

The impact of Corporate Social Responsibility on  
Corporate Value:  
An Empirical Study of Chinese Companies' Corporate  
Sustainability Disclosure and Financial Performance

by

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An honors thesis submitted in partial fulfillment

of the requirements for the degree of

Bachelor of Science

Business Honors Program

NYU Shanghai

May 2018

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# Table of Contents

Abstract.....	3
Acknowledgements.....	4
1. Introduction.....	5
2. Objective of Study.....	5
3. Literature Review.....	6
4. Research Methodology .....	11
5. Hypotheses.....	16
6. Data Analysis and Empirical Results.....	17
6.1. Test on the first linear regression model with 3 variables	
6.2. Test on the second linear regression model with 5 variables	
6.3. Test on CART model with 5 variables	
7. Conclusions and Implications.....	22
8. References.....	25
9. Appendix.....	28

**Abstract**

This research investigates the impact of corporate social responsibilities on the creation and preservation of Chinese companies' corporate value by both theoretical study and empirical analysis. First, this paper describes investors' incentives to invest in corporate sustainability, especially focusing on ESG factors, and concludes that there are mainly four motivations driving investors' decision towards sustainability-related investments: creating healthy corporate reputation, adopting a more long-term perspective, supporting insider philanthropy, and promoting added-value brand creation and preservation.

This research also examines the relationship between Chinese companies' sustainability and financial performance by building a regression model of their disclosure score and financial measures including accounting-based (operating margin and enterprise value compound annual growth rate (CAGR)) and market-based financial performance (Tobin's q). It is demonstrated that Environmental, Social and Governance disclosure scores do not have significant impact on company's accounting-based value (operating margin and enterprise value CAGR) but have significant impact on the company's market-based value (Tobin's q). And among the three ESG factors, the investment in environmental sustainability contributes the most to the increase in the enterprise value, as it is believed to bring promising added brand value and strong market confidence to the investors of the company. This research also finds a very weak evidence that Chinese companies take corporate sustainability seriously. This research can not discard that some Chinese companies are reporting ESG only because of greenwashing in order to deceptively meet stakeholders' demand for environmentally friendly goods and services. And it might lead to consumers' suspicion about all the green claims, and undermines the market force in driving companies towards more sustainable business operations.

*Keywords: Corporate Sustainability · ESG Disclosure · Company Valuation and Brand Value*

## **Acknowledgement**

I would like to express my gratitude towards my thesis advisor, Professor Rodrigo Zeidan, for his great support and guidance throughout my research process during the whole year. Professor Zeidan offered me a lot of valuable guidance and detailed feedbacks for me to construct and refine the overall structure of my research. In addition, he also greatly helped me through the whole data collection process and connected me to Offer Shapir, from whom I got helpful suggestions on the CSMAR database which includes China stock market financial data. In addition, his papers about Sustainable Finance inspired me a lot and gave me great insights to further pursue my research in the Corporate Social Responsibilities field. I would like to sincerely express again my appreciation to Professor Zeidan, for spending a lot of time and efforts in advising my research and always offering me greatest support and guidance.

I would like to thank Professor Marti Subrahmanyam and Professor Yiqing Lu for coordinating the NYU Shanghai Honor Programs. I feel honored to be the second class of the students in this program and conduct undergraduate research in the field that I am really interested in with the guidance and support of my advisor. I really cherish the professional mentorship I received from Professor Zeidan with your great coordination. I also would like to thank Professor Subrahmanyam and Professor Lu for bringing in so many great speakers and researchers to the seminars on each Friday, which greatly helped me to continuously build up my systematic mindset of research methodology and advanced financial knowledge.

I would like to thank Xinyi Yang, the best teaching assistant of the program. I would like to express my sincere thanks for your great coordination in each seminar and after-class communications.

I would like to thank Professor Offer Shapir for giving me helpful suggestions and advice on the database I can use in my research.

I would like to thank my fellow classmates in the NYU Shanghai Honor Programs for discussing with me about my thesis and giving me great suggestions and inspirations.

I would like to thank my family and friends for always giving me great support and encouragement whatever I do and wherever I go.

## **Introduction**

Sustainability is an emerging field for corporate world today, focusing on how companies integrate environmental, social and governance (ESG) criteria into the business decisions to achieve the lasting benefit of both clients and society. Of course, sustainability is more than ESG factors, but their criteria are the standard in financial markets today. Over the last decade, the managers' interest in corporate sustainability has developed significantly because of the reputation effect and long-term considerations of sustainable investment. However, due to the concern of the inverse relationship between sustainability and profitability, sustainability criteria is usually absent in the most commonly used valuation methods in financial markets today. And it still remains unknown whether the sustainable finance has an effect on the corporate finance and performance.

Therefore, this research is dedicated to:

- I. discover investors' incentive to invest in corporate sustainability;
- II. analyze whether sustainability disclosure influences corporate financial performance;
- III. evaluate which type of sustainability measures have potential significant impact on corporate financial performance.

