk associated with the expected future income can be measured.

The advantage of the income approach lies in the full consideration of the future expected returns of data assets. Since data assets will continue to generate economic value, the use of the income approach can more accurately reflect the value of data assets, and at the same time, it can also give certain reasonable expectations to data asset users and enterprise managers and increase the effectiveness of decision-making. However, in the process of applying the income approach, the subjectivity of the appraisers exists in the measurement of the future expected returns and its return period and risk, and the income approach requires a high degree of professionalism from the appraisers, which are all limitations of the application of the income approach.

3.3.3. Market Approach

The market approach is a set of appraisal methods designed along the lines of comparing data assets with comparable references in the open market. The application of the market approach requires the fulfillment of three basic conditions: (i) the market should meet the conditions of an open market; (ii) the market should meet the conditions of an efficient market; and (iii) there should be a certain number of comparable references in the market.

The advantage of the market approach is that for the data asset itself, it can measure the value of the data asset in a more objective and fair manner. At the same time, the market approach is simpler and easier to understand for both parties involved in the transaction of data assets. It is difficult to use the market approach to assess the value of data assets under the conditions

ISSN: 2692-7608 DOI: 10.6981/FEM.202403_5(3).0001

that the data trading market has not yet reached the open market conditions, and the current data trading volume is relatively small, and a large amount of data is still traded off-site, due to the small number of on-site transactions and the opacity of off-site transactions, which makes the number of comparable references sparse, and the conditions for the application of the market approach are not sufficiently mature.

4. Summary

Data assets are different from ordinary assets and intangible assets. In terms of category, data assets have a wide range of application scenarios, a long development cycle, rich and diverse sources, and a fine division of ownership; in terms of characteristics, in addition to similar features to intangible assets, data assets also have many new features such as variable value, multiple derivation, easy sharing, and zero-cost replication; in terms of value, the value drivers of data assets are often related to the quality of the data, the risk, the development, the application, and other dimensions. In terms of value, the value drivers of data assets are often related to data quality, risk, development, application and other dimensions. Data assets are a combination of data and intangible assets, with characteristics of both. However, traditional monetary-based value assessment methods are mainly applied in the field of intangible assets. This paper summarizes the advantages and disadvantages of traditional value assessment methods, compares the superiority and limitations of traditional value assessment methods, and conducts an adaptability analysis by combining the characteristics of data assets.

In the process of analyzing the adaptability of traditional methods for data asset value assessment, this paper finds that data assets and data products developed based on data assets have a complete life cycle, following the pattern of "newborn period - growth period - stable period - decline period". The law of "newborn period - growth period - stabilization period - decline period" is followed. Currently, the mainstream data asset valuation methods are mainly based on the income approach, especially the multi-period excess income approach, but these methods are conceived and applied as a single approach throughout the entire data asset life cycle, with insufficient consideration of the differences between the various phases of the life cycle. Therefore, this paper hopes that a set of combination methods can be proposed in the future, which is based on the data life cycle, applying the traditional value assessment methods according to the characteristics of different phases of the life cycle, and at the same time combining and matching the methods according to the actual application scenarios, so that the limitations of the traditional methods are corrected to the greatest extent possible.

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