

Study on the Internal Control Evaluation System of Coal Enterprise Safety Responsibility

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Abstract

Coal is an important natural resource and economic resource in China, which has been occupying an extremely important position in the national economy and production and life. However, in the process of coal mining, mining accidents have been unable to eliminate, each mining accident will cause the attention of the news media, ordinary people and government agencies, with the increase of news reports, the issue of coal mine safety has gradually come into the researchers' vision. The root cause of coal safety problem is that coal enterprises ignore the fulfillment of safety responsibility and lack of perfect internal control system in the process of pursuing profit and economic benefit maximization. As an important tool of enterprise management, internal control is playing an increasingly important role in enterprises. However, internal control usually pays more attention to the avoidance and control of enterprise economic risks, while neglecting the fulfillment of enterprise security responsibilities. Therefore, the safety responsibility of enterprises should be embedded into the internal control of enterprises, and the internal control evaluation system related to safety responsibility should be built to promote the sustainable development of enterprises.

Keywords

Safety responsibility, internal control evaluation, coal industry.

1. Introduction

According to Chinese coal association released the latest set of data, 2017-2018, China's coal production is about 7.02 billion tons, accounting for 50% of the total world output, but the number of mine is more than half of the total number of the world, from 2017 to 2018, China mining deaths in 634, the average production of 1 million tons of coal have 0.1 life pay, according to official statistics, about 300 people die each year from mine, there are 365 days in a year, on average, one day there was a dead, let a person.

Another set of data, coal mine safety, founded in 1970, is a mining engineering journal sponsored by Shenyang research institute co., LTD., coal science group. According to the official website of the editorial department of coal mine safety in September 2018, the editorial committee of coal mine safety has 50 members, 6 responsible editors and 2 English editors. According to CNNC on September 22, 2018, coal mine safety has published a total of 15,804 literatures, been downloaded 1328139 times, cited 4,9001 times, with a combined impact factor of 0.603 (2017 edition) and a combined impact factor of 0.444 (2017 edition). According to the data and knowledge service platform of Wanfang on September 22, 2018, coal mine safety contains 10,319 articles, 29,862 quotes and 54,514 downloads. According to the data of China journal citation report (expanded edition) in 2015, the impact factor of coal mine safety was 0.56. This set of data reflects that the problem of coal safety responsibility has aroused great attention of the society and the country.

At present, China's supervision over the safety of coal industry is increasingly strict, which reflects the country's attention to China's coal industry. However, it is not enough for the government to increase punishment. From the perspective of the coal industry, the internal control evaluation system of safety responsibility should be established, and the evaluation of safety responsibility of coal enterprises should be embedded into the already perfect internal control evaluation system, so as to better prevent the economic and social risks of coal enterprises. The internal control system related to social risks in the coal industry is to embed safety responsibility into the system on the basis of full research on internal control. In combination with the industry characteristics of the coal industry, the effectiveness of internal control is considered as well as the performance of safety risks, so as to build an evaluation system. It is of theoretical and practical significance to construct the evaluation system.

2. Establishment of Internal Control Evaluation System Related to Safety Responsibility in Coal Industry

2.1. Internal Control Objectives Related to Safety Responsibility.

Steven j. Root wrote in his book "beyond COSO: strengthening internal control of corporate governance" : "in the early 20th century, financial fraud cases were frequent. In order to make external audit work smoothly and form correct audit opinions, external auditors required enterprises to have some internal control, and the term internal control came into being."

The goal of enterprise internal control is to provide reasonable guarantee for the realization of enterprise goals. In 1992, COSO released "internal control -- the overall framework", which set the objectives of internal control as three categories: operating efficiency and effectiveness; Reliability of financial reports; Compliance with applicable laws and regulations. In 1995, the control standards committee of the institute of chartered accountants of Canada (CICA) issued COCO reports which summarized the internal control objectives into three categories: operational efficiency and effectiveness; Reliability of financial reports; Comply with relevant laws and regulations. In September 2004, COSO released the enterprise risk management framework, which divided the objectives of internal control into four categories: strategic objectives, operational objectives, compliance objectives and reporting objectives. In 2008, China's enterprise internal control basic standards jointly released by five ministries mentioned five objectives of internal control: strategic objectives, operational objectives, compliance objectives, asset safety objectives and financial reporting objectives. The internal control goal of Chinese enterprises is consistent with the internal control goal proposed by COSO, but the asset safety is listed as a single goal, which reflects the regulatory department's concern on the maintenance and appreciation of state-owned assets of large and medium-sized state-owned enterprises in China, making the internal control goal with Chinese characteristics and suitable for China's national conditions.

