

An ESG investment evaluation system based on metrics and model innovation

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Abstract. In recent years, with the acceleration of the economic transformation in China, environmentally friendly and sustainable enterprises are more conducive the construction of a green economy. Environmental, Social and Governance (ESG) which can quantify the relationship between enterprises and the environment, has emerged as the times require. Therefore, based on the "scoring model system for ESG information disclosure", we simplified and reformulated the ESG investment evaluation system, and built iESG, an integrated green financial service platform for small, medium and micro enterprises. It fills the gap in the field of ESG evaluation in the market, and provides targeted ESG evaluation and related analysis and green financial services for small, medium and micro enterprises and independent investors.

Keywords: ESG, three-level indicator, evaluation service.

1. Introduction

In recent years, as environmental, social and other issues related to sustainable development have become hot topics, ESG has become the focus of investors and entrepreneurs around the world [1]. In the past decade, the global ESG bond market has expanded rapidly, from nearly 5 billion dollars in 2010 to 550 billion dollars in 2020, an increase of nearly 110 times.

Although a series of favorable policies for the construction of ESG evaluation system has been issued, China's ESG evaluation is still in its infancy, and ESG still faces many problems in China's economic environment, such as there are many systems, and there is a lack of unified standards; disclosure is not highly relevant, and it is easy to generalize; some ESG products have the problem of "greenwash"; many ESG rating systems are not transparent enough, etc. [2-3]. Compared with other indicators in the same industry, the ESG investment evaluation system and three-level indicators proposed in this paper are more targeted at the actual situation and needs of small and medium-sized enterprises, filling the gap in the sinking market, and partially solve these problems [4-5].

2. iESG evaluation system and its mathematical model basis

In order to objectively evaluate the ESG performance of listed companies, SynTao Green Finance has developed an ESG rating system for Chinese listed companies based on international standards and the current status of information disclosure of Chinese companies. By collecting the company's ESG information and quantifying the ESG information, the ESG information is finally converted into sustainable development performance scores and levels that investors can easily use. Based on this, new evaluation standards and weights were tentatively proposed, so that small and medium-sized enterprises can conduct simple evaluations through this system, completing the self-examination of ESG standards while eliminating the still high related management fees and non-profit expenses.

2.1 Three-level indicators in ESG evaluation criteria and weights

As Table 1 shows, three-level indicators are set up. The weight of the first-level indicators is closely related to the main orientation of the economic environment in which the market entities are located, and fully combines the actual situation of the enterprise engaged in the relevant industry and the particularity of the enterprise itself. Due to the huge differences existing in different industries, it is difficult to use a unified data caliber for ESG investment evaluation. Therefore, before ESG evaluation, industry differences are taken into account, and different statistical standards are used under the same framework. Finally, the unique understanding of the enterprise decision-making level on the differences in the specificity of the enterprise is included, which is manifested as the addition of the subjective adjustment value. Relying on the PEST external macro environment analysis model, a weight distribution analysis model for the first-level indicators was established.

After the first-level evaluation index has completed the inspection and measurement of the particularity of each evaluation object, and determined the weight composition of the three indicators in first-level of the object according to its nature, the third-level indicators are determined as the specific criteria for evaluation under the general classification of the second-level indicators.

Table 1 Evaluation system and some evaluation indicators

Level 1 Indicators	Level 2 Indicators	Level 3 Indicators
Environmental (E)	1 Environmental management	1 Environmental management system, management objectives, employee environmental awareness, energy and water conservation policies, green procurement policies
	2 Environmental disclosure	2 Energy consumption, energy saving, water consumption, greenhouse gas emissions, air pollutant emissions,
	3 Environmental negative events	3 The proportion of recycled water and the proportion of recycled waste water pollution, air pollution, solid waste pollution
Social (S)	1 Staff management	1 Labor policy, anti-forced labor, anti-discrimination, female employees, employee training
	2 Supply chain Management	2 Supply chain responsibility management, supervision system
	3 Customer management	3 Confidentiality of customer information
	4 Community management	4 Community communication
	5 Product management	5 Fair trade products
	6 Charity and donations	6 Corporate foundations, donations and public welfare activities
	7 Negative events in society	7 Employee, supply chain, customer, social and product negative events
Governance (G)	1 Business ethics	1 Anti-corruption and bribery, whistleblowing system, tax transparency
	2 Corporate governance	2 Information disclosure, board independence, executive compensation, board diversity, workforce gender composition, training hours per employee
	3 Negative events of corporate governance	3 Business ethics, corporate governance negative events, recordable accident rate

