Research on the Impact of Corporate Compensation Management Mechanism on Corporate Performance and Innovation Capability Based on the Context of Big Data Science

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Abstract. This paper first analyzes the impact of ESG performance on the companies themselves from the perspective of the companies and investors to May 2020 Shenzhen created the GEM has 74 companies, using regression models to analyze the impact of compensation management mechanisms on company performance and innovation, respectively. The results show that: company performance is positively correlated with shareholding with a correlation coefficient of 0.523 and a significance probability Sig. = 0.005 < 0.05. The regression coefficient of employee compensation on innovation output is 0.079, which is significantly positively correlated at the 1% level. This study has a guiding role in promoting companies to practice ESG performance and promote the healthy development of the capital market.

Keywords: Corporate perspective · Investor perspective · ESG performance · GEM · regression model · Compensation management mechanism · Firm performance

1 Introduction

The domestic research literature related to corporate social responsibility (CSR) is very abundant and the research ideas are very mature, while the research related to corporate ESG has only received attention from Chinese academia in recent years [1, 2]. Both ESG and CSR focus on the impact of companies on the environment and society, and both pursue that companies can achieve long-term sound development and create value for both shareholders and society [3, 4]. However, CSR is more oriented to internal corporate self-governance or disclosure, while the application of ESG focuses on the capital market and is more used to provide investors or society at large to assess. ESG performance enables to assess the contribution of companies in promoting sustainable economic development and fulfilling social responsibility [5, 6]. Firms with different characteristics differ in their ability to integrate resources, so the impact of ESG performance on corporate investment efficiency is examined from three different perspectives: corporate ownership, corporate environmental impact, and corporate size [7, 8].

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Based on this, this paper uses the information related to corporate performance and executive compensation provided by the 2019 annual financial reports of companies listed in GEM 2020 using correlation analysis and multiple regression analysis to empirically analyze the impact of compensation management mechanisms on firm performance and innovativeness, and conducts robustness tests.

2 Corporate ESG Performance

2.1 Enterprise Perspective

Focusing on a firm's ESG disclosure can incur additional costs for the firm and be detrimental to its growth; however, most scholars now believe that good ESG performance of a firm will earn the firm a reputation. The expansion of managers' attention to include financial and non-financial performance indicators also increases the perceived long-term sustainability of the firm and has a significant or positive impact on corporate performance.

Corporate social responsibility can incur additional costs for companies, making resources inefficiently allocated and reducing the competitiveness of their products; the only goal of companies is to maximize profits. However, while creating economic value, companies must actively assume social responsibility and participate in solving social problems. Thus, CSR activities are a source of innovation, creating additional revenue that can cover additional costs, and an appropriate CSR strategy can be positively correlated with corporate financial performance.

In addition, companies with good social responsibility performance will attract specialized institutional investors and analyst coverage, thus reducing financing costs. Interaction of different dimensions of ESG, the study found that the positive signals and legitimate image elicited in companies with a high level of ESG rating will increase stakeholder attention. This leads to higher innovation capacity, while the positive impact of environmental and social initiatives will be diminished in firms with low level ESG ratings, and they confirm that internal governance mechanisms reduce institutional costs and amplify the positive impact of appropriate corporate strategies.

2.2 Nvestor Perspective

There is a growing body of research examining whether ESG-performing companies can reduce investment risk and improve investment returns from an investor's perspective. Investors are interested in ESG investing for at least two reasons:

One is the focus on ethical investing and the active promotion of ethical investment practices.

The second is that ESG investing is increasingly recognized as portfolio risk.

To some extent, ESG opens a new chapter in corporate social value. A high ESG score may indicate a greater chance of avoiding such events, and companies with stronger ESG characteristics are expected to be more resilient in volatile market conditions.

2.3 Convolutional Neural Network Foundation

Convolutional layers.

The convolutional layer, as the core unit of convolutional neural network, can extract the corresponding feature information from the input image. The strong information extraction capability of convolutional neural networks makes them preferred as the backbone network for many computational vision tasks. Typically, the input image contains three dimensions: width, height, and the number of color channels, for example, a common RGB image has three color channels (red, green, and blue).