For the establishment of internal control objectives related to safety responsibility, it is necessary to reduce its economic risk on the one hand and its social risk on the other hand. Therefore, when establishing the goal of internal control related to safety responsibility, it is necessary to embed the enterprise's safety responsibility goal into the enterprise's internal control goal on the basis of the established internal control goal. The goal of corporate safety responsibility can be summarized as the goal of balancing stakeholders, including the goal of balancing stakeholders such as shareholders, creditors, consumers, governments and communities. The industrial safety goal of enterprises is also a goal of balancing stakeholders, but due to the particularity of the coal industry, it is listed as a separate goal. Therefore, seven internal control objectives of safety responsibility are established, including strategic objectives, business objectives, reporting objectives, compliance objectives, industrial safety objectives and balance stakeholder objectives.

2.2. Safety Responsibility Related Internal Control Index Selection and Data Sources.

2.2.1. Selection of Evaluation Indicators

American quality management expert Dr. Deming first proposed PDCA model. The meaning of PDCA cycle is that quality management is divided into four stages, namely plan, do, check and action. In quality management activities, it is the basic method of quality management, as well as the general rule of enterprise management, to make plans, implement plans, check the implementation effect, and then include the successful ones into the standard, and leave the unsuccessful ones to the next cycle. This cycle is also applicable to improve the internal control quality of coal enterprises. Construction of the coal industry and safety responsibility is related to the internal control evaluation system in order to test the safety of the coal enterprise responsibility, internal control of PDCA cycle in check, internal control weaknesses by checking the found industry, according to the results of the inspection to improve quality of internal control, thereby lowering enterprise economic risks, improve the effectiveness of the security responsibility.

Associated with security responsibility for the construction of internal control evaluation system, on the one hand, should be to reduce the risk of the company goal, on the other hand, want to consider the goals of balance stakeholder interests, according to the coal industry of the internal control has been established for seven target select representative respectively and can obtain evaluation index to construct evaluation system, through the analysis of the coal enterprise, coal enterprise's internal control defects, and timely correct them, in order to improve the effectiveness of the coal enterprise internal control.

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The evaluation system of internal control related to safety responsibility is mainly constructed from the seven objectives of internal control related to safety responsibility in the coal industry. According to the selection principle of evaluation indicators and the basis for the construction of the evaluation system, the evaluation objectives are selected as follows:

Table 1. Selection of evaluation objectives

Internal control objectives	The evaluation target	The calculation formula of index
Strategic goals(X1)	Sales growth rate (X_{11})	(current year's sales - previous year's sales)/previous year's sales
	Return on total assets (X_{12})	Total profit/average total assets
Business objectives(X2)	Asset turnover (X_{21})	average balance of net sales for the period/total assets for the period
	Net profit on sales (X_{22})	net profit/sales

