Abstract. With the rise of the ESG investment philosophy in recent years, people have begun to pay attention to company’s ESG performance. At the same time, with China's dual carbon policy proposal, energy companies are facing enormous environmental pressure in the production process. For energy companies, the marginal benefits of excellent ESG performance will be greater than those of other industry companies. Under this background, this paper takes Yankuang Energy, a coal company, as an example and uses financial indicator analysis methods, the Z-score financial crisis model, and the EVA economic value-added method to explore how the energy company’s ESG practices can improve its firm value. The research has found that in terms of financial performance, ESG practices mainly enhance the firm value by improving its profitability.

Keywords: ESG practices, firm value, financial indicators analysis, Z-score model, EVA.

1. Introduction

1.1 Research background

Due to human activities such as exploiting and using natural resources, the ecological equilibrium of the environment has been disturbed, resulting in the frequent occurrence of diverse extreme weather. An underlying cause of the problem is the excessive release of carbon dioxide. Therefore, various governments have implemented several agreements, including the Kyoto Treaty and The Paris Agreement, to tackle climate challenges. These agreements have a common goal to stabilize the amounts of greenhouse gases in the atmosphere. During the 75th United Nations General Assembly on September 22, 2020, China announced its commitment to enhance its efforts in addressing climate change. China pledged to strengthen its contribution, implement more efficient policies and procedures, aim to reach the “carbon dioxide emissions peak” before 2030, and endeavor to achieve “carbon neutrality” by 2060, which is China’s dual carbon policy. Under the dual carbon policy, a new investment idea, ESG, has begun to receive widespread attention. ESG, which refers to environmental, social, and governance, has been a popular tool in enterprise management and financial investment in recent years. This concept advocates for enterprises’ joint environmental, social, and governance development. It reflects the concept of sustainable development from the enterprise perspective and is also one of the important means to improve market competitiveness and firm value.

In 2023, China released a series of related ESG policies. In February 2023, the Shenzhen Stock Exchange issued the Shenzhen Stock Exchange's Self Discipline Supervision Guidelines for Listed Companies No. 3 Industry Information Disclosure, strengthening the ESG information disclosure requirements for listed companies. In August 2023, the China Securities Regulatory Commission issued the Management Measures for Independent Directors of Listed Companies, promoting independent directors to play their due roles and helping to improve corporate governance. At the same time, the General Office of the State-owned Assets Supervision and Administration Commission issued the research results of the Research on the Preparation of ESG Special Reports for State-Owned Enterprises Holding Listed Companies to central and local state-owned assets, promoting the acceleration of the establishment of a unified ESG information disclosure standard and helping to build a Chinese characteristic ESG system, which aims to promote the ESG information disclosure of all central enterprise controlled listed companies by 2023. In September 2023, the China...
Securities Regulatory Commission stated that it is guiding the Shanghai and Shenzhen Stock Exchanges to study and draft the Guidelines for Sustainable Development Disclosure of Listed Companies to promote the development of a localized ESG system.

Under the dual carbon policy and the prevalence of ESG investment and management philosophy, the coal industry will encounter more challenges than other industries. Firstly, the carbon emissions of the coal industry are high. The coal industry is one of the primary sources of carbon emissions, and the dual carbon policy aims to achieve carbon peak and carbon neutrality, which means it puts more significant pressure on the coal industry to reduce its emissions. Secondly, energy replacement: With the advancement of global energy transformation, the development of alternative energy sources, such as renewable and clean energy, is widely adopted. As a result, coal energy is facing the risk of being replaced. Thirdly, profitability uncertainty: The coal industry’s profitability is highly uncertain due to its vulnerability to macroenvironmental factors, such as the global decrease in coal demand caused by the COVID-19 pandemic. Finally, investor attention has increased: ESG investment philosophy are receiving increasing attention from investors, who are paying more attention to the enterprises’ performance in environmental protection, social responsibility, and company governance. It requires the coal industry to pay more attention to these aspects to improve its ESG performance in order to meet the investors’ needs. Therefore, studying the value-added impact of ESG practices in the coal industry under the dual carbon background has specific importance for coal industries and companies. This is because, firstly, it can help coal companies meet the requirements of energy conservation and emission reduction and achieve sustainable development. Secondly, it could increase the company’s market competitiveness and seize market share. Finally, it can also satisfy the investors’ ESG needs.

Against this background, this dissertation will select Yankuang Energy, a company with excellent ESG performance in the coal industry. It will take its ESG practices as the research object to analyze its ESG practice results. From a valuation perspective, this dissertation will study how ESG practice affects firm value and explore the impact of ESG practices on firm value. Through research, this dissertation can provide a reference of ESG practices in the coal industry or other industries and help more enterprises focus on and promote ESG efficiently, achieving companies’ coordinated development of economic and social benefits.