## **Objective of study**

Many researchers have already examined the relationship between profitability and sustainability. However, most of the studies have been conducted in the context of developed

countries, such as US, UK, Europe, etc. The purpose of this paper is to examine the impact of the investment in corporate sustainability on the company's financial performance in a Chinese context. This paper also analyzes the impact of the three components of sustainability (i.e. Environmental, Social and Governance) on corporate financial performance. The association between the overall corporate sustainability and financial performance is also examined in the data analysis.

### **Literature Review:**

“Corporate Sustainability” means creating the long-term shareholder value by seeking opportunities and managing risks arising from Environmental, Social and Governing factors (Aggarwal, 2013). In Deutsche Bank Climate Change Advisors' research about sustainable investing<sup>1</sup>, they found that over 90% of the academic studies agree with the fact that companies with high ESG score tend to have a lower cost of capital in terms of debt and equity, and over 85% of the academic studies demonstrate that companies with high ESG score exhibit financial outperformance compared to their peers. Since ESG covers a broad range and each factor (E, S, G) may have a relationship of different impact on the companies' financial performance, this research will disaggregate the ESG impact into their respective aspect and examine their potential relevance.

The academic studies to date have collectively mapped a mixed relationship between the respective sustainability factor and the corporate financial performance. In terms of Environmental factor, eco-efficiency is found to have positive but time-variant relationship with the company's financial performance because the market incorporates the environmental information with a drift (Guenster et al., 2006). However, Semenova and Hassel (2008) discover that in some perfectly competitive and polluting industries, sustainable environmental

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<sup>1</sup> This is the key finding of Fulton's report after looking at more than 100 academic studies of sustainable, 56 research papers, 2 literature reviews and 4 meta by 2013

investments are very costly and affect the companies' operating efficiency. In terms of Social factor, Derwall et al. (2011) discover that although the socially responsible companies earn abnormal return in the short run, the over-performance actually diminishes in the long run<sup>2</sup>, while Edmans (2010) discovers a positive relationship between employee satisfaction and the company's long-term stock returns and emphasizes the importance of human resource capital advantages. In terms of Governance factor, Bauer et al. (2003) finds that corporate governance is negatively related to the company's valuation, as examined by Return on equity and Net profit margin. Harjoto and Jo (2011) find that both internal and external corporate governance, including board independence, institutional ownership and anti-takeover provisions, positively influences firm value. In an academic study that compares the governance of foreign firms and similar US firms, Aggarwal et al. (2007) find that among all the individual governance indexes, the firms with effective board and audit committee independence are usually valued more. However, other attributes such as the separation of the chairman of the board and of the CEO functions, are not associated with higher shareholder wealth as the market usually regard.

The mixed relationship demonstrated by these academic studies seem to support managers' concern about the uncertainty of sustainable-related investments. According to a CFA Institute Sustainability Survey<sup>3</sup>, it is found that sustainability is perceived to be very important by CEOs, with 93% believe that sustainability will be important to the future success of the business and 80% view sustainability as a route to competitive advantage in their industry. However, managers also find sustainability difficult to implement and quantify, with 37% see the lack of a link to business value as a barrier to accelerating progress.

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<sup>2</sup> For an insightful analysis of this trend, please see "A Tale of Values-Driven and Profit-Seeking Social Investors." by Jeroen Derwall et al.

<sup>3</sup> For more details of the report, please see: [https://www.cfainstitute.org/learning/future/Documents/ESG\\_Survey\\_Report\\_July\\_2017.pdf](https://www.cfainstitute.org/learning/future/Documents/ESG_Survey_Report_July_2017.pdf)

Therefore based on these two perspectives, this research further studies the company managers' incentive to invest in sustainability, and argues that for most companies, their incentive to invest in sustainability can be categorized in four perspectives— creating healthy corporate reputation, adopting a more long-term perspective, supporting insider philanthropy, and promoting added-value brand creation and preservation.

Investing in sustainability is a risk-free way to create healthy reputation and promote corporate image. Many sustainable initiatives help companies to conform to environmental regulations and acquire a competitive advantage on international markets with good reputation (Nenci, 2015). Instead of investing millions of dollars in temporary marketing campaign to build up the corporate image, more and more companies are taking the sustainable actions to strengthen the corporate reputation and demonstrate their sustainable efforts to all the potential stakeholders.

Firm's adoption of a more long-term perspective is also another great motivation for the pursuit of corporate sustainability. By engaging in sustainable behavior, the company has the great potential to “avoid risk of future lawsuits, consumer boycotts and environmental clean-up costs”, and also would be “eligible for tax-deductible contributions” (Tirole, 2010, p.2). It also helps in “assessing the capabilities and effectiveness of business administration and management” and leading to shift the organizational focus from short-term to long-term goals (Aggarwal, 2013). Company's cleaner production initiatives usually get the paybacks in 3 to 24 months because process restructuring not only reduces pollution but also improve manufacturing costs as well (Nenci, 2015). The sustainable actions are commonly believed to be able to produce long-term cost-saving and process-improving effects for the companies.

Besides the economic reasons as stated as the first two reasons, managements' or the board members' own desires to engage in philanthropy is another big reason for company to invest in sustainability. Employees also regard firm as a channel for the expression of their



positive citizen values (Tirole, 2010). Many companies also regard sustainable actions as a method to give back a certain portion of what they have earned from the society.

