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Evaluation and Analysis of Enterprise Accounting and Auditing Efficiency Based on Optimal Weighting Model——Taking Zhangzhou Pien Tze Huang Pharmaceutical Co., Ltd. as an Example

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Abstract: *In order to build a relatively complete accounting and auditing evaluation index system in the pharmaceutical industry and improve the accounting and auditing efficiency, this paper selects the three major indicators of Zhangzhou Pien Tze Huang Pharmaceutical Co., Ltd.'s revenue, profit and stock from 2012 to 2021 as research samples. The optimal weighting method is used to compare the influence of the selected three major indicators on accounting and auditing efficiency, and the weight of each indicator is determined by the analytic hierarchy process and the entropy method respectively. The importance of each index in the audit evaluation system. The study found that the profit index is an important factor in evaluating the efficiency of accounting and auditing, and its importance is higher than that of the income index and stock index; the influence degree of the income index is between the profit index and the stock index; the impact of stock index is low.*

Keywords: *accounting and auditing efficiency; analytic hierarchy process; entropy method; Pien Tze Huang Pharmaceutical Co., Ltd*

1. Introduction

2021 is the first year of the 14th Five-Year Plan. Documents such as the "14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of Vision 2035" and the "14th Five-Year Plan for National Medical Security" have been released successively, in which clinical value, high-quality development and technological innovation are the main themes of the development of the pharmaceutical industry during the 14th Five-Year Plan period, drawing a long-term blueprint for the medical and health undertakings and the biomedical industry, and the adjustment of the payment structure will drive the transformation and upgrading of the industry. In recent years, the number of innovative drugs on the market in my country has increased significantly. In 2020, the number of innovative drugs approved for marketing in China will be 45, which is 9 times that of 2016. The number of approved innovative drugs is gradually approaching developed regions such as the United States and Japan. According to "the Annual Report on the Status of New Drug Registration Clinical Trials in China (2020) ", there are 1,473 new drug registration clinical trials, and the top 10 drug targets total 389 projects, accounting for as high as 26%, of which 7 targets have more than 90% indications are concentrated in the anti-tumor field, and there are as many as 75 PD-1 registered clinical trial projects. Pien Tze Huang Pharmaceutical, as a national high-tech enterprise and a national intellectual property model enterprise, also attaches great importance to R&D to a certain extent, but its profitability in recent years is not objective, and the accounting and auditing efficiency of the enterprise can reflect the enterprise's financial situation to a certain degree. The company's board structure, supervision and access mechanism will affect the company's accounting information disclosure level in some degree [1]. The efficiency of internal audit can promote the repair of the internal control defects of listed companies, and the higher independence of internal audit will play a positive role in it [2]. The improvement of audit efficiency can strengthen the effectiveness and pertinence of audit work, give full play to the role of audit supervision, and enhance audit prevention capabilities.

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2. Analysis of existing research

Studies by scholars have shown that the improvement of internal audit efficiency can have a positive impact on the repair of internal control defects, that is, the higher the internal audit efficiency, the better the repair effect of internal control defects. At the same time, the independence of internal audit has a moderating effect on the efficiency of internal audit and the repair of internal control defects. With the improvement of the independence of internal audit, the promotion of internal audit efficiency to the repair of internal control defects is enhanced [2]. The ultimate goal of generalized behavioral auditing is to suppress defective behaviors, and the auditing efficiency under different auditing paths is affected by the organizational governance of the audited unit [3]. In addition, AHP can quantify qualitative indicators and the uncertainty expressed in quantitative evaluation, effectively reduce the subjectivity of audit evaluation, enhance the applicability of the evaluation index system, make audit evaluation more objective and fair, and add a new dimension to audit practice [4].

To some extent, the existing literatures explain the impact of evaluating the efficiency of corporate auditing on the interior of the audited unit, but there are still some shortcomings in the quantitative and qualitative analysis of various levels of evaluating the efficiency of corporate accounting and auditing. By using the AHP, this paper discusses the impact of evaluating the efficiency of the company's auditing on the interior of the audited unit from the company's profit index, income index and stock index three perspectives.

3. The research hypothesis of this paper

Audit efficiency refers to the result of the comparison between the actual input of audit resources and the results of the audit. For internal audit, studies have shown that audit work is inseparable from the identification and repair of internal control deficiencies. For users of accounting information, decisions need to be based on accounting information. Managers make decisions mainly based on the company's profit indicators, income indicators and stock indicators, and the most commonly used information is accounting information. By studying profit indicators, income indicators and stock indicators can help managers to better judge and make decisions.