1.2 The introduction of Yankuang Energy (SH600188)

Yankuang Energy Group Company Limited was founded in 1997, and its pillar businesses include mining, producing high-end equipment, new energy, sophisticated chemicals and materials, and intelligent logistics. As China’s only mega-sized energy company, it is listed in four major Chinese and international markets (Shanghai, Hong Kong, New York, Australia). Following its corporate goal of “developing green energy to lead energy revolution,” Yankuang Energy maintains integrity, fosters innovation, and speeds up industrial reform and transformation while actively integrating into China’s “Carbon Peaking & Carbon Neutrality” plan. Yankuang Energy is rapidly transforming into a world-class firm and a sustainable energy supplier. It has set up three operating bases in Australia, Shaanxi, Inner Mongolia, and Shandong. With excellent performance, sound management, solid international competitiveness, and exemplary social responsibility performance, Yankuang Energy has been widely recognized by the industrial peers worldwide and the China and international capital markets. Yankuang Energy has been selected as one of the “Two Hundred Enterprises” under the SOEs reform project initiated by SASAC of the State Council and has won the “National Quality Award” two times. It is also the only energy enterprise in China that has won the Asian Quality Excellence Award and the Global Performance Excellence Award. In 2022, Yankuang Energy was selected as the constitute stock of the CSI 300 Index and the SSE 180 Index. Yankuang Energy also secured its place in the Forbes 2022 China ESG50 list and ranked 93rd among the Fortune China Top 500 companies.
2. Literature of review

2.1 Relevance concepts

ESG is the abbreviation of Environment, social, and governance and derives from ethical and responsible investing (Michelson et al., 2004). ESG serves as a comprehensive metric for assessing businesses’ environmental sustainability, social impact, and governance capabilities. It integrates social credit considerations into conventional financial frameworks to evaluate the three categories of intangible assets that influence the actual value of companies. ESG mandates that companies prioritize environmental concerns, embrace social responsibility, and enhance corporate governance along their growth trajectory. However, these metrics are seldom apparent in conventional financial reports. Therefore, employing a company’s ESG performance as a reporting mechanism can effectively communicate non-financial competencies, including corporate culture, brand reputation, strategic planning, social responsibility, employee rights, and sustainable development, to investors and the general public. Simultaneously, the government, the public, and investors can assess the overall performance of firms by considering their ESG performance.

2.2 Literature of review

2.2.1 The relationship between ESG performance and firm value

2.2.1.1 The impact of environmental performance on firm value

There is a common consensus among international and Chinese scholars on the impact of environmental performance on firm value: A positive relationship exists between environmental performance and firm value. A study by Hodge J. C. (2002) discovered that companies prioritizing environmental responsibility appear to have higher stock prices. Al-Najjar and Anfimiadou (2012) investigated the link between eco-efficiency, as environmental policy, and firm value in the United Kingdom (UK) from 1999 to 2008. Within the context of the United Kingdom, the findings indicate that companies that prioritize eco-efficiency have more market value than those that do not implement environmental initiatives. Therefore, it is advisable for companies to engage in environmental policies, as implementing these policies will enhance firm value. Iqbal et al. (2022) revealed that organizational capital strengthens the positive relationship between environmental innovation and firm value. It implies that companies with greater organizational capital are more inclined to prioritize the demands of stakeholders for environmental sustainability, ultimately enhancing their market value.

In terms of Chinese scholars, Tang et al. (2019) used 71 environmental pollution exposure incidents of listed companies between 2005 and 2015 as samples. This study found that after pollution incidents were exposed, companies were more likely to be subject to government environmental supervision and punishment, and it was more difficult to obtain bank debt financing. The research findings indicate that exposure to environmental pollution incidents will reduce a company’s value. Li and Ruan (2019) found that the relationship between environmental disclosure and firm value shows a significant inverted “U,” meaning that as the level of environmental information disclosure improves, the firm’s value first indicates a decreasing trend and then shows an increasing trend.