In today's dynamic business environment, implementing sustainability strategy is believed to lay a solid foundation for creating and enhancing different perspectives of brand value. Various benefits of corporate sustainability can be mostly categorized into two major groups: value preservation and value creation (Aggarwal, 2013). Under the category of value preservation, the most fundamental benefit comes from the company's progress in compliance with regulations, industry standards and NGO concerns, and it has the great potential to bring in more active engagement and relations of stakeholders from the industry and even from different industries in the society to form a stronger sustainable alliance. These two factors will collectively strengthen the company's risk avoidance of boycotts, negative press and activist shareholder resolutions, which is easy to ignore but actually of great significance when putting it as a key branding event in the long life of a well-established company. Another important internal effect is within a more sustainable corporate governance structure considering the improvement in the factors including CEO duality, size of the board, percentage of female executives, percentage of independent directors on audit committee, board of directors age range, etc. The external benefits are usually more obvious from the perspective of customers, employees and business partners. The label of sustainable company usually charges a higher customer loyalty price premium on the market, and the customers are more willing to pay for that according to a research by Ping Wang regarding the factors influencing sustainable consumption behaviors (Wang et al., 2014). The customers have great interest to pay for that and so are the employees. It is found that the employees has a significantly improved morale and loyalty, and more positive feedback in terms of retention and recruitment regarding a self-labeled sustainable company. Both the external and internal effects are tend to bring cost-effective benefits to the company in the long-run even though the short-term

economic loss usually dominates, due to the higher spending and more sophisticated production on green ingredients and environmental-friendly raw material.

Although the value preservation benefits seem to be really promising, it is relatively conservative compared to the potential value creation benefits. The transformation to sustainable company equips the corporate with a greener global story to tell, which brings the corporate greater potential to attract more new customer access and act as the advantage to enter exciting new market with new environmental-friendly product portfolios. The license to operate under certain requirements will also a great plus for the corporate to start new and related business, and the contribution to the social responsibility will help the corporate to stand out and excel among the traditional peers and homogenous competitors. It also attracts more capital in favor of sustainability investment and impact business, and therefore increasing the chances of access to a better capital allocation. Last but not least, all these external benefits will collectively strengthen and build up the sustainable positioning of the brand image and company reputation, which ranks as the most important element for the companies to survive in today's global market and competitive battlefield.

The global trend seems very promising for sustainable companies, and China has also strived to pursue the follow the grand trend. Over the past ten years, China has prioritized sustainable finance policies in order to prevent and control pollution via the banking sector (Nabili, 2017). The world is expecting China to take a leadership role on a greener path towards sustainable finance. However, have Chinese green finance policies actually led to improved financial performance regarding environmental issues? Four years ago, China Banking Regulatory Commission published Green Credit Guidelines, which requires banks to measure and control environmental and social risks of their lending, such as pollution, energy consumption, and even climate change, including multinational corporations outside the nation's border. Domestically, the Green Credit Guidelines has effectively contributed to

prevent and control pollution risks. By working with local environmental bureaus, banks have developed “credit blacklists” for chronic polluters and green credit schemes to funnel financing towards low carbon rather than high carbon industries (Wang and Li, 2016). Besides the sustainable finance policy from China’s political perspective, it is also insightful to analyze how Chinese business industry try to initiate and implement their sustainable finance strategies. The Green Digital Finance Alliance is the latest step in China’s sustainability journey, a unique experiment in financial technology geared towards environmental goals and the first global public-private partnership to be co-founded by a Chinese finance company – Ant Financial, which is a Chinese platform with around 450 million active users handling 58 percent of payments in China’s burgeoning e-commerce industry (Nabili, 2017). Ant as a new app calculates each user’s carbon footprint by a personalized measure, and rewards them by promising to plant trees in Mongolia. And within three months of the app’s launch, the active app members have obligated Ant to plant a million and a half trees across the country (Nabili, 2017). Therefore, we can see that both China’s government and business industry have launched their first steps to improve financial service performance regarding environmental and social responsibilities. And in this research project, hypotheses about the ESG score and profitability will be further examined through Chinese companies to analyze whether sustainability has the potential to influence corporate financial performance and to evaluate the most important sustainability factor.

### **Research Methodology**

This research mainly focuses on regression models to map the potential relationship between sustainability and profitability, and also applies classification and regression tree(CART) model to determine the most important factors that have relatively strong impact on corporations’ financial performance. The measure of corporations’ financial performance

is divided into market-based financial performance and accounting-based performance<sup>4</sup>: market-based performance “represent the net cash flows that accrue to shareholders, with the forward-looking economic effect that reflects the market’s perception of both potential and current profitability”; by contrast, accounting-based performance profits can “differ from economic profits as a result of timing issues, adjustments for depreciation, choice of accounting method, and measurement error” and it usually reflects “an historical perspective”(Fulton et al., 2012, p.52).

Furthermore, this research is divided into two sections to examine first whether there is a potential linkage between corporate sustainability and financial performance, and which ESG index might have the biggest potential to influence the financial performance.

In the first part of this section, this paper examines, through linear regressions, the relation between corporates’ financial and market-based measures and corporates’ ESG disclosure scores, including overall ESG disclosure score, and respective score in terms of Environmental, Social and Governance performance. The financial measures are operating margin and enterprise value compound annual growth rate(CAGR), and the market-based measure is Tobin’s Q.

