

Research on the Current Status of Data Asset Disclosure in the Steel Industry

Jingdan Hu *

School of Accounting, Southwestern University of Finance and Economics, Chengdu, China

* Corresponding Author Email: hujingdan001@gmail.com

Abstract. With the market-oriented allocation of data elements becoming a national strategy, the recognition of data assets in financial statements has emerged as a critical issue in enterprise digital transformation. However, existing research has paid insufficient attention to the status of data asset disclosure in traditional manufacturing industries, particularly the steel sector. This study focuses on the steel industry, analyzing its potential for data asset capitalization by integrating industry digital transformation trends and core data application scenarios. Through case studies of three typical enterprises: Nanjing Iron and Steel Co., Ltd. (Nangang), Hesteel Company Limited (Hesteel), and Baosteel Co., Ltd. (Baosteel). This paper explores market reactions to sustained disclosing enterprises, potential risks of non-sustained disclosure, and response strategies of non-disclosing enterprises, ultimately summarizing the influencing factors in disclosure strategy decisions. The research finds that the disclosure rate of data assets in the steel industry is extremely low, with enterprises' disclosure decisions influenced by factors such as input-output ratio, industry disclosure atmosphere, and disclosure standards and difficulty. Specifically, Nangang's sustained disclosure generated short-term positive market reactions; Hesteel faced the risk of declining financing capacity due to suspended disclosure; Baosteel replaced data asset disclosure with ESG reports to maintain investor's confidence.

Keywords: Steel industry, data assets, data asset capitalization.

1. Introduction

With the rise of the digital wave, the digital economy centered on data has become the third major economy form following agricultural and industrial economies. According to the China Digital Economy Development Research Report (2024), China's digital economy reached 53.9 trillion yuan in 2023. The market-oriented allocation of data elements has become a national strategic priority. In August 2023, the Ministry of Finance issued the Interim Provisions on Accounting Treatment for Enterprise Data Resources, and in September of the same year, the China Appraisal Society released the Guidelines for Data Asset Valuation. These two documents have jointly driven enterprises' transition from "data resources" to "data assets", ushering in a wave of data assetization.

However, existing research has focused on overall status, practical implementation, and market reactions to data asset capitalization, with a center in the IT sector and limited attention to traditional manufacturing industries like steel. While some studies have provided targeted discussions on the steel industry, for instance, this literature explores specific practical paths of data asset capitalization through offline interviews with leading steel enterprises. They cover a relatively narrow scope and lack in-depth analysis of the behavioral logic behind differences in corporate disclosure strategies [1].

2. Analysis of the Potential for Data Asset Capitalization in the Steel Industry

2.1. Digital Transformation Trends Driving Data Asset Capitalization

As a pillar industry of the national economy, the steel sector faces challenges such as overcapacity, slow core technology iteration, and the need to improve green and low-carbon development. Thus, the 14th Five-Year Plan emphasizes the coordinated goals of high-end, intelligent, and green development in the steel industry. In January 2025, the Ministry of Industry and Information Technology issued the Steel Industry Specification Conditions (2025 Edition), introducing an

"Leading Enterprise Evaluation System" with digital transformation as a core indicator. This inevitable trend of digital transformation has generated vast untapped data resources, which, through effective integration and asset management, will strongly drive data asset capitalization in the steel industry.

2.2. Core Data Types and Application Scenarios

2.2.1 Production Process Data

In quality control, deploying data analysis tools enables intelligent monitoring and analysis of the entire production process, activating production data to support quality issue tracing and trend prediction [2].

In energy management, collecting and analyzing energy data across processes allows enterprises to optimize energy allocation and improve efficiency [3]. For example, Nangang deployed an integrated smart energy management platform, reducing annual carbon emissions by over 50,000 tons, enhancing the utilization of residual gas, heat, and pressure, lowering production costs, and promoting the coordinated development of digitalization and greenization.

2.2.2 Supply Chain Data

In supply chain management, building a supply chain management system and collecting procurement data enables pre-prediction, in-process control, and post-analysis for optimal decision-making [4]. For instance, Beijing Shougang Co.,Ltd. developed an integrated procurement and supply chain system to unify procurement plans, integrate suppliers' resources, and analyze whole procuring process efficiency, resolving issues like ineffective plan management and poor supplier quality, achieving cost reductions and efficiency gains.