2.2.1.2 The impact of social performance on firm value

Wang and Xiao (2015) used the Nanjing University Social Responsibility Index (CSRINJU) as the evaluation standard for listed companies to fulfill social responsibility, Tobin Q as the measurement standard for corporate value, and used data from Chinese listed companies in 2007 to empirically examine whether fulfilling social responsibility can enhance corporate value. The study found a significant positive correlation between corporate social responsibility and corporate value, and this positive relationship is more pronounced in companies with higher levels of fulfilling social responsibility. Hu et al. (2018) conducted a study. Based on longitudinal data of Chinese manufacturing firms listed in the Shanghai and Shenzhen Stock Exchange between 2010 and 2015, they used multiple linear regression to find that CSR has a positive relationship with firm value. The results show that state-owned firms benefit more from CSR, as CSR by these firms gains positive
stakeholder responses for such firms. Wang (2020) analyzed the relationship and impact of corporate social responsibility disclosure, company value, and financial performance using a generalized structural component analysis method based on data from 330 listed manufacturing companies in China from 2010 to 2019. Research has shown that CSR disclosure has a positive and significant impact on financial performance and company value. Tsang et al. (2022) used a large international sample of 24,293 observations from 3,991 unique firms in 56 countries; they examined the role of financial analysts in the relationship between voluntary CSR reporting and firm value. The result shows that after controlling for firms’ CSR performance ratings and other factors, voluntary CSR reporting increases firm value in countries worldwide, and analysts strengthen the positive relationship between CSR reporting and firm value.

However, according to the empirical findings of Chen and Lee (2017), the critical value of the CSR Index has been estimated to be 13.08. Therefore, they concluded that investment in CSR does not have a positive impact on firm value until CSR is above that threshold. Therefore, it is recommended that enterprises should persist in investing in CSR for a long time in order to enhance their firm value.

2.2.1.3 The impact of corporate governance on firm value

Wang and Gao (2008) believed that good corporate governance not only helps companies save financing costs but also improves business performance and increases company value, playing an important role in market competition. A study conducted by Ammann et al. (2011) examined the relationship between corporate governance at the firm level and firm value. The researchers applied a previously unused dataset from Governance Metrics International (GMI). The dataset comprised 6663 firm-year observations from 22 developed countries from 2003 to 2007. Based on 64 individual governance attributes, they constructed two alternative additive corporate governance indices with equal weights attributed to the governance attributes and one index derived from a principal component analysis. The three indices provide evidence of a strong and positive relationship between firm-level corporate governance and firm valuation. Wang (2012) found a significant positive correlation between the number of board meetings, gender diversity, and external investment by companies. Moreover, the company’s outward investment has a driving effect on promoting the increase of company value, indicating that the board of directors can not only enhance the company’s value through its supervisory function but also enhance the company’s value by improving its investment decision-making methods. He (2014) sorted out the pairwise relationships between corporate governance and corporate value, debt financing, and corporate value from theoretical and practical perspectives. There is a consensus among China and international research theories and many empirical studies that companies can improve the management efficiency of operations by improving corporate governance. Specifically, by reducing agency costs, companies can actively influence their operations and enhance the firm’s value. Huang and Li (2017) construct a mediation model of “corporate governance-cash dividend-firm value” to investigate the effect of corporate governance on firm value and cash dividend. The results show that firms with better corporate governance have higher value, and cash dividends are a mediator on the valuation effect of corporate governance, suggesting that good corporate governance coupled with appropriate dividend policy will create greater value for firms. They also found that companies with high financing restrictions have a more significant effect of corporate governance on enhancing company value, indicating that for companies with high financing restrictions, good corporate governance can better convey positive information to the market.

2.2.1.4 The impact of overall ESG performance on firm value

There was a positive association between ESG disclosure level and firm value (Yi et al., 2017). Zhang et al. (2021) empirically tested the impact of improving ESG performance on company value based on annual data of A-share listed companies in Shanghai and Shenzhen from 2015 to 2020. The research results indicate that improving ESG performance by enterprises significantly enhances company value, which has a long-term impact. Zhou (2022) studied whether the Chinese companies’ ESG performance can enhance company value, using two different financial indicators: return on
assets (ROA) to define the company’s accounting performance and Tobin Q to define the company’s market value. Research has shown that ESG performance has a positive impact on a company’s accounting performance and market value. Fan and Yujuan (2022) selected 559 Chinese A-share listed companies from 2017 to 2020 as research samples. They found that ESG performance has a significant positive impact on the long-term value of enterprises. Zhou et al. (2023) used A-share listed companies from the first quarter of 2009 to the third quarter of 2022 as samples to empirically analyze the impact of ESG ratings on stock investment value. Research has found a significant positive relationship between ESG ratings and excess stock returns. The mediation effect test indicates that this positive impact can be achieved through improving operational performance within the company and attracting investor attention in the external market.

However, Liu (2023) conducted a study on the marginal effects of short-term ESG investment, using the Wind ESG score and Huazheng ESG score for regression analysis of short-term listed companies. It was found that the Wind ESG score does not affect the price-to-book ratio, while the Huazheng ESG score significantly negatively affects the price-to-book ratio. The different rating agencies’ ESG scores have different effects on the valuation of listed companies. Therefore, Liu (2023) recommends that listed companies’ decision-makers should not only focus on the long-term ESG values but also continue to vigorously promote the deepening and development of ESG evaluation, pay with confidence to promote ESG and strike a balance between long-term and short-term effects.