In the second section, this paper further studies the relationship of the corporates’ financial performance and detailed disclosure score of each ESG category breakdown to further discover the most important factors and how they influence the corporate sustainability performance. Among the wide range of 208 ESG disclosure categories, 78 categories are chosen to perform the data analysis including energy intensity per EBITDA, percentage of women in workforce and percentage of Independent Directors on Audit Committee, in order to map the most representative and reasonable indexes that have the potential to influence corporates’ financial performance.

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<sup>4</sup> The methodology is inspired by the model applied in Mark Fulton, Bruce Kahn and Camilla Sharples’s research “Sustainable Investing: Establishing Long-Term Value and Performance” (June 12, 2012).

There are two main data sources. Operational risk events come from the Reprisk database<sup>5</sup>. Financial statement data (including operating margin, ESG disclosure score, ESG ratio, etc.) come from Bloomberg. Both are used to test the hypothesis and discover the potential relationship between corporate sustainability and financial performance. There are 10 year observations in our data, from 2007 to 2016.

#### a) Sample Company Selection

The preliminary sample comprises a panel of 7,560 firm-year Reprisk observations from 770 Chinese companies during the period 2007–2016. Each risk event in the Reprisk database indicates that the company was involved in a specific ESG violation during the period covered. Most of these companies are in the China Fortune 500. We want a sample of companies with a high number of violations to test the effects of the self-reported ESG scores into the companies' performance. The companies with the count of Reprisk observations less than ten (over the period of ten years from FY 2007 to FY 2016, on average Reprisk data less than one each year) are taken out to ensure the neutrality of the data analysis. For those firms that meet our criteria we include in our sample all years with available data between 2007 and 2016, even if the firm is not in the China Fortune 500 list in a particular year.

*The following criteria have been used to select companies eligible to be included in sample:*

- Chinese companies included in Reprisk data (involved in any ESG violation) from 2007 January to 2016 June = 770
- Less: Companies with the count of Reprisk data (over the period of ten years from FY 2007 to FY 2016) smaller than 10 (On average, Reprisk data less than one each year) = 648

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<sup>5</sup> Reprisk data refers to company's business due diligence data if it is involved in any issue related to ESG violation

- Less: Companies whose financial statement data (including operating margin, ESG disclosure score, ESG ratio, etc.) is not available = 28
- Less: Financial companies (these companies usually have immaterial effect on environment) = 22 (The regression results of all the companies including financial companies are shown in Appendix II & III)
- Total companies eligible for sample = 70 (the sample company list is attached in the notes of the Appendix I)

## b) Measurement of Variables

### 1. Financial Performance

- Accounting-based
  - Operating Margin<sup>6</sup>

Operating margin is a margin ratio used to measure a company's operating efficiency, specifically what proportion of a company's revenue is left over after paying for variable costs of production such as wages, raw materials, etc. In this research, it is calculated by dividing a company's operating income during a given period by its net sales during the same period. "Operating income" here refers to the profit that a company retains after removing operating expenses and depreciation. "Net sales" here refers to the total value of sales minus the value of returned goods, allowances for damaged and missing goods, and discount sales.

- Compound Annual Growth Rate(CAGR)

The compound annual growth rate (CAGR) is the mean annual growth rate of the corporate value over a specified period of time longer than one year. In this research, it is calculated by dividing a company's enterprise value at the end of

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<sup>6</sup> Sources: Investopedia

the period from Bloomberg database by its enterprise value at the beginning of that period, raise the result to the power of one divided by the period length, and subtract one from the subsequent result.

- Market-based
  - Tobin's q<sup>7</sup>

Tobin's q is measured as the ratio of the firm's market value to total assets. The firm's market value is the value of common equity plus total assets minus the book value of common equity. A low Q (between 0 and 1) means that the cost to replace a firm's assets is greater than the value of its stock. This implies that the stock is undervalued. Conversely, a high Q (greater than 1) implies that a firm's stock is more expensive than the replacement cost of its assets, which implies that the stock is overvalued.

## 2. Sustainability Measures

- ESG Disclosure Score

ESG Disclosure Scores is collected from Bloomberg database with more than 120 sustainability indicators for publicly-listed company within the categories of Environmental, Social and Governance. It is mainly analyzed based on the companies' disclosure of quantitative and policy-related ESG data and information. In this research both the overall ESG Disclosure Score and specified indicators will be examined and analyzed. In the data analysis part of this research, 78 out of 120 ESG indicators are chosen to be tested and analyzed based on the criteria of 40% of factor percentage measure, 40% of binary outcome and 20% of absolute value. The list of all the ESG indicators examined in this research is shown in Table 2 below:

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<sup>7</sup> Sources: Investopedia