The convolutional layer is to perform the corresponding inter-correlation operation between the input image and the convolutional kernel with the scalar deviation. That is, the parameters of the convolutional layer contain the convolutional kernel parameters and the scalar bias parameters. The input and output of the convolutional layer are collectively referred to as the feature map. An element in the output feature map is affected by a region in the input feature map, and this region is the receptive field of that element. The convolution operation usually includes a series of fill and step operations. Padding is the process of filling the original input with certain elements (usually 0) at the top, bottom and left, increasing the width and height of the input to ensure that the input can all participate in the convolution operation. During the convolution operation, the convolution kernel is moved from left to right and top to bottom on the input image. The step size is the magnitude of each move. Increasing the step width can reduce the computational effort of convolution operation. Settings $F_{in} \in R^{C_{in} \times C_{out} \times I_{in}}$ indicates an input, $F_{out} \in R^{C_{out} \times H_{out} \times I_{out}}$ denotes the output feature map. $W \in R^{C_{out} \times I_{in} \times K \times K}$ denotes the parameters of the convolution kernel. Then the convolution operation is shown in the following figure:

$$F_{out} = F_{in} * W \tag{1}$$

And H_{out}, W_{out} the formula for the calculation of:

$$H_{out} = \frac{H_{in} - K + 2P}{S} + 1 \tag{2}$$

$$I_{out} = \frac{I_{in} + K + 2P}{S} + 1 \tag{3}$$

where C_{in} and C_{out} denote the number of channels in the input and output feature maps, H_{in}, I_{in} denotes the input feature height and width, H_{out}, I_{out} denotes the output feature map height and width, K × K denotes the size of the convolution kernel, P denotes the amount of padding, and S denotes the step size. It can be seen that the size of the output feature map can be controlled by controlling the step size and padding for different input sizes.

The following figure shows the two-dimensional convolution operation process, where the scalar bias is omitted, the size of the input is 6 × 6, the convolution kernel is 3 × 3, the step size is 2, the fill size is 1, and the fill element is 0. As show in Fig. 1.

The convolutional operation in most of the current convolutional neural network models is the three-dimensional convolutional operation. The structure of three-dimensional convolutional operation is shown as follows Fig. 2.

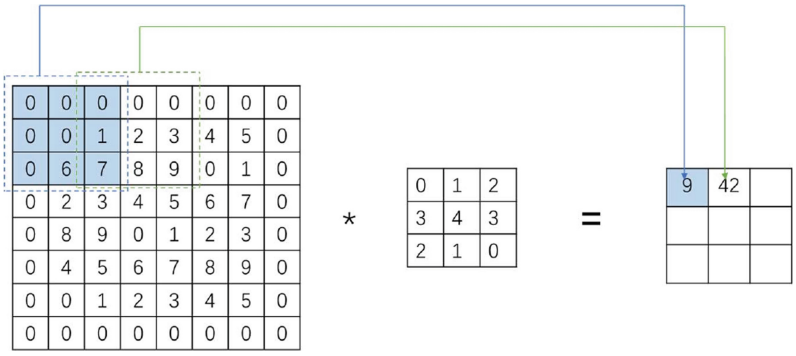

Fig. 1. Two-dimensional convolution operation

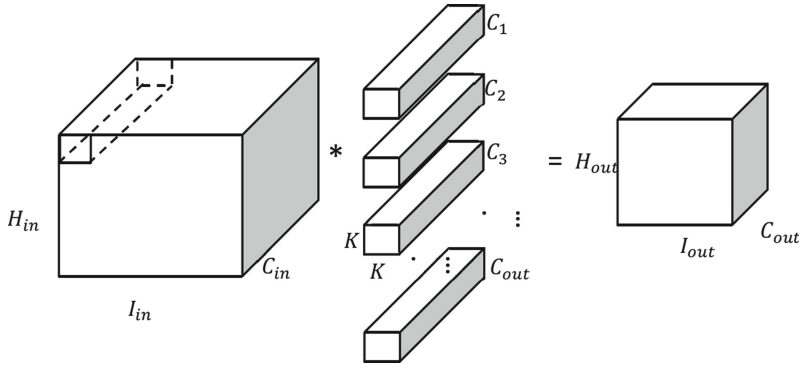

Fig. 2. Three-dimensional convolution operation

One convolutional layer can often extract only a limited amount of information, so researchers started to stack convolutional layers of different sizes to build convolutional neural networks. It is subconsciously believed that the deeper the stacked network, the better its performance. So gradually those convolutional neural network models with huge structures emerged.