2.2.2 Literature review

By reviewing the literature above, it can be found that there are several characteristics of current research on the impact of ESG practices on firm value. Firstly, most studies are quantitative research and use statistical methods. The research results show that companies’ investment in environmental and social responsibility investment and corporate governance can lead to increased firm value. However, there is limited literature and case studies to illustrate the way ESG practices can enhance corporate value. Secondly, companies need to make long-term ESG investments, and short-term ESG investments are unlikely to bring value appreciation to the company. Finally, in addition to long-term investments, there is a threshold for the investment amount. When the investment amount exceeds that threshold, ESG practices are able to increase firm value.

3. Financial analysis

This Chapter will evaluate Yankuang Energy’s financial performance through its financial indicators, financial situation, and company valuation. Firstly, fundamental financial indicators like profitability, solvency, and operating capacity will be analyzed. Secondly, the financial model, the Z-Score model, will be used to analyze its financial situation. Finally, the valuation model EVA will be used to evaluate Yankuang Energy’s company valuation.

3.1 Financial indicators

3.1.1 Profitability

Profitability is a measure of an organization’s profit relative to its expenses. Therefore, Yankuang Energy’s profitability will be analyzed through its net profit margin (Table 1).

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Revenue (Billion/CNY)</td>
<td>163</td>
<td>200.64</td>
<td>214.99</td>
<td>151.99</td>
<td>200.82</td>
</tr>
<tr>
<td>Net Profit (Billion/CNY)</td>
<td>10.66</td>
<td>11.11</td>
<td>6.84</td>
<td>18.57</td>
<td>39.44</td>
</tr>
<tr>
<td>Net Profit Margin (%)</td>
<td>6.54%</td>
<td>5.54%</td>
<td>3.18%</td>
<td>12.22%</td>
<td>19.64%</td>
</tr>
</tbody>
</table>
Net Profit Margin = \frac{Net\ Profit}{Total\ Revenue} \times 100\% \tag{1}

Net profit margin reflects the ability of the enterprise to create net profit, which is a indicator to measure a company’s profitability; the higher the ratio, the stronger the enterprise’s profitability. Its profitability experienced an upward trend from 2020 to 2022, hitting a record high of 19.64% in 2022. The main reason is that the international energy situation has undergone significant changes, with significant fluctuations in energy prices, leading to a tight supply and demand pattern in the coal industry, with prices maintaining a medium to high level. The result is that the sales price of the coal business has increased year-on-year, resulting in a year-on-year increase of RMB 42.047 billion in operating revenue.

From the financial analysis results, it can be seen that the increase in profitability is due to the increase in coal sales prices caused by the tight international energy supply and demand, resulting in a historic high in net profit, and is not related to the company’s ESG performance. However, from a deeper perspective, ESG’s practices and models support this high net profit financial performance. Mainly from the perspective of governance: Firstly, in terms of innovation, the company’s intelligent mines supported by high-tech have increased the speed of coal mining, greatly enhancing the production capacity of coal mines. Secondly, strict quality management: In addition to having a high coal output, Yankuang Energy’s strict quality management ensures that all its products achieve a 100% qualification rate. Efficient mining technology and strict quality management show a synergistic effect, enabling Yankuang Energy to quickly occupy a large share of the coal mining market, reflecting its governance capabilities within ESG.

3.1.2 Solvency

Solvency refers to an enterprise’s capability to repay its long-term and short-term debt using its assets. A company’s solvency is one of the significant indicators that reflects its financial state and operational capacity. In this paper, the quick ratio will analyze Yankuang Energy’s ability to repay short-term debt. At the same time, the ability to repay the long-term debt will be analyzed through the assets liability ratio.

3.1.2.1 Quick ratio

The quick ratio, also known as the acid-test ratio, quantifies the relationship between quick assets and current liabilities. Quick assets, also known as liquid assets, are a subset of current assets that do not contain inventory. These assets are liquid and mainly consist of cash, short-term investments, notes receivable, accounts receivable, and other similar items. The quick ratio serves as an indicator of a company’s capacity to settle its debts promptly within a short period of time. Generally, a quick ratio of 1 or higher is regarded as a favorable indicator Figure 1.