	<b>ESG Disclosure Score</b>	Ye 16
<b>Environmental</b>	<b>Social</b>	<b>Governance</b>
Energy Intensity per Sales	Number of Employees	Size of the Board
Energy Intensity per EBITDA	% Employees Unionized	Unitary or Two Tier Board System
Energy Intensity per Employee	% Women in Workforce	# Employee Rep on Board
Energy Intensity per Assets	% Minorities in Workforce	Classified Board System
NOx Intensity per Power Generated	Social Supply Chain Management	Board Duration (Years)
NOx Emissions per Sales	Fatalities - Contractors	# Board Meetings
SO2/SOx Intensity per Power Generated	Fatalities - Employees	Board Mtg Attendance
SOx Emissions per Sales	Fatalities - Total	%Non-Executi Dir on Board
Renewable Energy Use	Gender Pay Gap Breakout	% Independent Directors
Self-generated Renewable Electricity	Fatalities per 1000 employees	% Women on Board
Investments in Operational Sustainability	Accidents per 1000 employees	Percentage of Female Executives
Renewable Electricity Target Policy	Sustainable Invt/CapEx	Board of Directors Age Range
Energy Efficiency Policy	Community Spend % PTP	Board Average Age
Emissions Reduction Initiatives	Community Spend% EBITDA	Board Meeting Attendance %
Environ Supply Chain Management	Community Spend% Equity	Ind Dire Board Meeting Atten %
Green Building Policy	Training Spending per Employee	% of Ind Dire on Audit Committee
Waste Reduction Policy	R&D Expenditures per Cash Flow	Audit Com Meeting Attendance %
Water Policy	Actual Net Income per Employee	% of Ind Dire on Compen. Com
Sustainable Packaging	Actual Cash Flow per Employee	Compensation Meeting Atten%
EnvironQuality Management Policy	Actual Personnel Exp per Employee	% of Ind Dire Nomination Com
Climate Change Opportunities Discussed	Health and Safety Policy	Age of the Youngest Director
Risks of Climate Change Discussed	Fair Remuneration Policy	Age of the Oldest Director
Climate Change Policy	Training Policy	Board of Directors Age Range
New Products - Climate Change	Employee CSR Training	Board Average Age
Biodiversity Policy	Equal Opportunity Policy	CEO Duality
Verification Type	Human Rights Policy	Independent Chairperson

*Table 2*

### **Hypotheses**

Based on the theoretical arguments about corporate sustainability and keeping the study objectives in mind, the following six hypotheses will be further examined through Chinese companies as shown in Table 1.



No.	Hypotheses
1	Ho1: Company's environment-related score has no impact on its accounting-based financial performance. Ha1: Company's environment-related score has an impact on its accounting-based financial performance.
2	Ho2: Company's society-related score has no impact on its accounting-based financial performance. Ha2: Company's society-related score has an impact on its accounting-based financial performance.
3	Ho3: Company's governance-related score has no impact on its accounting-based financial performance. Ha3: Company's governance-related score has an impact on its accounting-based financial performance.
4	Ho4: Company's environment-related score has no impact on its market-based financial performance. Ha4: Company's environment-related score has an impact on its market-based financial performance.
5	Ho5: Company's society-related score has no impact on its market-based financial performance. Ha5: Company's society-related score has an impact on its market-based financial performance.
6	Ho6: Company's governance-related score has no impact on its market-based financial performance. Ha6: Company's governance-related score has an impact on its market-based financial performance.

*Table 1. Hypotheses*

### **Data Analysis and Empirical Results**

The model applying Multiple Regression and Classification and Regression Tree(CART) as statistical tools in R will be tested in this research. The result will help to examine and quantify the relationship between corporate sustainability disclosure and profitability.

The first model aims to examine the impact of overall ESG disclosure score and respective ones on the operating profitability of the company (dependent variable). The regression equation will be tested in this model:

$$\text{Operating Margin} = c + b_1. \text{ ESG} + b_2. \text{ Total Asset} + b_3. \text{ Leverage Ratio}$$

$$\text{Operating Margin} = c + b_1. \text{ Environmental} + b_2. \text{ Social} + b_3. \text{ Governance} + b_4. \text{ Total Asset} + b_5. \text{ Leverage Ratio}$$

The second model aims to examine the impact of respective Environmental, Social, Governance disclosure score (independent variable) on company's valuation-related and

growth-related financial measures (dependent variable). The regression equation will be tested in this model:

$$\text{Tobin's } q = c + b_1. \text{ Environmental} + b_2. \text{ Social} + b_3. \text{ Governance} + b_4. \text{ ROCE} + b_5. \text{ CAGR}$$

$$\text{CAGR} = c + b_1. \text{ Environmental} + b_2. \text{ Social} + b_3. \text{ Governance} + b_4. \text{ Leverage Ratio} + b_5. \text{ Total Asset}$$

The third model applies the CART method and uses a tree structure to implement the analysis across the 78 ESG indicators, and classify the data into a decision tree model with pure leafs to examine and analyze the most important sustainability factors that have potential impact on the corporate profitability. In this research, the CART tree with pure leafs is selected in order to ensure minimize the squared losses.