Pooling layer.

The pooling layer, also known as the downsampling layer, does not introduce any learnable parameters in the network model. The convolution operation of the convolution layer introduces a large amount of invalid feature information, which can lead to overfitting problems. The pooling layer is mainly used to reduce the useless information, ensure the input and output invariance of the model, reduce the computational and structural complexity of the model, prevent overfitting, and enhance the generalization ability by reducing the dimensionality of the data and representing the image with higher level features.

Max Pooling and Average Pooling are two common pooling methods today. Maximum pooling means that the maximum value is selected as the pooled value in the

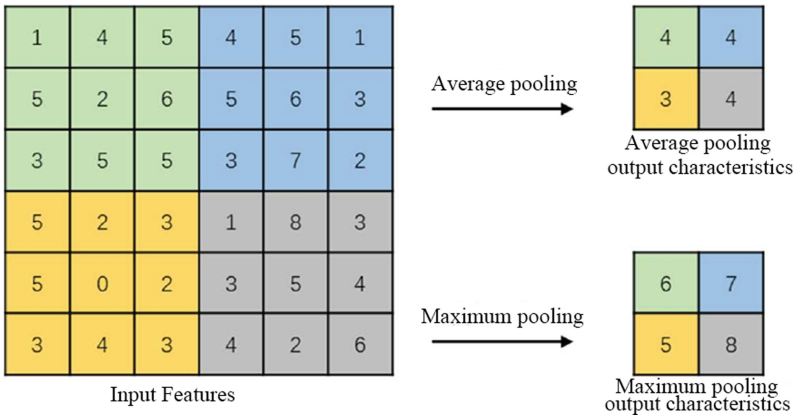

Fig. 3. Maximum pooling and average pooling operation process

forward propagation process; in the backward propagation process, the gradient is propagated to the maximum value in the forward process, and the gradient of other elements is 0. There are two types of maximum pooling, overlapping pooling and non-overlapping pooling. Previously proposed convolutional neural networks used overlapping pooling; VGG and others used non-overlapping pooling; since ResNet, pooling is used gradually less frequently and replaced by using a step size of 2 in the convolution operation. Maximum pooling can extract feature information such as texture and edges in the input image very well.

Average pooling is the forward propagation process in which the mean value of all elements in the pooled region is selected as the pooled value; the backward propagation process in which the gradient is passed to all regions. The most important feature of mean pooling is to enhance the robustness of the network model and reduce the bias of the estimated mean value.

A simulation schematic of maximum pooling and average pooling is shown in Fig. 3, where the sample size is 3×3, the step size is 3, and the fill is 0. In addition to maximum pooling and average pooling, there are special pooling operations such as random pooling, median pooling, fractional order maximum pooling, and combinatorial pooling.

3 Analysis of the Impact of Compensation Management Mechanism on Company Performance and Innovation Ability

3.1 The Impact of Compensation Management Mechanism on Company Performance

(1) Sample selection and data source

Sixty-three companies listed on GEM before the end of 2020 and disclosing their annual reports before May 20, 2020 were used as the study sample. Using 2019 annual report data, descriptive statistics and regression analysis of the econometric model were performed using SPSS software.

(2) Variable selection and research hypothesis

The first one is executive compensation indicators. Here, three indicators are selected, namely, the average of executive monetary compensation AP, executive shareholding ratio MSR, and average annual salary of independent directors IDAP, to comprehensively examine the incentive effect of executive compensation.

The second is the company performance index. Considering that listed companies may have the motive of manipulating ROE due to the need of financing, and combined with the characteristics of GEM companies with prominent main business, growth and high technology content, ROE, the indicator of ROE, is selected here to measure the performance of the company to make the results as perfect as possible. The following hypotheses are proposed for the impact of compensation management mechanism on firm performance in this paper:

Hypothesis 1 is that there is a significant positive relationship between division performance and annual executive salary.