Through the above analysis, the internal accounting and auditing efficiency of the company is affected by many indicators, and we need to analyze the weight of the impact of different indicators. Profit index is the main basis for analyzing the operating results of an enterprise, an important index for evaluating profitability, and also the basic basis for equity investors to choose investment objects and creditors to evaluate credit risks and make credit decisions. Based on this, the research hypothesis H1 is put forward: Profit index is an important factor in evaluating the efficiency of accounting and auditing of a company, and its importance is higher than that of income index and stock index. Stock prices involve various factors in the process of aggregating accounting information efficiency, so the efficiency of aggregating accounting information is not high. Based on this, the hypothesis H2 is put forward : the impact of stock index on accounting and auditing efficiency is low.

4. Research design

4.1 Sample selection and data sources

Data in this article are mainly from www.cninfo.com.cn, some of them are from the data disclosed by the Shanghai Stock Exchange, and other data are collected by hand. By selecting some indicators of Zhangzhou Pien Tze Huang Pharmaceutical Co., Ltd. from 2012 to 2021 as the initial research sample. In order to ensure the validity of the data, the screening is carried out according to the following principles: (1) Taking into account the differences in capital structure and operation mode, the financial and insurance samples are excluded; (2) The samples with missing observation data during the sample period are excluded. Finally, 9 valid sample observations that can evaluate the company's accounting and auditing efficiency and related data are available.

4.2 Variable definitions

① Net Profit (NP): The company's profit retention after paying income tax in the total profit according to regulations. Net Profit = total profit * (1 - income tax rate).

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② Gross Profit Margin (GPM): It reflects the value-added part of a commodity after the internal system is converted into production. Gross Profit Margin = gross profit / operating income × 100% = (operating income - operating cost) / operating income × 100%.

③ Net Profit Rate (NPR): It comprehensively reflects the operating efficiency of an enterprise or an industry. Net Profit Rate = net profit / operating income × 100%.

④ Return on Equity (ROE): It reflects the income level of shareholders' equity and is used to measure the efficiency of the company's use of its own capital. Return on Equity = net profit / average net assets * 100%.

⑤ Return on Assets (ROA): an indicator used to measure how much net profit is generated per unit of assets. Return on Assets = net profit after tax / total assets.

⑥ Operating Income (OI): The monetary income obtained by commercial enterprises from selling goods or providing labor services in a certain period of time. Operating Income = main business income + other business income or operating income = product sales volume (or service volume) * product unit price (or service unit price).

⑦ Dividend Payout Ratio (DPR): It reflects the willingness of listed companies to return shareholders with cash. Dividend Payout ratio = dividend per share / current share price.

⑧ Dividend per share (DPS): Dividend per share = dividend/weighted average number of ordinary shares.

⑨ Earnings per share (EPS): It reflects the operating results of the company, measures the profit level and investment risk of common stocks, and is used by investors and other information users to evaluate the profitability of the company, predict the growth potential of the company, and then make relevant economic decisions. Basic earnings per share = current net profit attributable to ordinary shareholders / weighted average number of ordinary shares outstanding in the current period.

4.3 Model building

This paper uses the optimal weighting method to evaluate the company's accounting and auditing efficiency. Its core is the combination of the AHP and the entropy method, which considers the subjective analysis angle and the objective analysis angle at the same time.

Firstly, we determine the weight of each indicator through AHP. The steps are as follows:

Step 1: Build a Hierarchy. Firstly, the decision problem is divided into three parts, namely: target layer, criterion layer and scheme layer.

Step 2: Construct the judgment matrix. The judgment matrix is the judgment of the importance of the two indicators. The general judgment matrix is constructed as follows.

$$C = \begin{bmatrix} C & C_1 & C_2 & C_3 & \cdots & C_n \\ C_1 & C_{11} & C_{12} & C_{13} & \cdots & C_{1n} \\ C_2 & C_{21} & C_{22} & C_{23} & \cdots & C_{2n} \\ C_3 & C_{31} & C_{32} & C_{33} & \cdots & C_{3n} \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ C_n & C_{n1} & C_{n2} & C_{n3} & \cdots & C_{nn} \end{bmatrix} \quad (1)$$

Table 1: Nine-level scale table

Scaling	meaning
1	Indicates that compared with two factors i and j, the i factor is as important as the j factor
3	Indicates that the i factor is slightly more important than the j factor compared with the two factors i and j
5	Indicates that the i factor is significantly more important than the j factor compared with the two factors i and j
7	Indicates that compared with two factors i and j, the i factor is more important than the j factor
9	Indicates that compared with two factors i and j, the i factor is extremely important than the j factor
2, 4, 6, 7, 8	The median of the above two adjacent judgments
reciprocal	Indicates the importance scale of the j factor and the i factor compared with the two factors j and i

C_i and C_j represent the lower elements associated with C. C_{ij} represents the relative importance value

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of C_i compared to C_j in terms of C, and so on.