- First Model Results:

For Non-financial Companies:

$$\text{Operating Margin} = c + b_1. \text{ ESG} + b_2. \text{ Total Asset} + b_3. \text{ Leverage Ratio}$$

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>ESG</b>	0.0618	0.718			
<b>Leverage Ratio</b>	-2.415	0.334	0.178	0.066	1.891
<b>Total Asset</b>	0.000	0.013*			
<b>Intercept</b>	0.221	0.019			

$$\text{Operating Margin} = c + b_1. \text{ Environmental} + b_2. \text{ Social} + b_3. \text{ Governance} + b_4. \text{ Total Asset} + b_5. \text{ Leverage Ratio}$$

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>Environment</b>	-0.081	0.734			
<b>Society</b>	0.285	0.123			
<b>Governance</b>	-0.265	0.319	0.060	-0.015	0.800
<b>Leverage Ratio</b>	-1.629	0.518			
<b>Total Asset</b>	0.000	0.922			
<b>Intercept</b>	0.243	0.034			

*Tobin's q = c + b<sub>1</sub>. Environmental + b<sub>2</sub>. Social + b<sub>3</sub>. Governance + b<sub>4</sub>. ROCE + b<sub>5</sub>. CAGR*

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>Environment</b>	0.008	0.000***			
<b>Society</b>	-0.004	0.007**			
<b>Governance</b>	-0.006	0.011*	0.289	0.230	4.884
<b>ROCE</b>	0.000	0.900			
<b>CAGR</b>	0.016	0.625			
<b>Intercept</b>	1.133	0.000***			

*CAGR = c + b<sub>1</sub>. Environmental + b<sub>2</sub>. Social + b<sub>3</sub>. Governance + b<sub>4</sub>. Leverage Ratio + b<sub>5</sub>. Total Asset*

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>Environment</b>	0.001	0.892			
<b>Society</b>	-0.001	0.916			
<b>Governance</b>	-0.001	0.908	0.026	-0.054	0.321
<b>Leverage Ratio</b>	-0.002	0.784			
<b>Total Asset</b>	0.000	0.222			
<b>Intercept</b>	-0.287	0.464			

For Manufacturing-only Companies:

*Operating Margin = c + b<sub>1</sub>. ESG + b<sub>2</sub>. Total Asset + b<sub>3</sub>. Leverage Ratio*

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>ESG</b>	0.131	0.500			
<b>Leverage Ratio</b>	-0.827	0.765	0.017	-0.057	0.226
<b>Total Asset</b>	0.000	0.976			
<b>Intercept</b>	0.112	0.173			

*Operating Margin* =  $c + b_1 \cdot \text{Environmental} + b_2 \cdot \text{Social} + b_3 \cdot \text{Governance} + b_4 \cdot \text{Total Asset} + b_5 \cdot \text{Leverage Ratio}$

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>Environment</b>	-0.298	0.276			
<b>Society</b>	0.520	0.025			
<b>Governance</b>	-0.146	0.660	0.133	0.019	1.167
<b>Leverage Ratio</b>	0.001	0.996			
<b>Total Asset</b>	0.000	0.996			
<b>Intercept</b>	0.132	0.372			

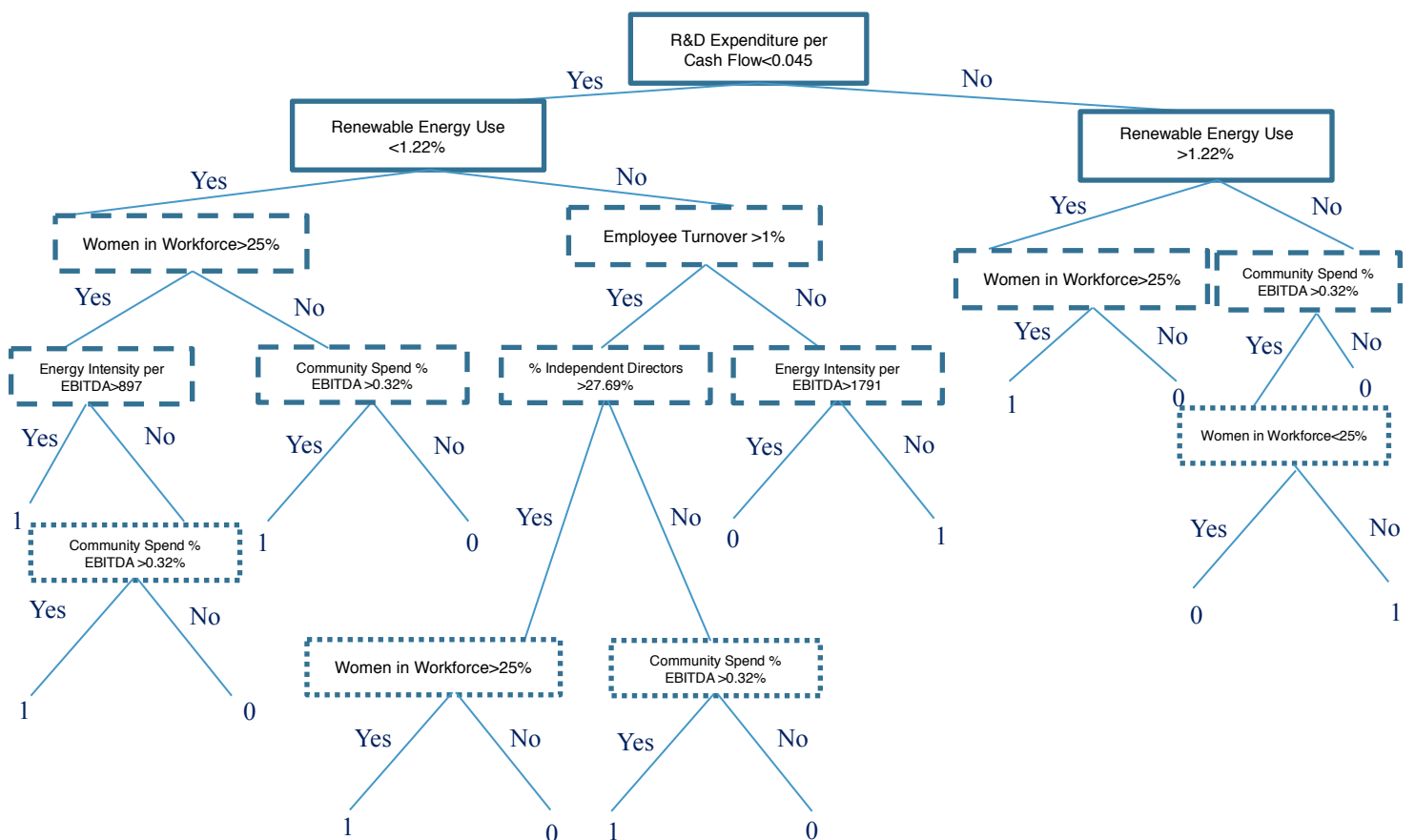
*Tobin's q* =  $c + b_1 \cdot \text{Environmental} + b_2 \cdot \text{Social} + b_3 \cdot \text{Governance} + b_4 \cdot \text{ROCE} + b_5 \cdot \text{CAGR}$