Hypothesis 2 is that there is a significant positive correlation between company performance and the percentage of shares held by executives.

Hypothesis 3 is that the average annual salary of independent directors has a significant effect on company performance.

(3) Empirical analysis

The econometric model1 proposed to be constructed in this paper is:

$$ROE_i = \alpha_0 + \alpha_1 AP_i + \alpha_2 MSR_i + \alpha_3 IDAP_i + \varepsilon \tag{4}$$

where, *ROE* is the return on net assets, *AP* is the average annual salary, *MSR* is the employee shareholding ratio, *IDAP* is the average annual salary of independent directors, and ε is the disturbance term.

The results of regression analysis of model 1 are shown in Fig. 4.

The results of the regression analysis showed that Adjusted R Square = 0.173 and the independent variable explained 15.2% of the dependent variable. The ANOVA results showed that F = 3.921 and Sig = 0.005 < 0.05, indicating that the regression model was better.

(1) Company performance is positively correlated with average compensation with a correlation coefficient of 0.138 and a probability of significance Sig. = 0.279 > 0.05, indicating that the positive correlation is not significant.

(2) Company performance is positively correlated with shareholding, with a correlation coefficient of 0.523 and a significance probability Sig. = 0.005 < 0.05, indicating that they are significantly positively correlated.

(3) Company performance is positively correlated with the average compensation of independent directors with a correlation coefficient of 0.108 and a significance probability Sig. = 0.415 > 0.05, indicating that the positive correlation is not significant.

3.2 Analysis of the Impact of Compensation Management Mechanism on the Innovation Power of Enterprises

(1) Sample selection and data source as above.

(2) Variable selection and research hypothesis

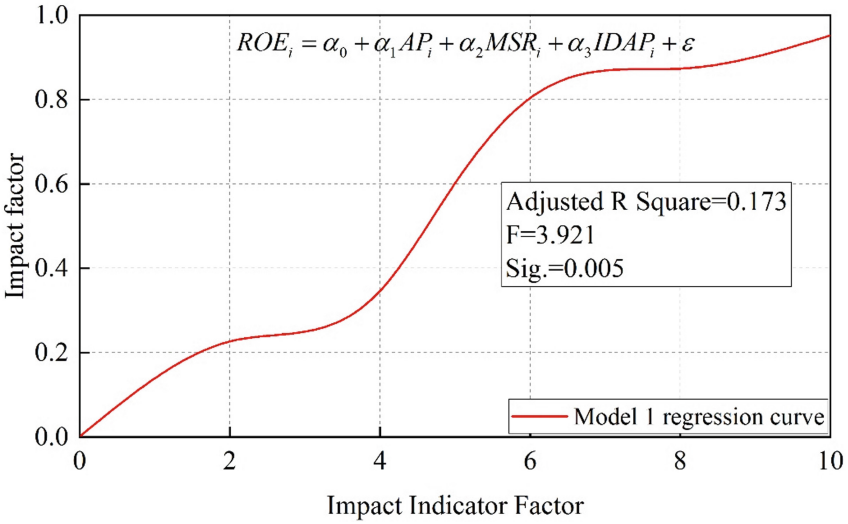

Fig. 4. Regression analysis results of model 1

There are many factors affecting innovation capability. In this paper, company size, government subsidy, media attention, and analyst attention are treated as control variables to exclude the influence of these factors on innovation capability. Company size excludes the influence of the difference in resources owned by different employees on innovation capability. The government subsidy factor means that it is not an incentive from the company to employees to innovate, but from the government. Media attention and analyst attention exclude the non-autonomous innovation forced by external forms, and also can exclude the psychological aspect of external attention on employees' innovation incentives. Therefore, the following hypotheses are proposed in this paper on the influence of compensation management mechanism on corporate innovativeness:

Hypothesis 1: There is a positive correlation between general employee compensation and enterprise innovation output.

(3) Empirical analysis

This paper proposes the constructed econometric model 2 as:

$$IO_i = \beta_0 + \beta_1 Salary + \beta_2 Size + \beta_3 Sub + \beta_4 Mattention + \upsilon \tag{5}$$

The results of the model 2 regression analysis are shown in Fig. 5.