Here we use the 1-9 scale method to measure the importance of the factors (as shown in Table 1).

Step 3: Check the compatibility of the judgment matrix and determine the index weight

Next, we need to perform a compatibility test on the rationality of the constructed judgment matrix. The calculation formula of its incompatibility is CI, and the calculation formula of CI is:

$$CI= (\lambda max - n)/(n - 1) \quad (2)$$

If the calculated CI=0, it means that the judgment matrix has complete consistency, and the whole system has satisfactory consistency. Professor Saaty also introduced the average random consistency index RI, and the specific data is in Table 2.

Table 2: N -dimensional vector average random consistency index

n	3	4	5	6	7	8	9
R	0.58	0.9	1.12	1.24	1.32	1.41	1.45

According to the calculated CI and the RI given by the look-up table, the CR can be calculated according to the formula CR=CI/RI. When CR<0.1, it is considered that the judgment matrix has good compatibility. Otherwise, the judgment matrix needs to be readjusted.

Step 4: Weight calculation

Hierarchical sorting adopts the formula $CX= \lambda_{max} X$ to find the maximum eigenvalue λ_{max} of C and the corresponding eigenvector $X = (X 1 , X 2 , X 3 , X 4)^T$ transforms the relationship of qualitative factors into quantification. And it normalizes the weights:

$$X1 * =Xi / (\sum_{j=1}^{4} Xj), i =1,2,3,4 \quad (3)$$

Step 5: calculate the comprehensive evaluation score

The second step of the optimal weighting method is the entropy method modeling:

Step 1: Normalize the data

Since the measurement units of various indicators are not uniform, they must be standardized before calculating the comprehensive weight, that is, the absolute value of the indicator is converted into a relative value, and $x_{ij} =|x_{ij}|$, so as to solve the problem of homogenization of different quality index values. Moreover, since the values of positive indicators and negative indicators have different meanings (the higher the value of the positive indicator, the better, and the lower the value of the negative indicator, the better), we use different algorithms to standardize the data for the high and low indicators. The specific method is as follows:

For positive indicators:

$$xij = \frac{x_{ij} - \min\{x_{1j}, L\, x_{nj}\}}{\max\{x_{ij}, L\, x_{nj}\} - \min\{x_{1j}, L\, x_{nj}\}} \quad (4)$$

For negative indicators:

$$xij = \frac{max\{x_{1j}, L\, x_{nj}\} - x_{ij}}{\max\{x_{ij}, L\, x_{nj}\} - \min\{x_{1j}, L\, x_{nj}\}} \quad (5)$$

Step 2: Calculate the proportion p_{ij} of the index value of the i-th plan under the j-th index

$$pij = \frac{x_{ij}}{\sum_{i=1}^{n} x_{ij}} (j = 1, 2, L, m) \quad (6)$$

Step 3: Calculate the entropy value e_j of the j-th index

$$ej = - k \sum_{i=1}^{n} p_{ij}\, lnp_{ij} \quad (7)$$

where k = 1/ ln(n), satisfying $e_j >= 0$

Step 4: Calculate the information entropy redundancy

$$gj = 1- ej \quad (8)$$

Step 5: Calculate the weight of each indicator

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$$wj = \frac{g_j}{\sum_{j=1}^{m} g_j} \quad (9)$$

Step 6: Calculate the composite score

$$si = \sum_{j=1}^{m} w_j p_{ij} \quad (10)$$

Finally, combined with matlab software, the relevant weights of the optimal weighting method are obtained, that is, the weights calculated by the AHP method and the weights calculated by the entropy method are synthesized.

5. Empirical Research

By dividing the selected influencing factors into three categories: profit index, income index, and stock index, the profit index includes net profit, gross profit rate, and net interest rate; income index includes return on equity, return on assets, and operating income; stock index includes payout ratio, dividends per share, earnings per share. In order to test the degree of influence of each variable on accounting and auditing efficiency, the research carried out AHP analysis on the main variables respectively, and determined the index weight by constructing a judgment matrix. The results of AHP analysis are shown in Table 3, it can be seen that the weight of net profit exceeds 40%, which is in line with expectations. It shows that this index has a significant impact on the evaluation of the company's accounting and auditing efficiency, and preliminarily verifies the research hypothesis H1. However, the total impact of stock index on accounting and auditing efficiency is about 10%, and the proportion is small, indicating that its impact on accounting and auditing efficiency is small, so the hypothesis H2 is also established.