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>Environment</b>	0.008	0.002**			
<b>Society</b>	-0.005	0.012**			
<b>Governance</b>	-0.007	0.034*	0.299	0.207	3.238
<b>ROCE</b>	0.000	0.858			
<b>CAGR</b>	0.036	0.431			
<b>Intercept</b>	1.206	0.000***			

*CAGR* =  $c + b_1 \cdot \text{Environmental} + b_2 \cdot \text{Social} + b_3 \cdot \text{Governance} + b_4 \cdot \text{Leverage Ratio} + b_5 \cdot \text{Total Asset}$

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>Environment</b>	-0.001	0.866			
<b>Society</b>	0.008	0.286			
<b>Governance</b>	0.008	0.486	0.091	-0.029	0.760
<b>Leverage Ratio</b>	-0.001	0.886			
<b>Total Asset</b>	0.000	0.405			
<b>Intercept</b>	-0.960	0.070			

- In this CART method to examine the most important sustainability factors that have potential impact on the corporate profitability, 1 indicates positive CAGR and 0 indicates negative CAGR.
  - In this CART regression tree, this research makes splits to minimize the squared losses. The nodes close to the root (for example R&D Expenditure per Cash Flow<0.045) are the most important factors, and the nodes near the leaves are secondary factors that affects the result. The tree shown below has the accuracy level of 70.6%.



### **Conclusions and Implications**

From the first model, it is observed for non-financial companies, the Social disclosure score has positive but insignificant impact on accounting-based financial performance of company, while the company's Environmental and Governance disclosure scores have negative and insignificant impact on accounting-based financial performance of the company. Hence, the first three alternate hypotheses are rejected. It is also observed that for non-financial companies, Environment disclosure score has highly significant positive relationship with company's market-based financial performance and Social and Governance disclosure score have significant negative relationship with company's market-based financial performance. Hence, the last three alternative hypotheses are accepted. Therefore, the company's Environmental sustainability disclosure has positive and significant impact on the stock valuation of the company in the direction of overvalue, while the company's Social and Governance sustainability disclosures have negative and significant impact on stock valuation of the company in the direction of undervalue. It also backs up the analysis in this research's theoretical part about the strong impact of corporates' environmental sustainability on consumers and clients' perception of the company and usually leads to higher valuation of the corporate.

<i>Hypothesis(Alternative)</i>	<i>Accept/Reject</i>
<i>Ha1</i>	<i>Reject</i>
<i>Ha2</i>	<i>Reject</i>
<i>Ha3</i>	<i>Reject</i>
<i>Ha4</i>	<i>Accept</i>
<i>Ha5</i>	<i>Accept</i>
<i>Ha6</i>	<i>Accept</i>

For Manufacturing companies specifically, the outcome turns out to be similar to the general trend of different industries. The manufacturing company's Environmental and Governance disclosure scores have negative and insignificant impact on financial performance of the company. Hence, the first three alternate hypotheses are rejected. It is also observed that for manufacturing companies, Environment disclosure score has significant positive

relationship with company's market-based financial performance and Social and Governance disclosure score have significant negative relationship with company's market-based financial performance. As it is also observed by Fulton et al. in their research<sup>8</sup>, the environmental factor of ESG is expected to offer greatest stock return for investors via first mover advantages, because company's early realization of the materiality behind environmental concerns over climate change, carbon regulation, and energy efficiency will help the investors transform environmental requirements into great opportunities (2013), which also verifies the result that Environment contributes more to the market-based financial performance relative to the accounting one. For the Governance and Social factors, their negative relationship with the market-based financial performance might either suggest that the result contradicts the argument that "the alpha generated from these factors may already be priced into the market due to its relatively early integration into mainstream investing"(Fulton, 2013, p.34), or subject to the time limitation which fails to capture the long-term relationship.