The results of the regression analysis showed that Adjusted R Square = 0.201 and the independent variable explained 13.93% of the dependent variable. The ANOVA results showed that F = 4.178 and Sig = 0.001 < 0.05, indicating that the regression model was better.

The regression coefficient of general employee compensation on innovation output was 0.079, which was significantly positively correlated at the 1% level, thus verifying the positive effect of general employee compensation on innovation output. It indicates

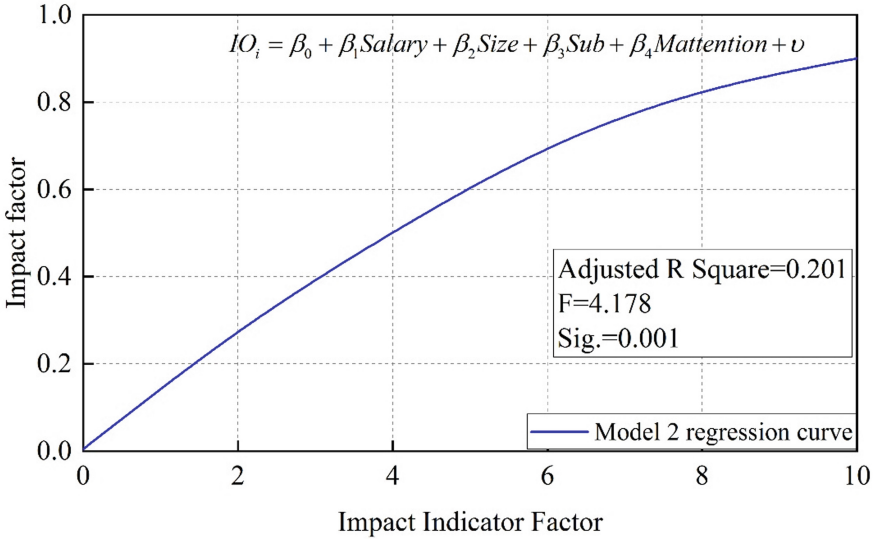

Fig. 5. Regression analysis results of model 2

that increasing the compensation of general employees can improve the motivation of employees as well as the incentive to innovate, which helps to improve the innovation output of enterprises and proves hypothesis 1.

4 Conclusion

This paper uses correlation analysis and multiple regression analysis using information related to corporate performance and executive compensation provided by the 2019 annual financial reports of companies listed in GEM 2020. It is found that corporate performance is positively correlated with shareholding ratio with a correlation coefficient of 0.523 and a significance probability Sig. $= 0.005 < 0.05$. It indicates that the information on corporate characteristics embedded in corporate ESG performance can affect the quality of analysts' earnings forecasts, and listed companies should take active measures to improve ESG management and enhance ESG performance, and disclose timely and accurate ESG information related to the company.

References

1. Radu C, Smaili N. Alignment versus monitoring: An examination of the effect of the CSR committee and CSR-linked executive compensation on CSR performance. Journal of Business Ethics, 2021: 1–19.
2. Assenso-Okofo O, Jahangir Ali M, Ahmed K. The impact of corporate governance on the relationship between earnings management and CEO compensation. Journal of Applied Accounting Research, 2021, 22(3): 436–464.

3. Conyon M J, He L. Executive compensation and corporate fraud in China. Journal of Business Ethics, 2016, 134: 669–691.
4. Abou-Moghli A A. The influence of compensation management strategy on talent retention: Exploring the mediating role of structural capital. International Business Research, 2019, 12(3): 165–173.
5. Chhaochharia V, Grinstein Y. CEO compensation and board structure. The Journal of Finance, 2009, 64(1): 231–261.
6. Smith Jr C W, Watts R L. Incentive and tax effects of executive compensation plans. Australian Journal of Management, 1982, 7(2): 139–157.
7. Ilak P, Lin H, Rajl I, et al. Equilibrium Pricing with Duality-Based Method: Approach for Market-Oriented Capacity Remuneration Mechanism. Energies, 2021
8. Florian Zimmermann, Andreas Bublitz, Dogan Keles, and Wolf Fichtner. Cross-border Effects of Capacity Remuneration Mechanisms: The Swiss Case. The Energy Journal, 2021, volume 42.