In supply chain logistics, analyzing historical transportation data reduces costs and improves efficiency. Shougang Jingtang United Iron and Steel Co Ltd.'s smart logistics platform, leveraging 5G, IoT, and AI, has reduced transport vehicles by 60 units, has improved logistics efficiency by 15.2%, and has lowered on-site vehicle costs by 10%.

2.2.3 Market Data

In the field of market demand, building a customer-enterprise interconnection platform enables data-driven flexible production and demand response, balancing supply and demand [5]. Nangang collaborated with China Mobile to develop an intelligent operation platform for industrial chain collaboration, implementing a C2M model driven by data that shortened high-end product R&D cycles by over 30% and generated annual direct economic benefits of approximately 410 million yuan.

2.3. Overall Status of Data Asset Disclosure in the Steel Industry

As of April 30, 2025, among 5,349 A-share listed companies, 43 steel enterprises released 2024 annual reports. Otherwise, only 100 A-share companies disclosed data resource-related matters in 2024, with merely 1 steel enterprise (Nangang) disclosing data assets. Nangang has continuously disclosed data asset amounts since Q1 2024, while Hesteel in Q3 2024 but later only listed "data resources" without amounts. All other steel enterprises remained non-disclosing. Thus, the data asset disclosure rate in the steel industry remains overall low.

3. Case Studies of Data Asset Capitalization in Leading Steel Enterprises

To conduct an in-depth analysis of the heterogeneity in enterprise disclosure strategies, this section selects three enterprises with different disclosure strategies: Nangang (sustained disclosure), Hesteel (non-sustained disclosure), and Baosteel (non-disclosure) for case studies, analyzing the market reactions resulting from sustained disclosure of data assets, the potential risks faced by enterprises with non-sustained disclosure, and the response strategies of non-disclosing enterprises.

3.1. Nangang: Sustained Disclosure

Nangang has continuously disclosed data asset amounts since its Q1 2024 report. The following analysis will interpret its disclosure status and the resulting market reactions to explore the underlying behavioral logic.

3.1.1 Data Asset Disclosure Status

According to Table 1, Nangang disclosed a data asset amount of 5.004 million yuan in its 2024 semi-annual report and 10.323 million yuan in its annual report, representing a year-on-year increase of 5.319 million yuan with a growth rate of 106.3%. As indicated in Tables 2 and 3, data resources classified as intangible assets are entirely self-developed, while data resources categorized as development expenditures are all derived from capitalized research and development expenditures. Consequently, Nangang has actively advanced the data assetization process by integrating data asset management into the entire lifecycle of its “Zhigai Shuzhuan Wanglian” (Intelligent Transformation, Digital Conversion, and Network Integration) project management, thereby completing the capitalization of data assets into financial statements (see Table 1, Table 2 and Table 3).

Table 1. Nangang’s Data Asset Disclosure (Unit: Yuan)

Period	Data Resources (Inventory)	Data Resources (Intangible Assets)	Data Resources (Development Expenditures)	Total
2024 Q1	-	151,802.52	1,022,893.43	1,174,695.95
2024 H1	-	146,742.44	4,857,316.60	5,004,059.04
2024 Q3	-	142,947.38	4,857,316.60	5,000,263.98
2024 Annual	-	747,572.31	9,575,476.22	10,323,048.53
2025 Q1	-	697,875.74	12,870,519.70	13,568,395.44

Table 2. Nangang’s 2024 Annual Data Resources (Intangible Assets) (Unit: Yuan)

Item	Amount Added in Current Period	Amount Reduced in Current Period	Ending Book Value
Total Intangible Data Resources	783,399.34	35,827.03	747,572.31
- Purchased	-	-	-
- Self-developed	783,399.34	35,827.03	747,572.31
- Acquired by Other Means	-	-	-

Table 3. Nangang’s 2024 Annual R&D Expenditures (Unit: Yuan)

Item	Current Period Amount	Previous Period Amount
Total R&D Expenditures	2,445,807,710.45	2,402,465,866.24
- Expensed R&D Expenditures	2,436,232,234.23	2,402,465,866.24
- Capitalized R&D Expenditures	9,575,476.22	-

Nangang classifies data assets under "Intangible Assets" and "Development Expenditures" rather than "inventory" due to steel industry characteristics. Per *Accounting Standard for Business Enterprises No. 1 Inventories*, inventory must be "held for sale" or "produced for sale". However, steel industry data assets are deeply integrated into production, used internally for process optimization, quality control, and energy efficiency improvement, not for direct sale, disqualifying them as inventory [6]. Meanwhile, the data application scenarios in the steel industry determine that the data assets of the steel industry are characterized by realizing the value of data resources through indirectly improving production efficiency to bring about inflows of economic benefits, which meets the recognition criteria for "Intangible Assets"; the long-cycle and phased cultivation characteristics

of its data assets also qualify as capitalized development-stage expenses, conforming to the recognition criteria for "Development Expenditures".