![Quick Ratio Graph](Image)

**Figure 1.** Yankuang Energy’s quick ratio(Source: CSMAR database)

3.1.2.2 Asset-liability ratio

The asset-liability ratio represents the proportion of total liabilities to total assets Figure 2. The asset-liability ratio exhibits a positive correlation with a company’s long-term solvency, making it a key indicator of long-term solvency in financial ratio analysis. The asset-liability ratio is an important indicator that provides a full assessment of a company’s capacity to repay its debts. It analyzes the proportion of the company’s total assets acquired through borrowing by comparing liabilities to assets.
A higher index signifies a greater debt load for the firm, whereas a lower indicator suggests a lighter debt burden. Creditors prefer a lower ratio as it indicates a lighter debt burden for the firm and a stronger ability to pay off debts, providing more assurance for the rights and interests of creditors. On the other hand, enterprises hope that this indicator will be larger. Although this will increase the debt burden of the enterprise, it can also gain more financial leverage benefits by expanding the scale of borrowing. According to the CSMAR database, the value of the asset-liability ratio in the coal industry between 2018 and 2022 ranges from 60% to 70%.

![Yankuang Energy’s asset-liability ratio](Source: CSMAR database)

In terms of short-term debt, Yankuang Energy’s quick ratio remains stable from 2018 to 2022, although it reached its lowest point at 0.49 in 2020. It is shown that Yankuang Energy’s short-term debt capacity is average, hovering around the standard line of 1. With regard to the repayment of long-term debt, the asset-liability ratio maintains a consistent and healthy level. Despite reaching a ratio of around 70% in both 2020 and 2021, it does not deviate considerably from the industry norm.

In conclusion, from 2018 to 2022, Yanguang Energy’s short-term and long-term debt repayment ability remained stable, with no significant changes overall. It can be inferred that currently, the practice of ESG has no significant impact on the company’s debt solvency.

### 3.1.3 Operating capacity

Enterprise operating capacity refers to the decision-making ability of an enterprise on its business strategy and plan, including its internal conditions and development potential, as well as the total management ability of various production and business activities. In general, an enterprise’s operating ability can be evaluated using the accounts receivable turnover rate, inventory turnover rate, and total assets turnover rate.

#### 3.1.3.1 Accounts receivable turnover rate

The accounts receivable turnover rate refers to the average number of times accounts receivable are collected within a certain period, reflecting the speed of accounts receivable turnover and the efficiency of accounts receivable management in enterprises Figure 3. Timely collection of accounts receivable can significantly improve the efficiency of fund utilization and reflect enterprises’ operational solid ability.

![Yankuang Energy’s accounts receivable turnover rate](Source: CSMAR database)

From the accounts receivable turnover rate, Yankuang Energy’s value has mostly stayed the same in the past five years, indicating that its accounts receivable management level has not changed much.
Currently, it can be inferred that the practices of ESG have not significantly improved Yankuang Energy’s accounts receivable management capacity.

### 3.1.3.2 Inventory turnover rate

The inventory turnover rate measures how efficiently a firm manages its inventory Figure 4. It is calculated by dividing the cost of goods sold by the average inventory balance within a specific period. The inventory turnover rate measures the speed at which inventory is sold and replenished. It indicates the liquidity of inventory and the allocation of inventory funds. Its purpose is to motivate businesses to enhance the efficiency of fund utilization while maintaining production and operational continuity, thereby improving their short-term solvency. The inventory turnover rate is a crucial metric used to assess the operational efficiency of businesses and is commonly employed in decision-making processes within enterprise management. In general, a higher inventory turnover rate corresponds to a lower level of inventory occupancy, indicating more substantial liquidity and a quicker conversion of inventory into cash or accounts receivable.

**Figure 4.** Yankuang Energy’s inventory turnover rate(Source: CSMAR database)

**Table 2.** Yankuang Energy’s coal business situation(Source: Yankuang Energy’s financial report)

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production quantity</td>
<td>95,101</td>
<td>94,469</td>
<td>120,270</td>
<td>105,025</td>
<td>99,528</td>
</tr>
<tr>
<td>Sales volume</td>
<td>93,625</td>
<td>91,595</td>
<td>112,776</td>
<td>93,832</td>
<td>91,173</td>
</tr>
<tr>
<td>Inventory</td>
<td>4,931</td>
<td>6,849</td>
<td>5,646</td>
<td>7,111</td>
<td>4,448</td>
</tr>
</tbody>
</table>

The chart shows that the inventory turnover rate of Yankuang Energy has been decreasing year by year, from 28.66 in 2018 to 13.6 in 2022. However, from the data in Table 2, it can be seen that although the coal inventory, which is the main business, has fluctuated, the overall change during this period is not significant. This phenomenon can be explained by combining the profitability of Yankuang Energy and ESG practices. Firstly, apart from the increase in sales prices caused by coal supply and demand, there has been little overall change in coal production and sales volume. However, the increase in profits indicates that Yankuang Energy has invested in scientific research and innovation, and the construction of intelligent mines has dramatically improved production efficiency and reduced production costs. Secondly, there has been little change in coal inventory. The overall decrease in inventory turnover rate is due to the expansion of other industries by Yankuang Energy, increasing raw materials. This also precisely reflects the industrial deployment of Yankuang Energy in its governance, achieving industrial upgrading and integration and ultimately forming synergistic effects.