2.2 Econometric Test

In order to ensure that the ESG investment evaluation analysis system proposed is practical, empirical, and executable in economic and financial practice, it is necessary to perform hypothesis testing on this model and even continuously revise the model through machine learning. The multiple regression analysis method of econometrics is used. Asset-liability ratio (CuLia), current-liability ratio (DebtAsset), return on equity (ROE), and TobinQ ratio (TobinQ) in corporate financial reports are selected to reflect the financial status of the enterprise. Debt financing cost (DebtCost) and equity financing cost (EquityCost) are selected to reflect the financing cost of the enterprise. With considering the systemic risk under the macro market, a total of seven explanatory variables are used to construct a multiple regression analysis model (Eq. (1)):

$$ESGrate = \alpha_0 + \alpha_1 CuLia + \alpha_2 DebtAsset + \alpha_3 ROE + \alpha_4 TobinQ + \alpha_5 Risk + \alpha_6 DebtCost + \alpha_7 EquityCost \quad (1)$$

The financing cost variable in this paper is calculated by using the general system of debt and equity financing cost (Eq. (2)), in which the cost of equity adopts the calculation result of the ex post cost of equity PEG model as a variable, EPS_1 is the predicted t_1 earnings per share, EPS_2 is the predicted t_2 earnings per share. Predictor data is from the China Stock Market & Accounting Research Database (CSMAR).

$$EquityCost = \sqrt{\frac{EPS_2 - EPS_1}{P_0}} \quad (2)$$

According to the Pearson correlation analysis, multiple regression analysis test of explanatory variables, and the test of the endogeneity of the regression model using the two-stage least squares method, the results are as follows:

- ① Corporate financial performance has a positive impact on ESG scores
- ② Enterprise systemic risks have a negative impact on ESG scores
- ③ There is a positive correlation between ESG scores and corporate debt financing costs
- ④ There is a negative correlation between ESG scores and corporate equity financing costs

The research results and hypothesis testing are reliable, the selection of instrumental variables is effective, and the instrumental variable testing and regression results are consistent.

It can be seen that the ESG investment evaluation system not only innovatively adds sustainable development and long-term macro considerations on the basis of ESG concepts and sustainable development concepts, but also has good compatibility with traditional performance evaluation methods. While simplifying the systematic, specialized and systematic ESG assessment, it does not damage the practicability and feasibility of the methodology, and it still has empirical significance. And as the amount of data increases, the confidence in this ESG assessment increases. More details were discussed by the study of "*The Empirical Research of ESG evaluation system in measuring corporate performance*".

3. iESG assessment service products

3.1 Product introduction

Like most corporate strategies and investment evaluation models, ESG investment evaluation methods have distinct direct empirical characteristics, that is, through observation and analysis of research data, and mathematical and case empirical research, to develop theoretical hypotheses or test theoretical hypotheses and expect the results to have an investment evaluation system with direct reality reference [6]. ESG is an investment strategy model that starts from the three major aspects of environment, society and corporate governance, based on certain cases and data analysis, and invests according to the obtained enterprise risk assessment results [7]. At the same time, in order to obtain accurate enterprise risk assessment results and give full play to product functions, enterprises need to provide a certain amount of accurate data.

For small and medium-sized enterprises, on the basis of SynTao Green Finance ESG assessment, data services, and the Corporate Sustainability Reporting Directive (CSRD), the evaluation criteria are tentatively proposed in combination with the investment and financing environment of China's current market, so that small and medium-sized enterprises can conduct a simple assessment through this system [8]. While completing the ESG standard self-examination, they can avoid the still high related management fees and non-profit expenses. Through model building, corporate performance and corporate return on total assets can be mapped through ESG rating scores.