3.1.2 Market Reaction to Data Asset Capitalization

A short-term event study was conducted using Nangang’s 2024 annual report release date as the event day (T=0), with an event window of [-5,5] and an estimation window of [-210, -11]. The market model was employed:

Step 1: Calculate the actual stock return $R_{i,t}$, where $R_{i,t}$ denotes the actual return of stock i on day t ; $R_{m,t}$ represents the market return on day t , with the Shanghai Composite Index return adopted in this study; and $\varepsilon_{i,t}$ denotes the regression residual. After substituting the data from the estimation window into the regression analysis, the formula for Nangang's actual stock return is derived as $R_{i,t} = 0.6872$ and $R_{m,t} - 0.0007$.

Step 2: Calculate the abnormal return $AR_{i,t}$; the cumulative abnormal return (CAR) is then obtained by summing up $AR_{i,t}$. Here, $E(R)$ denotes the normal return determined by the excess return α_i , market risk β_i , and market return $R_{m,t}$. The specific calculations are presented in the table below (see Table 4):

Table 4. Nangang’s AR and CAR Values

T	$R_{m,t}$	$R_{i,t}$	$E(R)$	$AR_{i,t}$	CAR
-5	-0.39%	0.63%	-0.34%	0.97%	0.97%
-4	1.81%	1.05%	1.17%	-0.12%	0.84%
-3	0.19%	-1.04%	0.06%	-1.10%	-0.26%
-2	0.11%	-1.89%	0.01%	-1.90%	-2.15%
-1	-0.10%	-1.50%	-0.14%	-1.36%	-3.51%
0	-0.51%	0.43%	-0.42%	0.85%	-2.66%
1	-1.29%	2.16%	-0.96%	3.12%	0.45%
2	0.15%	2.75%	0.03%	2.72%	3.17%
3	0.00%	-0.82%	-0.07%	-0.75%	2.42%
4	-0.04%	-1.25%	-0.10%	-1.15%	1.27%
5	0.15%	0.42%	0.03%	0.39%	1.66%

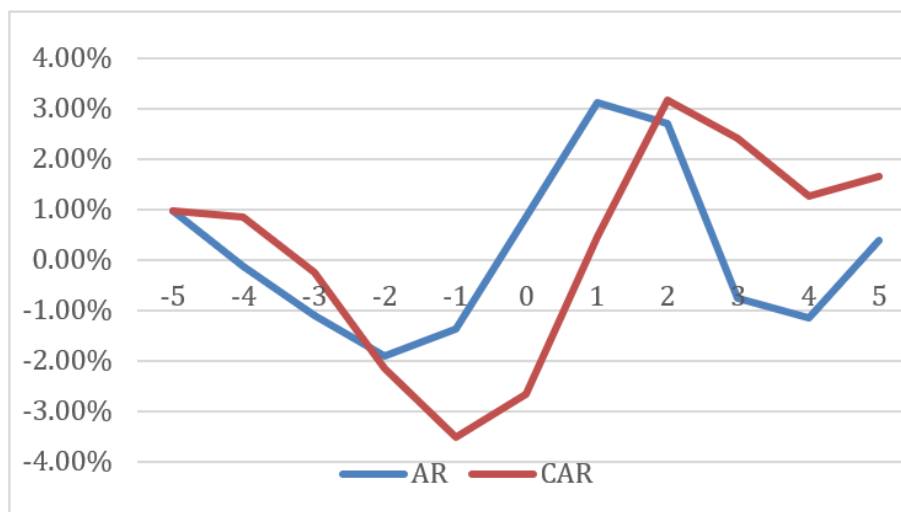


Fig 1. Market Reaction of Nangang

As illustrated in the figure, overall, both AR and CAR exhibited significant volatility. During the period T (-5,0), AR remained consistently negative, leading to a sustained decline in CAR. However, on the event day itself, AR turned positive, driving a rebound in CAR. On the first day after the event, AR reached its peak within the event window and remained positive through the second day post-event, resulting in a substantial increase in CAR. During T (2,5), despite short-term fluctuations in AR, CAR continued to remain positive (see Figure 1).

