High-precision Solution of Differential Equations for Corporate Accounting and Financial Statement Based on Stochastic Galerkin Spectrum Method

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Abstract. Based on the high-precision guidance, the main high-precision points in each link of the supply chain in accounting and financial statements are analyzed systematically, and effective control activities are performed. It can significantly improve the quality of accounting and financial statements and enhance the forecast effect of accounting and financial statements on economic activities and the availability for decision-making, which allows economic activities to be carried out more orderly.

Keywords: Stochastic Galerkin Spectrum Method, Accounting and Financial Statements, Differential Equation, High Precision

1. Introduction
High-quality information disclosure is an important condition for the healthy and orderly development of the capital market, which is of great significance to protect the interests of investors and strengthen the supervision of listed companies. In recent years, there are frequent financial scandals[1-2], among which there are many well-known international companies, such as Enron, Hollinger group, Kirsch media group, Nortel Network Corporation of Canada, Parmalat of Italy, Satyam, a software giant of India and BOC Guangxia, etc. Report fraud of a company can severely damage the interests of investors, hinder the healthy development of the capital market[3-4], and rouse the widespread concern of investors, regulators, academia, etc. In recent years, scholars at home and abroad have made an in-depth exploration of the influencing factors of the quality of information disclosure and how to improve the quality of information disclosure[5-6]. Based on the stochastic Galerkin spectrum method, this paper studies the high-precision control of the financial statements of enterprises, which is a new
idea.

2. Main links of the supply chain in accounting and financial statements and the high-precision control objectives

From the perspective of the supply chain, the generation process of accounting and financial statements can be divided into five parts: preparation, review, audit, release, and application analysis. The preparation of accounting and financial statements involves the formation of preparation plans, the determination of accounting treatment of major transactions or events, the liquidation and verification of assets, the confirmation of claims and debts, reconciliation and settlement, the preparation of individual financial statements, the preparation of consolidated financial statements, etc. The preparation link is the basis of the generation of accounting and financial statements. The high-precision control effect of the preparation link directly affects whether the information on accounting and financial statements is true and reliable. The high-precision control objective of this link is to ensure that enterprises have clear procedures for preparing accounting and financial statements, clear division of responsibilities and reasonable staffing, and prepare accounting and financial statements in accordance with accounting standards and internal systems. The audit of financial statements refers to that before the financial statements are provided to the outside world, the person in charge of the accounting department and the person in charge of the enterprise shall ensure the accuracy, authenticity, integrity, and legal compliance of the financial statements through the audit procedure. The high-precision control objective of this link is to ensure that the enterprise's accounting and financial statements are audited according to the standard process, to ensure the authenticity, integrity, and compliance of the accounting and financial statements provided to the outside world.

The audit link of accounting and financial statements is that before the accounting and financial statements are released to the outside world. A company engages a qualified accounting firm to audit the accounting and financial statements; under the supervision of the government and the market, the accounting firm audits the accounting and financial statements in accordance with the accounting standards and auditing standards. The control objective of this link is to ensure the credibility of the audited financial statements, so that users of the financial statements can make correct and useful economic decisions based on the audited financial statements. The issue of accounting and financial statements refers to that a company submits the accounting and financial statements and audit reports to investors, creditors, government supervision departments, etc. to disclose its own financial information to provide a decision basis for financial information users. The high-precision control goal of this link is to enable users of accounting and financial statements to use accounting and financial statements and related resources more quickly and effectively.

The use and analysis of accounting and financial statements refers to the systematic review and evaluation of the financial status, operating results, and cash flow of a company by using financial statements such as balance sheet, profit statement and cash flow statement. The overall objectives of the use and analysis of accounting and financial statements are as follows: To evaluate the business performance, financial status and cash flow of the enterprise, reveal the contradictions and problems existing in the financial activities, provide direction and clues for improving the operation and management; analyze whether the budget of the enterprise is reasonably completed, evaluate the operation of the management., and propose financial advice for improving the operation results;
predict the future high-precision returns of enterprises, and provide a necessary basis for financial information users to make correct economic decisions.