### 3.1.3.3 Assets turnover rate

The total asset turnover rate reflects the relationship between a company’s net sales revenue and the average total assets throughout a specific time frame. It is a measurement that assesses the relationship between the size of asset investments and the level of sales. The total asset turnover rate is an important indicator for evaluating the operational efficiency of a company’s assets. It measures the speed at which all assets are transported from input to output during the operating period, providing insights into the management quality and utilization efficiency of the company’s assets.
Overall, a greater total asset turnover rate indicates a stronger sales ability of the firm and more efficiency in asset investment.

As shown in the figure 5, the total asset turnover of Yankuang Energy has been continuously declining from 2018 to 2022, but this does not mean that its operational capacity has declined. This is because, in terms of total asset size, its total assets have been continuously increasing over the past five years, from 203.68 billion in 2018 to 295.8 billion in 2022, which means that the total asset size in 2022 is 1.5 times that of 2018. So, from the perspective of financial indicators, Yankuang Energy’s ESG practices have not improved its total asset turnover rate. However, this is not because ESG’s practices have not improved this indicator but because its total asset size has increased. This phenomenon also precisely indicates that Yankuang Energy’s ESG practices have, to some extent, increased the size of total assets, indicating that ESG practices can enhance the firm value.

In conclusion, in terms of the three indicators of operational capability, the ESG practice results of Yankuang Energy from 2018 to 2022 show that the accounts receivable turnover rate has not changed much, while the inventory turnover rate and total asset ratio have decreased. This phenomenon can be interpreted as two pieces of information. Firstly, ESG practices currently do not significantly improve Yankuang Energy’s receivable management capacity. Secondly, the ESG practice of Yankuang Energy has achieved success, helping the company transform and increase its total asset size, which is why its inventory and total asset turnover have decreased. This phenomenon also indicates to some extent that Yankuang Energy’s ESG practices have enhanced firm value.

3.2 Z-score model

Nowadays, there is no standardized scholarly definition of financial crisis. However, in the real world, it typically refers to a scenario in which a business confronts bankruptcy due to its poor management. In academic research, the Z-score model can be used to analyze the financial crisis of listed companies. The specific formula is as follows:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 0.99X_5$$  \hspace{1cm} (2)

$$X_1 = \frac{\text{Working Capital}}{\text{Total Assets}}$$: it demonstrates the company’s assets’ liquidity and scale characteristics. A declining working capital of a corporation frequently indicates either an inefficient capital turnover or a short-term debt issue.

$$X_2 = \frac{\text{Retained Earnings}}{\text{Total Assets}}$$: it reflects the cumulative profitability of the company. For listed companies, retained earnings refer to the balance of net profit minus all dividends. The more retained earnings, the stronger the company’s residual ability to pay dividends.

$$X_3 = \frac{\text{EBIT}}{\text{Total Assets}}$$: it represents the capacity of a listed firm to effectively utilize its assets to generate profits.

$$X_4 = \frac{\text{Market Value of Equity}}{\text{Total Liabilities}}$$: it reflects a company’s financial structure, which indicates the capacity of a company’s solvency.
Operating Revenue
Total Assets

\[ X_5 = \frac{\text{Operating Revenue}}{\text{Total Assets}} \]  

It is the Total Assets Turnover, which reflects the operational capacity of the enterprise’s overall assets. Generally speaking, the more turnover times or the fewer turnover days of assets, the faster the turnover speed and the stronger the operational capacity.

The Z-Score model assesses a company’s financial status based on its asset size, profitability, financial structure, and solvency. After analyzing the Z-Score model, Altman concluded that the probability of a financial crisis is inversely connected with the Z-value. As the Z-value increases, the probability of a financial crisis decreases; as the Z-value declines, the probability of a financial crisis increases.

- When \( Z < 1.8 \), the company is likely to encounter bankruptcy;
- When \( 1.8 < Z < 2.675 \), the company’s financial performance is poor, but it has not reached the level of bankruptcy.
- When \( Z > 2.675 \), the company’s financial position is good, and the possibility of bankruptcy is tiny.