Table 3: Influence weights of main indicators on accounting and auditing efficiency (under AHP)

Net profit	0.6370	0.4058	Roe	0.6267	0.1619	Payout ratio	0.6738	0.0705
Gross profit margin	0.2583	0.1645	Return on assets	0.2797	0.0722	Dividend per share	0.2255	0.0236
Net interest rate	0.1047	0.0667	Operating income	0.0936	0.0242	EPS	0.1007	0.0105

The entropy method is more objective. By using the entropy method to analyze the nine indicators, the weight of each indicator is obtained. The experimental results in Table 4 show that the proportion of profit index, income index and stock index is between 30% and 40%. The proportion of various indexes is relatively balanced, and their impact on accounting and auditing efficiency is not very different, so further research is needed.

Table 4: Influence weight of main indicators on accounting and auditing efficiency (under entropy method)

Net profit	0.2878	Roe	0.0289	Payout ratio	0.0813
Gross profit margin	0.0047	Return on assets	0.0275	Dividend per share	0.1234
Net interest rate	0.0130	Operating income	0.2714	EPS	0.1619

The weight of each index according to the AHP and entropy method obtained above. Since the AHP is greatly affected by subjective factors, the entropy method is more objective, and the weight of the optimal weighting method is obtained. The combination of the two is shown in the Table 5. The degree of influence of this indicator on accounting and auditing efficiency is roughly expressed by the weight. The larger the weight, the higher the degree of influence. According to the Table 5, it can be seen that the proportion of profit index is 43.81 % , the proportion of income index is 30 % , and the proportion of stock index is 26.18% . Then the weights of various indicators are: profit indicator>income indicator>stock indicator, and the assumptions H1 and H2 can also be verified.

Table 5: Influence weights of main indicators on accounting and auditing efficiency (under the optimal weighting method)

Net profit	0.3350	Roe	0.0821	Payout ratio	0.0770
Gross profit margin	0.0686	Return on assets	0.0454	Dividend per share	0.0835
Net interest rate	0.0345	Operating income	0.1725	EPS	0.1013

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6. Conclusion and Suggestion

Starting from the connotation of accounting and auditing efficiency, and the relationship between financial indicators and accounting and auditing efficiency, this paper discusses the degree of influence of different indicators on accounting and auditing efficiency. Research shows that profit index is an important factor in evaluating the efficiency of company accounting and auditing, and its importance is higher than that of income index and stock index. Income indicators also affect accounting and auditing efficiency, but their impact is between profit indicators and stock indicators. At the same time, the impact of stock indicators on accounting and auditing efficiency is low. Based on this, the following recommendations are made.

First, scientifically locate the relationship between financial indicators and accounting and auditing efficiency, and standardize the calculation and acquisition of financial indicators. Zhangzhou Pien Tze Huang Pharmaceutical Co., Ltd. can implement the evaluation of internal financial indicators based on its own characteristics, so as to better use it for information users, and the management can make decisions with a higher degree of information reference.

Coordination and linkage mechanism between financial indicators and accounting and auditing efficiency. Incorporating the analysis of financial indicators into the procedures for evaluating accounting and auditing efficiency can fundamentally strengthen the close connection between financial indicators and accounting and auditing efficiency, and effectively ensure the improvement of accounting and auditing efficiency.

Third, the professional competence of accountants and auditors and the diversification of accountants and audit teams are crucial to improving accounting and auditing efficiency and ensuring quality. Enterprises can improve the quality and skills of staff to improve the efficiency of accounting and auditing by improving the selection, appointment and training system of 5ersonnel.

References

[1] Geng Yanjun. The impact of corporate governance structure on the level of environmental accounting information disclosure [J]. Journal of Liaodong University (Social Science Edition), 2021,23(06):46-50.
[2] Wu Li, Wang Lei, Lin Nan. Internal Audit Efficiency, Internal Audit Independence and Internal Control Deficiency Repair [J]. Journal of Northeastern University (Social Science Edition), 2021, 23(04): 34-41.
[3] Zheng Shiqiao, Bai Yaxin. Organizational Governance Status, Institutional Audit and Audit Efficiency Effect: Theoretical Framework and Case Analysis [J]. Friends of Accounting, 2017(24): 127-131.
[4] Li Suying, Xie Hua, Lu Lina. Construction and Application of Natural Resources Assets Audit Evaluation Index System——Based on Fuzzy Analytic Hierarchy Process [J]. Friends of Accounting, 2018(10):27-30.