Report targets(X3)	Audit of financial reports opinion (X ₃₁)	The audit opinions of financial reports are generally divided into two categories, one is the standard audit report with a value of 1, and the other is the non-standard audit report with a value of 0.
	Internal control audit report opinion (X ₃₂)	Internal control audit reports generally fall into two categories: one is the standard internal control audit report you, assigned to 1, and the other is the non-standard internal control audit report or no internal control audit report, assigned to 0
	Internal control evaluation report (X ₃₃)	According to whether the internal control evaluation report is disclosed or not, it is divided into two categories, one is the internal control evaluation report of public disclosure, the other is the internal control evaluation report of non-public disclosure, with an assignment of 0
	Whether enterprises disclose social responsibility reports (X ₃₄)	If the social responsibility report is disclosed, it is assigned a value of 1; otherwise, it is assigned a value of 0
Compliance objectives (X4)	Violation of laws and regulations by enterprises (X ₄₁)	The violation of laws and regulations in the enterprise this year
Asset security objectives (X5)	Enterprise external guarantee ratio (X ₅₁)	Amount of external security/owner's equity at year end
	Accounts receivable turnover (X ₅₂)	Operating income/average accounts receivable balance
	Long-term debt to working capital ratio (X ₅₃)	Long-term liabilities / (current assets - current liabilities)
Industrial safety objectives (X6)	Million ton mortality rate (X ₆₁)	death toll/actual production (ton) x 1000000
	Whether personnel attend safety training (X ₆₂)	Enterprise personnel are assigned a value of 1 if they attend the training; otherwise, they are assigned a value of 0
Balance stakeholder goals (X7)	Asset-liability ratio (X ₇₁)	Total liabilities of the enterprise/total assets of the enterprise
	Employee compensation in the proportion of sales revenue (X ₇₂)	Employee compensation/sales revenue of the enterprise
	Charity spending as a percentage of sales (X ₇₃)	The charitable expenditure of the business in the current year/the sales revenue of the business in the current year
	Taxes and fees paid throughout the year accounted for the proportion of sales revenue (X ₇₄)	Annual tax paid by the enterprise/annual sales revenue of the enterprise
	The proportion of environmental protection expenditure in sales revenue (X ₇₅)	Corporate environmental expenditure/corporate sales revenue for the year

2.2.2. Construct the Data Source of the Evaluation System

This study mainly analyzes the coal industry safety responsibility related to internal control situation, due to unable to get the related data not listed coal companies, so this article selects the coal listed companies including the Shanghai stock exchange, shenzhen stock exchange, the Hong Kong stock exchange and the small and medium-sized board listed coal companies, a total of 19 companies as the analysis sample, tidal wave by vendors database, information, sina finance and economics, stock exchange, shenzhen stock exchange and hkex analysis, stock transfer system of small and medium-sized enterprises, China's coal network online website and the China coal industry to obtain the index of the data, Through the analysis of relevant data, the internal control of safety responsibility of coal enterprises is obtained

2.3. Determine the Weight of Internal Control Evaluation Index Related to Safety Responsibility.

There are usually two methods to determine the weight of evaluation index, namely subjective valuation method and objective valuation method. The subjective valuation method is mainly used by re

levant experts or experienced people to make subjective judgment based on relevant experience and obtain the weight coefficient, such as expert evaluation method, analytic hierarchy process and so on. Objective valuation method is mainly used to determine the weight coefficient according to the correlation of relevant indicators or the coefficient of variation between them, such as coefficient of variation method, factor analysis method, entropy method and so on. In this paper, the variable coefficient method in objective valuation method is mainly used to determine the weight of relevant indicators. Through the above methods, the comprehensive score of internal control evaluation system related to safety responsibility is obtained.

2.3.1. The Coefficient of Variation Method Determines the Weight

Coefficient of variation method is used to assign weight to each evaluation index, mainly by analyzing the gap between the existing value of each index and the target value. If the gap is large, it indicates that the index is difficult to realize, so it should be given a larger weight, and vice versa. Therefore, the weights determined by this method are determined by the variation degree of the existing value and target value of each index. Of course, the objective reality should also be taken into account when assigning the values of relevant evaluation indicators. When the coefficient of variation method is not consistent with the objective weight, artificial adjustment should be made to make the determined weight more reasonable.

The specific steps to determine the index weight by the coefficient of variation method are as follows:

calculate the mean and standard deviation of each index according to the index indexes of 19 listed companies; Calculate the coefficient of variation of each index according to the mean and standard deviation,

$$V_i = \sigma_i / \bar{X}_i \quad (1)$$

$$\text{add up the coefficient of variation of each index to } = A \quad (2)$$

$$\text{weight of each evaluation index } = V_i / A \quad (3)$$

Finally, the weight of each evaluation index is obtained.