Table 3. Yankuang Energy’s Z value and parameter (Source: CSMAR database)

<table>
<thead>
<tr>
<th>Year</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>X5</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>0.03</td>
<td>0.24</td>
<td>0.09</td>
<td>0.36</td>
<td>0.80</td>
<td>1.70</td>
</tr>
<tr>
<td>2019</td>
<td>-0.05</td>
<td>0.24</td>
<td>0.08</td>
<td>0.42</td>
<td>0.97</td>
<td>1.76</td>
</tr>
<tr>
<td>2020</td>
<td>-0.17</td>
<td>0.24</td>
<td>0.05</td>
<td>0.27</td>
<td>0.83</td>
<td>1.19</td>
</tr>
<tr>
<td>2021</td>
<td>-0.02</td>
<td>0.18</td>
<td>0.10</td>
<td>0.60</td>
<td>0.53</td>
<td>1.47</td>
</tr>
<tr>
<td>2022</td>
<td>0.02</td>
<td>0.20</td>
<td>0.20</td>
<td>0.98</td>
<td>0.68</td>
<td>2.32</td>
</tr>
</tbody>
</table>

Based on the Z-score model Table 3, Yankuang Energy’s working capital to total assets ratio (X1) remains between 2% and 3% Figure 6, suggesting its weak short-term solvency. However, the ratios of the market value of equity to total liabilities (X4) have increased, indicating good long-term debt solvency. Despite the decline in earnings in 2020 and 2021 due to the COVID-19 pandemic, the ratio of retained earnings to total assets (X2) grew, indicating the robust profitability of Yankuang Energy. Yankuang Energy consistently enhances profitability by exploiting technological innovations to reduce costs and effectively control expenses. The EBIT-to-total-assets ratio (X3) has experienced fluctuations but generally hovers around 10%. The enterprise’s total asset turnover rate (X5) remains consistently above 50%, indicating its exceptional ability to utilize its assets efficiently.

### 3.3 EVA

Economic value added (EVA) is a new type of value analysis tool and performance evaluation index developed by Stern Stewart company, a newly developed value model based on residual income. EVA formulation is shown as follows.

\[ \text{EVA} = \text{NOPAT} - \text{TC} \times \text{WACC} \]  

Where

\[ \text{NOPAT} = \text{Net Operation Profit After Tax} \]
TC = Total Cost  
WACC = Weighted Average Cost of Capital  

If the value of EVA is positive, it means that income received by the investor from the capital invested in the company is higher than the income received from other investments, which means that the company has generated value; on the contrary, it means that the enterprise has lost value. Compared to traditional valuation methods, the EVA indicator considers market factors on top of the operating profit of the enterprise, avoiding the influence of company performance alone and reflecting more accurately the value growth realized during the enterprise’s operation.

Table 4. Yankuang Energy’s EVA value and parameter(Source: CSMAR database)

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOPAT (Billion/CNY)</td>
<td>15.00</td>
<td>12.63</td>
<td>17.40</td>
<td>22.93</td>
<td>42.20</td>
</tr>
<tr>
<td>TC (Billion/CNY)</td>
<td>136.48</td>
<td>130.22</td>
<td>157.68</td>
<td>190.85</td>
<td>199.41</td>
</tr>
<tr>
<td>WACC (%)</td>
<td>4.34%</td>
<td>4.12%</td>
<td>3.77%</td>
<td>3.42%</td>
<td>4.28%</td>
</tr>
<tr>
<td>EVA (Billion/CNY)</td>
<td>9.07</td>
<td>7.26</td>
<td>11.46</td>
<td>16.41</td>
<td>33.66</td>
</tr>
</tbody>
</table>

Figure 7. Yankuang Energy’s EVA value(Source: CSMAR database)

From the chart Table 4 and Figure 7, it can be seen that Yankuang Energy’s total cost continued to increase from 2018 to 2022 due to the increase in the company’s total assets and the expansion of its operating scale. From the changes in WACC, there has been little change in the past five years, maintaining a level of around 4%, indicating that the company’s debt structure and equity financing costs have remained stable. While maintaining a relatively stable capital structure, NOPAT continues to rise, indicating that the company’s profitability is constantly improving, leading to a continuous increase in the company’s valuation. From the company’s valuation results, this also reflects to some extent the value creation that ESG practices have brought to the company, mainly in reducing costs and increasing production efficiency. The continuous investment in innovation and R&D in the governance aspect has improved the mining efficiency of Yankuang Energy, thereby reducing production costs and increasing its profits.

4. Discussion

4.1 Conclusion

4.1.1 The relationship between ESG practices and the company’s financial performance

This paper uses three standard financial indices to analyze the relationship between ESG practices and corporate financial performance: profitability, solvency, and operation capacity.
Profitability: The profitability has significantly improved, mainly due to increased profits and reduced costs. From the perspective of ESG practices, the company’s continuous investment in innovation, R&D, and employee training has dramatically improved production efficiency.