3. Main high-precision analysis in the preparation of financial statements

This paper only takes the essential link of the supply chain of accounting and financial statements - the preparation link as an example to study its main high-precision points, key control points, and control measures. The preparation process of accounting and financial statements usually involves the preparation of accounting and financial statements, the determination of accounting treatment of significant events, the liquidation and verification of assets, the verification of creditor's rights and debts, reconciliation and settlement, the preparation of individual financial statements, the preparation of consolidated financial statements, etc.

The quality assessment of corporate accounting information can be expressed as follows:

\[
\Phi(t) = \Phi(T_0) + f(t - T_0) + \sum_{i=1}^{n} \frac{f^{(i)}(t - T_0)^{i+1}}{(i+1)!} 
\]

(1)

Where \( t \) represents the corporate benefit information; \( \Phi(T_0) \) represents the information at the time of quality evaluation \( T_0 \); \( f \) represents the frequency of corporate accounting information evaluation; \( f^{(i)} \) represents the \( i \) derivative of \( f \) (generally \( i = 1, 2, 3 \)).

To simplify the quality evaluation, we take \( i = 2 \) and get:

\[
\Phi(t) = \Phi(T_0) + f(t - T_0) + \sum_{i=1}^{n} \frac{f^{(2)}(t - T_0)^{i+1}}{(i+1)!} 
\]

(2)

Where \( f, \dot{f}, \ddot{f} \) and \( \Phi(T_0) \) represent model parameters, which represent the accuracy of corporate accounting information evaluation, the first derivative and second derivative of accuracy, which can be obtained by fitting long-term evaluation data of information evaluation.

As the original information of corporate accounting information is not required for corporate accounting information assessment and assessing through the original corporate accounting information, three pieces or above corporate accounting information shall be assessed at the same time by integration of information assessment equation (2) and information assessment conversion equation (3) based on the enterprise profit.

Based on neural network combination principle, in consideration of influence to the accuracy of quality assessment from other factors, and by combining the \( \delta r = r - \hat{r} \), the information quality assessment conversion equation can be expressed as:

\[
c(t_{SAB} - t_{SC}) = \hat{n} \cdot (\bar{r} + \delta r) + \frac{1}{2D_0} \left[ \hat{n} \cdot (\bar{r} + \delta r) \right]^2 + 2(\hat{n} \cdot b) \left[ \hat{n} \cdot (\bar{r} + \delta r) \right] - \| \bar{r} + \delta r \|^2 - 2b \cdot (\bar{r} + \delta r) \]

(3)

3.1. Main high-precision control measures for preparing the accounting and financial statements

Before preparing the financial statements, a company shall draw up the preparation plan of the financial statements, and make clear the preparation basis, preparation method, and procedure, division of responsibilities, preparation schedule and other relevant contents of the financial
statements. The main high-precision points, key control points, control objectives and corresponding control activities in this stage are described in Table 1.

**Table 1.** Main high-precision control measures for preparing accounting and financial statements

| Main high-precision points | critical control point | Control objectives | Main control measures |
|----------------------------|------------------------|--------------------|-----------------------|
| Accounting policies are not adjusted in time; | Stuffing control; Approval system and process; | Ensure the legal compliance, complete content, scientific planning, and strong feasibility of the preparation plan of accounting and financial statements. | Keep consistent with the national unified accounting system; The adjustment of accounting policies and accounting estimates shall be approved per the prescribed authority and procedures; Corporate accounting rules and regulations, accounting and financial statement process, annual report preparation plan, etc. shall be approved by the relevant person in charge; Establish a perfect information communication system; Clarify the responsibilities of each department; Arrange working hours according to the submission requirements of accounting and financial statements, set key time nodes, and supervise, assess and remind. |
| The change of important accounting policies or accounting estimates has not been approved; | Strengthen information communication; | | |
| Accounting policies are not effectively implemented; | Strengthen internal audit; | | |
| The unclear division of power and responsibility among departments results in poor information communication; | Job division and allocation of rights and responsibilities; | | |
| The schedule of each step is not clear, and the submission time may be delayed. | Time node control. | | |