2.4. Safety Responsibility Related Internal Control Score Calculation.

2.4.1. Calculation of Score by Coefficient of Variation Method

(1) application of coefficient of variation method

In this paper, the sample data are calculated and processed, and then the weight is obtained by using the variation coefficient method:

Table 2. The weight is obtained by using the variation coefficient method

Objective	evaluation index	Max	Min	Avge	standard deviation	variable coefficient	weight
Strategic goals	Sales growth rate	244.63%	-5.35%	29.5%	1.29%	1.77661	0.056611
	Return on total assets	18.60%	0.37%	5.01%	0.0447	0.892215	0.028431
Business objectives	Asset turnover	1.46	0.28	0.63	0.32	0.507936	0.016185
	Net profit on sales	27.84%	0.47%	9.22%	0.0666	0.722342	0.023017
Reporting objectives	Audit opinions on financial reports	1					
	Internal control audit report comments	1	1	1	0	0	0
	Internal control evaluation comments	1	0	0.36	0.48	1.333333	0.051071
	Social responsibility report	1	0	0.44	0.496387	1.128152	0.043212
Compliance objectives	Violation of laws and regulations by enterprises	4	0	0.947368	1.394488	1.47196	0.046904
	Accounts receivable turnover	62.88	6.96	24.35	16.55	0.679671	0.021666
Asset security objectives	Long-term debt to working capital ratio	4.93%	-3.32%	0.15%	0.0181	12.066666	0.384506
	Enterprise external guarantee rate	105.66%	0.14%	35.24%	0.6983	1.981555	0.063142
Industrial safety objectives	Million ton mortality rate	0.21%	0	0.15%	0.0032	2.133333	0.067979
	Whether to attend safety training	1	1	1	0	0	0
Balance stakeholder goals	Asset-liability ratio						
	The proportion of employee compensation in sales revenue						
	Charity spending as a percentage of sales	90.77%	28.39%	52.9%	14.71%	0.278071	0.008861
	The proportion of annual tax paid by enterprises in sales revenue	29.50%	0.92%	9.92%	7.81%	0.787298	0.025087
	The proportion of enterprise environmental protection expenditure in sales revenue	1.74%	0.01%	0.16%	0.45%	2.8125	0.08962
		31.85%	2.99%	14.02%	8.86%	0.631954	0.020137
		2.95%	0.08%	1.29%	0.93%	0.72093	0.002297

According to the weight calculation of the 19 indicators of the 7 targets, the top three of the 19 indicators are: the ratio of long-term debt to working capital, the proportion of charity expenditure in sales revenue and the mortality rate of million tons, accounting for 38.45%, 9% and 6.8% of the total weight, respectively. It indicates that the difference of the above

indicators is large, and there is a large gap between enterprises. The two indicators, such as the audit opinion of financial reports and whether to participate in safety training, belong to qualitative indicators, and there is no gap between listed coal enterprises, so the weight of the above two evaluation indicators is 0.

Summary based on the above indexes were obtained by security responsibility 7 target weights of the internal control as shown in figure (8), asset security goals took the largest weight, 47% of the target in the weight of the largest is the long-term debt and the ratio of working capital, it shows that the index weight gap between enterprises is bigger, followed by report target, accounted for 15%, of which the social responsibility report and internal control auditing opinions have certain contribution, more enterprises to the fulfillment of social responsibility consciousness is weak, so in the annual report disclosure of social responsibility report, so lead to differences between enterprises. Third, to balance stakeholders, the main contribution comes from the proportion of charity expenditure in sales revenue, which also shows that enterprises do not fully understand the role of charity in contributing to society, so the gap between enterprises is large. Remaining targets including the industrial safety management goal, the compliance goals and objectives for a small proportion, on the one hand, because of the special industry, has been to coal production safety problems will cause great impact to the enterprise, so coal enterprises are more emphasis on their industry security issues, on the other hand, due to the gradually perfect, perfect the market system in our country, and China's regulators gradually strengthen penalties for illegal items, so makes compliance goals of enterprises, industrial security goals and strategic goal gap is not very big, makes it much smaller weight.

(2) calculation of internal control evaluation score related to social risk

Since the above indicators have different degrees of measurement for internal control objectives, the evaluation indicators can be divided into positive indicators, negative indicators and moderate indicators, and normalized for different indicators.

$$\text{For positive indicators: } K_i = (X_i - X_{\min}) / (X_{\max} - X_{\min}) * 60 + 40 \quad (4)$$

$$\text{For negative indicators: } K_i = (X_{\max} - X_i) / (X_{\max} - X_{\min}) * 60 + 40 \quad (5)$$

X_{\max} is the maximum value in the index, and X_{\min} is the minimum value in the index.

