Analyzing Drivers of Green Transformation in Taiwan: A Study Using Decision Trees, Random Forests, and Linear Discriminant Analysis

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Abstract:

As climate change and environmental crises escalate, corporate green transformation has emerged as a critical issue for sustainable development. This study investigates the driving factors influencing green transformation among Taiwanese publicly listed companies, analyzing data from 2016 to 2024 from the Green Securities Information Platform and Taiwan Economic Journal. By integrating corporate attributes, financial indicators, and Environmental, Social, and Governance (ESG) scores, the research applies decision tree, random forest, and linear discriminant analysis (LDA) models to predict the likelihood of firms obtaining green certifications and evaluate the models' performance. Empirical findings reveal that firm size, R&D expenditure ratio, and energy management play significant roles in determining green certification attainment. Among the models, the random forest demonstrates superior accuracy and robustness, excelling in handling high-dimensional data and complex interactions. Decision tree models offer high interpretability, effectively identifying key factors driving green transformation. LDA, in contrast, performs well in linear data contexts, providing a simpler predictive framework. These results highlight the strengths and limitations of machine learning techniques in addressing corporate sustainability challenges. The study underscores the importance of innovation, resource allocation, and sustainability efforts in corporate strategies. By leveraging these approaches, companies can enhance their environmental performance and competitiveness while aligning with broader sustainable development goals. This research not only provides actionable insights for businesses and policymakers but also emphasizes the critical role of advanced predictive tools in supporting green transformation initiatives.

Keywords:

Green transformation, Corporate sustainability, Machine learning.