Solvency: During the research period selected in this paper from 2018 to 2022, the solvency (short-term and long-term debt repayment ability) of Yankuang Energy did not show significant changes and remained at its original level. Therefore, it can be concluded that the practice of ESG has not significantly impacted Yankuang Energy’s solvency so far.

Operating capacity: In terms of operating capability, this dissertation uses accounts receivable turnover and total asset turnover to evaluate. The analysis shows that the accounts receivable turnover rate did not show significant changes from 2018 to 2022. On the other hand, the total asset turnover rate is constantly decreasing. In conclusion, in terms of financial indicator performance, ESG practices have not improved Yankuang Energy’s operation capabilities. However, from the perspective of ESG practices, due to the continuous increase in total assets of Yankuang Energy over the past five years, the total asset size in 2022 is 1.5 times that of 2018, which is one of the reasons for the decrease in total asset turnover rate. It indicates that the practice of ESG has, to some extent, helped companies increase their asset size, thereby enhancing their value.

4.1.2 Company situation

In this paper, the financial crisis analysis model, the Z-Score model, and the economic value-added valuation model, the EVA model, will be used to analyze Yankuang Energy’s current situation.

Z-Score: From 2018 to 2022, the Z-value was 1.76, then fell to the lowest point of 1.19 in 2020, and finally reached 2.32 in 2022, indicating that the overall operating situation of Yankuang Energy is showing a trend of improvement. This phenomenon is also in line with the macroeconomic development in the past five years: In 2020, the demand for the coal industry due to COVID-19 decreased, which will lead to the value decline of X2 and X3, which represent the profitability index, thus reducing the overall Z value. Therefore, it can be seen that in the Z-score model, the X2 and X3 parameters of the profit indicator are heavily weighted. Subsequently, with the liberation of COVID-19, the overall situation of the coal industry has rebounded again, with an increase in the values of X2 and X3 and an overall improvement in profitability. It is worth noting that Yankuang Energy has been continuously practicing ESG for the past five years. Even though profits have decreased, it has continuously invested in R&D and innovation. As a result, in 2022, internal production efficiency improved, and costs were reduced through these years of ESG practices. Externally, with the rise of international coal prices, Yankuang Energy seized the opportunities, capturing the market share and thus enhancing firm value. In conclusion, the direct impact of ESG practices on finance performance is to enhance the company’s profitability.

EVA: From 2018 to 2022, the EVA value of Yankuang Energy continued to increase, indicating that the value created by Yankuang Energy is constantly increasing. The increase in EVA value is mainly due to the increase in NOPAT, which means an increase in profitability. The valuation analysis results of the EVA model are consistent with the Z-score model and the financial indicator analysis method, which improve the firm value through its profitability. According to the previous analysis, the increase in profitability is, to some extent, related to the practice of ESG. Therefore, it can be concluded that ESG practices can help Yankuang Energy enhance its value mainly by improving its profitability.

In conclusion, from the perspective of financial performance, the most direct impact of ESG practices on firm value enhancement is to enhance its profitability. However, although ESG practices sometimes may not directly lead to improved financial indicators, such as solvency and inventory turnover rate, they can provide long-term support and assurance for a company’s financial performance. This is because ESG practices can help companies establish and maintain a healthy, sustainable, and responsible business model.

4.2 Limitations

There are six limitations in the research of this paper.
1. Firstly, the case study method used in the paper is not representative, meaning that the research results may not universally apply to other cases. In other words, companies that take the same ESG practices may not produce the same outcomes. Therefore, the research results of this paper only serve as a reference for other companies.

2. Secondly, due to the degree of disclosure of ESG reports and financial reports, some information and data cannot be accessed, affecting the accuracy of research conclusions.

3. The third point is that China has not yet established a unified ESG disclosure framework system, meaning that the company may subjectively disclose data that benefits it.

4. Fourthly, the period of China’s ESG practices and mandatory disclosure of ESG reports are relatively short, and the impact of ESG practices requires long-term observation. Yankuang Energy only began to disclose complete ESG reports in 2020, so the impact of ESG practices on firm value may not analyzed comprehensively.

5. Fifthly, it is difficult to quantify the relationship between the ESG practices and the financial performance of Yankuang Energy and its firm value. Therefore, only adopting financial data cannot accurately evaluate how ESG practices affect the firm’s value.

6. Limitations of the Z-score model: Firstly, the model was initially applied to manufacturing enterprises and later improved to be widely applied in other industries. Secondly, due to the different economic environments of each country, the criteria for judging the Z-value of companies in each country are also different, so the critical value of Z-value for companies in each country is also different.

References