For established including sales growth, total assets profit margin, asset turnover and sales net interest rate, the auditing opinions of financial reporting, internal control audit, internal control evaluation opinion, social responsibility reports, accounts receivable turnover, whether to participate in safety training, employee compensation accounted for the proportion of sales revenue, charity accounts for the proportion of sales revenue, corporate annual pay taxes accounted for the proportion of sales income and corporate environmental accounts for the proportion of sales revenue belongs to positive indicators. In particular, the higher the proportion of employee compensation in sales revenue, the proportion of charity expenditure in sales revenue, and the larger the proportion of enterprise environmental protection expenditure in sales revenue, the smaller the return attributable to shareholders will be. In terms of maximization of shareholders' wealth, it is a negative indicator. However, since this paper selects evaluation indexes from the perspective of constructing the evaluation system of internal control of social risk, it should not only consider the maximization of shareholder wealth, but also consider the relevant interests of employees, creditors, consumers, government, community and society to analyze the evaluation indexes.

For established illegal items including enterprises, long-term debt and the ratio of working capital, enterprise external guarantees rate, one million tons mortality and asset-liability ratio belongs to negative indicators of relevant indicators, the indicators is smaller, for the better to achieve the goal of social risk internal control, the above goals, the greater the will hinder the social risk to achieve the goals of the internal control, so enterprises should, as far as possible

to control the internal control evaluation index, can better achieve the goal. In the analysis of financial data, we hope that the asset-liability ratio can reach the level required by an industry. If the index is low, the leverage effect of assets cannot be fully exerted to increase the income of enterprises. If the index is higher, increases financial risk in enterprise could be insolvent, is unable to long-term development, belongs to moderate type indicators, but because of the indicators used to measure the risk of creditors, so, the evaluation index as small as possible, from the perspective of creditors belongs to the negative index, because usually asset-liability ratio is smaller, the smaller the risk of the enterprise to repay creditors, creditors is guaranteed, so belong to the negative index.

Through the above calculation of safety responsibility internal control evaluation scores

$$=0.056611 \times X_{11} + 0.028431 \times X_{12} + 0.016185 \times X_{21} + 0.023017 \times X_{22} + 0 \times X_{31} + 0.051071 \times X_{32} + 0.043212 \times X_{33} + 0.055836 \times X_{34} + 0.046904 \times X_{41} + 0.021666 \times X_{51} + 0.384506 \times X_{52} + 0.063142 \times X_{53} + 0.067979 \times X_{61} + 0 \times X_{62} + 0.008861 \times X_{71} + 0.025087 \times X_{72} + 0.08962 \times X_{73} + 0.020137 \times X_{74} + 0.002297 \times X_{75} \quad (6)$$

By substituting the average normalized data of the industry into the above formula, it can be known that:

Industry average responsibility for safety internal control score

$$=0.056611 \times 48.36 + 0.028431 \times 55.27 + 0.016185 \times 57.80 + 0.023017 \times 59.18 + 0 \times 0 + 0.051071 \times 61.6 + 0.043212 \times 66.4 + 0.055836 \times 59.2 + 0.046904 \times 85.79 + 0.021666 \times 58.65 + 0.384506 \times 74.76 + 0.063142 \times 80.04 + 0.067979 \times 57.14 + 0 \times 0 + 0.008861 \times 76.43 + 0.025087 \times 58.89 + 0.08962 \times 45.20 + 0.020137 \times 62.93 + 0.002297 \times 65.24 = 66.53$$

Through the study of the processing of the data, using the industry has learned that the average of the obtained the average of the internal control evaluation system related to security responsibility scored 66.53 points, this means that when a firm's internal control score higher than 66.53, the security responsibility of the enterprise internal control evaluation system is better than the industry average, when the score is lower than the industry average need to analyze the reason, found problems in a timely manner to improve.

3. Countermeasures and Suggestions

From the perspective of the government, we should improve the laws and regulations of safety responsibility and establish the internal control rating system of safety risk. From the perspective of coal industry, the establishment and improvement of industry supervision system; From the perspective of coal enterprises, it is necessary to strengthen ideological construction, improve the safety awareness of coal mine workers, increase safety input, and ensure production safety. From the social point of view, the media should pay more attention to the supervision of the public and conduct safety responsibility audit.

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