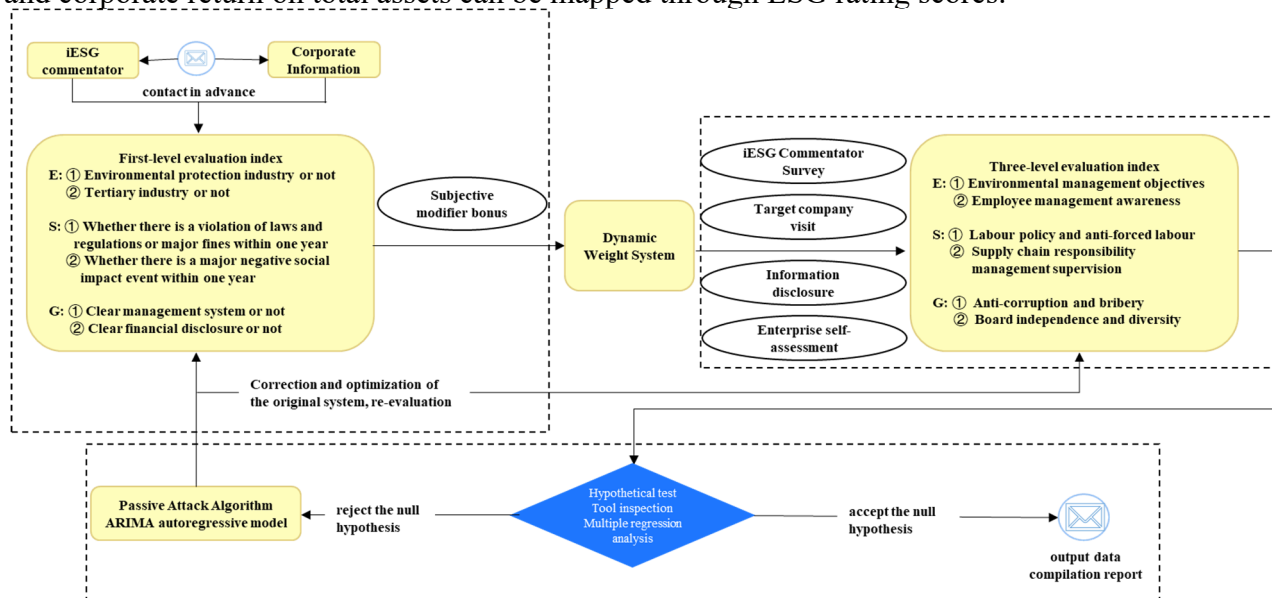


Figure 1. Product Architecture and Technology Route

3.2 Product innovation

3.2.1 Weight of Evaluation Criteria

First of all, it is considered that the focus of ESG assessment is different due to different industries. Therefore, after the three-level indicators are created, the distribution of the weights of the first-level indicators is also constructed. Secondly, in the second-level indicators, innovations and subdivisions were carried out in the three aspects of society, environment and corporate governance. Different weighting ratios are adopted for different companies, so that the model is compatible with the particularity of each company's reality on the basis of the universality applicable to most companies, making the iESG service more suitable for the reality of unicorn companies with distinct personalities [9].

3.2.2 Model establishment innovation

This model takes into account the inherent differences between industries and enterprises, and innovatively builds a dynamic weight evaluation system, which encourages evaluators and enterprise executives to make adjustments subjectively and encourages enterprises to strengthen information disclosure. The existing overly complex models are also simplified to a certain extent for the actual conditions of small, medium and micro enterprises to ensure the acceptability of the model and the actual execution ability, and meanwhile, to improve the confidence of the model with the support of a large amount of data. On this basis, the multiple linear regression model is used to measure the confidence, which is demonstrated that the model is empirical, and the original model can be continuously optimized according to the return residuals of the tool test [10].

4. Conclusion and perspective

As an integrated green financial service platform for small, medium and micro enterprises, iESG is established on the ESG investment evaluation system and information disclosure system. Based on

the self-built online service platform and innovative and improved ESG assessment three-level indicators and mathematical models, iESG mainly provides affordable ESG assessment, analysis and green financial services for small and medium-sized enterprises, filling the gap in the ESG assessment field in the market.

Nevertheless, due to the huge differences between different industries, it is difficult to use a unified data caliber for ESG investment evaluation. Even if new evaluation standards and the weight of the first-level indicators were proposed, the increasingly subdivided industries, the complex and diverse market environment brought about by the market structure that is undergoing transformation and upgrading, and the unevenness of market participants are still issues that need to be addressed in the development of ESG. Therefore, this evaluation index still has certain shortcomings, and the weight should be more detailed and precise.

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