From the changes in AR and CAR throughout the event window, Nangang's stock price showed a less optimistic trend prior to the annual report release date. However, in the 1-2 days following the release, the stock price rebounded rapidly. Although minor fluctuations occurred in the 3-5 days post-release, overall, the annual report disclosure - specifically the capitalization of data assets - generated a short-term positive impact on the company's stock price. Additionally, according to Nangang's 2024 annual report, due to ongoing downward pressure in the steel industry, its net profit decreased by 2.33% year-on-year and operating revenue declined by 14.79% year-on-year, which would typically trigger a negative market reaction. Nevertheless, the significant rebound in its stock price indicates that data asset capitalization has indeed boosted investors' confidence and yielded favorable financial effects.

3.2. Hesteel: Non-Sustained Disclosure

Hesteel first disclosed the amount of "Data Resources (Intangible Assets)" as RMB 485,300 in its 2024 Q3 report, yet in its 2024 annual report, it merely listed the "Data Resources" account and ceased to disclose amounts related to data asset items. Against the backdrop of the critical period for digital transformation in the steel industry today, the fluctuations in Hesteel's data resource disclosure stand out as particularly unusual. The following analysis will examine the motivations behind this behavior and propose its potential impacts on the company's future development.

3.2.1 Reasons for Non-Sustained Disclosure

Subjective Factors: Hesteel's 2024 financial report reveals multiple challenges. First, both operating revenue and net profit declined; in particular, primarily due to market price fluctuations and rising operating costs. Second, its asset-liability ratio reached as high as 74.89%, far exceeding the industry average, indicating significant debt-servicing pressure on the company. Meanwhile, the net cash flow from operating activities also contracted significantly, decreasing by 13.69% year-on-year, which suggests that the company's cash flow generation capacity in daily operations is weakening. Thus, we can infer that Hesteel, facing profit pressure and considering the substantial costs required for data resource collation and valuation to disclose data assets, chose to suspend disclosure after weighing the input-output ratio of data asset disclosure.

The less optimistic industry-wide data asset disclosure trend has led to insufficient motivation to disclose. In terms of disclosure status in the steel industry, the disclosure rate is less than 5%. However, Hesteel, a leader in the industry's digital transformation, still demonstrates strong digital capabilities to investors. Thus, the positive market reaction brought by disclosing data assets can be temporarily overlooked. The accounting standards system related to data asset capitalization is not yet well-established, with a lack of unified industry disclosure standards, and significant obstacles remain in practical implementation [7]. Therefore, most enterprises remain in a wait-and-see mode, and Hesteel has also chosen to suspend disclosure.

3.2.2 Potential Risks

Non-disclosure may negatively impact financing capacity, as investors might form pessimistic expectations [8]. However, Hesteel, a digital transformation leader, risks undervaluation of its data assets by suspending disclosure. Therefore, when choosing to suspend the disclosure of data assets, enterprises need to consider this aspect of risk.

3.3. Baosteel: Non-Disclosure

3.3.1 Rationale for Case Selection

As the steel industry's largest market capitalization enterprise in 2024, Baosteel leads in digital transformation and has strong potential for data asset disclosure, with 125 AI scenarios deployed and a data assetization rate exceeding 70%, making it comparable to Nangang and Hesteel.

3.3.2 Reasons for Non-Disclosure

Subjective Factors: During its transformation phase, Baosteel prefers to allocate costs toward long-term capability building to generate sustained inflows of benefits, rather than pursuing short-term financial presentation through data asset monetization. Its 2024 annual report places greater emphasis on the "Intelligent Transformation Strategy", with resources primarily directed toward the "Three-Thousand Capability Development". This reflects management's focus on enhancing digital capabilities rather than prioritizing data asset capitalization, as they perceive the input-output ratio of data asset capitalization to be relatively low.

Most peer enterprises choose not to disclose specific amounts of data assets. Following industry trends, Baosteel has opted to avoid disclosing controversial indicators, instead focusing on demonstrating transformation progress and verifiable metrics such as data assetization rate. The accounting standards system related to data asset capitalization is not yet well-established, and the criteria for data asset capitalization are strict. The direct economic benefits brought by Baosteel's AI application scenarios cannot be fully quantified. Therefore, Baosteel focuses on describing efficiency improvement indicators driven by digital technologies rather than specific data asset amounts.