| High precision point | critical control point | Control objectives | Main control measures |
|---------------------|------------------------|--------------------|-----------------------|
| The accounting treatment of significant events does not conform to the accounting standards, resulting in the distortion of accounting information and the inability to truthfully reflect the actual situation of the enterprise. | Business ability of accounting personnel; | To ensure that the accounting treatment of significant events complies with the standards and that the accounting information truthfully reflects the economic essence. | Pay close attention to major issues such as audit adjustment and its impact in previous years, change and impact of standards, new business, scope of internal consolidated report, etc.; Timely communicate major accounting matters requiring professional judgment, and conduct accounting treatment according to the requirements of the standards. |
| | Approval system and process; Internal information transmission and communication; Expert review control. | | |

3.2. **Determination of the main high-precision control measures in the accounting treatment of significant events**

Before preparing the accounting and financial statements, the enterprise shall pay attention to the significant events that have a significant influence on the current report and their accounting treatment. These significant events may include debt restructuring, merger and acquisition, non-monetary asset exchange, fair value measurement, asset impairment, etc. The main high-precision points, key control points, control objectives and corresponding control activities in this stage are described in Table 2.

**Table 2.** Main high-precision control measures in accounting treatment of significant events

3.3. **Main high-precision control measures for asset review and debt validation**

Before the preparation of accounting and financial statements, the enterprise shall organize the financial and accounting departments and relevant departments to carry out the asset
inventory and the verification of claims and debts. The main high-precision points, key control points, control objectives and corresponding control activities in this stage.

3.4. Main high-precision control measures for reconciliation and settlement

Before preparing the annual accounting and financial statements, the enterprise shall complete the reconciliation, account adjustment, error correction and other businesses on the basis of checking the daily information, and then implement the closing operation. The main high-precision points, key control points, control objectives and corresponding control activities in this stage are described in Table 4.

(5) Main High-precision Control Measures for Preparing Individual Financial Statements

Based on the format and content of the accounting and financial statements stipulated in the accounting standards, a company should prepare the accounting and financial statements according to the true, complete and correct records of accounting books and other relevant materials, to ensure that the contents are complete, the data are true, and the calculation is correct. It is not allowed to omit or choose at will. The main high-precision points, key control points, control objectives, and corresponding control activities in this stage are shown in the description.

(6) Preparation of Consolidated Financial Statements

Before preparing the consolidated financial statements, the group company shall timely obtain the financial statements of each branch, subsidiary, and internal independent accounting unit included in the scope of consolidation and review the form and content in accordance with the prescribed procedures. If any problem is found, it shall be returned to the original unit for recompilation. The main high-precision points, key control points, control objectives, and the corresponding control activities in this stage are described in Table 6.

4. Conclusions

It is an important responsibility of a company to ensure the reasonable authenticity and integrity of its accounting and financial statements and related information. High-precision reporting is one of the main high-precision reporting faced by enterprises. The information distortion in the financial statements of a company can seriously damage the interests of the investors and hinder the healthy development of the capital market. Hence, it is of considerable significance to strengthen the high-precision solution of differential equations for the financial statements. Based on the stochastic Galerkin spectrum method, we studied the high-precision solution of differential equations for the accounting and financial statements in this paper. The preparation of accounting and financial statements is taken as an example to analyze in detail the main high-precision points, key control points, control objectives, and control measures in the preparation of accounting and financial statements. The author believes that in the high-precision solution of differential equations for the accounting and financial statements, close attention should be paid to the professional competence of the relevant personnel and the moral quality of the key personnel; the allocation of rights and responsibilities and the division of personnel should be clarified; the separation of incompatible positions should be followed to clarify the system and process of preparation, audit, approval, release and utilization of accounting and financial statements; the main high-precision points of each link in the supply chain of accounting and financial statements should be consolidated systematically; key
control points should be established, control objectives should be defined and broken down in detail, and the corresponding high-precision control measures should be taken.

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