3.3.3 Response Strategies for Non-Disclosure

Although Baosteel has not disclosed data asset amounts, it has demonstrated its data governance effectiveness to investors through an alternative path such as ESG reporting. In the S (Social Responsibility) section of its report, Baosteel elaborates on measures to enhance its smart management capabilities, which has improved the transparency of the corporate information environment, reduced information asymmetry, strengthened investors' confidence in the company's development prospects, and to a certain extent replaced the role of data asset capitalization in enhancing corporate market trust [9].

Meanwhile, Baosteel is actively building a cloud-edge integrated data asset management system, promoting the transformation of data resources into data assets, advancing efforts toward data asset capitalization [10].

4. Discussion and Analysis

Based on the above case studies of enterprises with different data asset disclosure strategies in the steel industry, the influencing factors for enterprises' choice of different disclosure strategies can be summarized into three points: The input-output ratio positively affects data asset disclosure. The industry disclosure atmosphere positively influences enterprises' disclosure willingness. Inconsistent disclosure standards and high disclosure difficulty are the primary obstacles to enterprises' disclosure.

Therefore, we can analyze the current low disclosure rate in the steel industry. Amid industry downturns and most steel enterprises that invest heavily in R&D expenses are in the digital transformation stage, disclosure costs relatively rise. But market reactions according to Nangang's disclosure, though positive, were modest. Therefore, the current input-output ratio of data asset disclosure in the steel industry is low, resulting in a low overall disclosure rate.

The industry disclosure atmosphere is not favorable, and enterprises have low disclosure willingness. Currently, Nangang remains the only enterprise in the steel industry that has capitalized data assets. Although there are enterprises with strong disclosure potential, the overall disclosure trend remains unoptimistic. At the same time, according to the Steel Industry Digital Transformation Assessment Report (2024) released by the China Iron and Steel Industry Association, the overall level of digital transformation in the steel industry continues to improve, but the industry development is uneven - only leading enterprises actively promote innovation, and the deep value of data has not been fully realized, indicating that some enterprises may have insufficient awareness of the strategic value of data resources. Therefore, most enterprises maintain a wait-and-see attitude or lack the capacity to disclose due to their own circumstances.

There are inconsistent disclosure standards within the industry and high disclosure difficulty. The work of data asset capitalization is in its initial stage, and there is no sound accounting standards system. Furthermore, data resources in the steel industry are basically tied to production and mainly used for internal production optimization and efficiency improvement, making it difficult to quantify the economic benefits they bring. Therefore, this has become the primary obstacle to disclosure for steel enterprises.

5. Conclusion

5.1. Summary

This paper conducts an analysis of the current status of data asset capitalization in the steel industry from the following three aspects: This study analyzed data asset disclosure in the steel industry, finding significant capitalization potential driven by digital transformation and core data scenarios. Case studies revealed that sustained disclosure generates short-term positive market reactions, non-sustained disclosure risks financing capacity, and non-disclosing enterprises should search for alternative paths before having the ability to disclose data assets such as ESG reporting. Disclosure strategies are influenced by the input-output ratio, the industry disclosure atmosphere and the disclosure standards and difficulty.

However, this paper still has research limitations. There is a bias in sample selection, leading to insufficient external validity. This study only selects three state-owned leading steel enterprises as cases and does not include small and medium-sized or private enterprises to consider the impact of firm size and ownership nature on disclosure decisions, which may make it difficult to generalize the conclusions to the entire industry. The analysis of short-term market reactions has limited explanatory power. The event window is short, making it impossible to capture long-term value effects, and macro market environment interference may lead to attribution bias in abnormal return fluctuations. There is a conflict between industry specificity and theoretical universality. This results in theoretical contributions being limited to a single industry, making it difficult to form a generalized theory of cross-industry data asset disclosure. Therefore, future research will conduct empirical tests based on large samples, integrate data from the entire steel industry, adopt more quantitative methods such as difference-in-differences models to quantify the impact of various factors on disclosure decisions, and overcome the limitations of case studies. At the same time, it will extend to other traditional industries to develop a generalized cross-industry theory.

5.2. Recommendations

5.2.1 For enterprises

While the steel industry undergoes digital transformation, data asset capitalization is also driving industry transformation. Enterprises should embrace this wave of digitalization and proactively advance efforts toward data asset capitalization.

Non-disclosing enterprises should take Nangang as a benchmark to establish organizational and process support systems for data asset management. Before fully acquiring the capability for disclosure, they should learn from Baosteel's response strategies that explore alternative paths for data asset disclosure.

5.2.2 For Investors

When making investment decisions, investors should not solely rely on the "Data Resources" account to assess enterprises' digital capability development. Instead, they should also pay attention to non-financial indicators through other public channels.

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