The third model constructs the decision tree model to discover the most important indicators within the 78 categories and ranks the "R&D Expenditure per Cash Flow" as the most important one, followed by "Renewable Energy Use", "Percentage of Women in Workforce" and "Employee Turnover Rate". These factors are found to be the ones that have the potential to drive strong impact on the corporates' financial performance.

From the data we can observe that corporates' investment in sustainability does not have significant influence on the corporates' accounting-based financial performance but have some impact on the company's market-based financial performance. From the results of these two models, this research can not discard that these companies do not precisely report sustainability indexes and conduct greenwashing. From the CART model analysis, two of the most important indexes are "R&D Expenditure per Cash Flow" and "Renewable Energy

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<sup>8</sup> Fulton et al. reached this conclusion after examining 56 research papers, 2 literature reviews and 4 meta studies

Use”, which should have direct impact on the company’s operating efficiency. And if these companies report their ESG performance precisely, high sustainability investment should have an impact on their operating efficiency, but the regression model shows no significant association between company’s sustainability disclosure score and their accounting-based financial performance. Therefore this research finds a very weak evidence that these Chinese non-financial companies take corporate sustainability seriously. This research can not discard that these companies conduct greenwashing, in order to deceptively meet stakeholders’ demand for goods and services as environmentally friendly, socially sustainable and with good governance standing. As also discussed in Laufer’s paper that many companies use greenwashing as a way to repair and rebuild the brand perception, and therefore the companies set up the corporate sustainability disclosure in order to maximize the perceptions of legitimacy (Deegan, 2002). In addition, more and more social and environmental accounting research discovers that without external monitoring and adequate verification, these greenwashing intentions can be regarded as corporate posturing (Laufer, 2003). And the biggest risk of this trend is that it might lead to consumers and stakeholders’ suspicion about all the green claims and announcements, and undermines the market force in driving companies towards more sustainable business operations.

### **Limitations**

This research is subject to some limitations. Firstly, the sample size is relatively small (i.e. 70 non-financial companies). Secondly, although the time frame of the companies is across 10 years, the Reprisk data is not fairly distributed because of all kinds of reasons such as absence of credible data, operational changes of the company during the time span, and so on. Lastly, the research does not take into account the control variables such as the growth stage of the companies, the capital intensity, etc. which might have non-negligible influence on the relationship of corporate sustainability and financial performance.



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**Appendix I. Sample Company List**

<b>No.</b>	<b>Company Name</b>	<b>Reprisk#</b>
1	China Petroleum & Chemical Corp (SINOPEC Group)	319
2	PetroChina Co Ltd	300
3	ZTE Corp	78
4	Zijin Mining Group Co Ltd	72
5	China North Industries Corporation (Norinco)	57
6	Aluminum Corporation of China (CHINALCO)	54
7	China Railway Construction Corporation Limited (CRCC)	53
8	WH Group Limited (formerly Shuanghui International Holdings Ltd)	44
9	China Southern Airlines Co Ltd	39
10	China Gezhouba Group Co Ltd (CGGC)	35
11	Baosteel Group Corporation (Baosteel Group)	34
12	China Mengniu Dairy Co Ltd	33
13	China Shenhua Energy Co Ltd	31
14	Alibaba Group Holding Ltd	31
15	Air China Ltd	31
16	China Telecom Corp Ltd	31
17	China Railway Group Ltd	30
18	Datang International Power Generation Co Ltd	30
19	China United Network Communications Group Co Ltd	30
20	China Eastern Air Holding Co	28
21	China Nonferrous Metal Mining (Group) Co Ltd (CNMC)	27
22	Suntech Power Holdings Co Ltd	27
23	China Communications Construction Co Ltd (CCCC)	27
24	Baidu Inc	25
25	Yunnan Baiyao Group Co Ltd	24
26	Tencent Holdings Ltd	23
27	Li Ning Co Ltd	20
28	Tongling Nonferrous Metals Group Co Ltd (Tongling)	20
29	Dongfang Electric Corp Ltd (DEC Ltd)	20
30	Dongfeng Motor Group Co Ltd	18
31	GOME Electrical Appliances Holdings Ltd	18
32	China State Construction Engineering Corp (CSCEC)	18
33	China COSCO Holdings Co Ltd	17
34	China National Gold Group Corporation (CNGG)	17
35	Inner Mongolia Yili Industrial Group Co Ltd	17
36	BYD Co Ltd	17
37	China Coal Energy Co Ltd	17
38	Trina Solar Ltd	16
39	Yunnan Yuntou Ecology and Environment Technology (formerly known as Yunnan Green-Land Biological Technology Co Ltd)	16

40	Wuliangye Yibin Co Ltd	15
41	Sinovel Wind Group Co Ltd	15
42	JD.com Inc (formerly 360buy Jingdong Mall)	15
43	Yanzhou Coal Mining Co Ltd	14
44	Maanshan Iron & Steel Co Ltd (Masteel)	14
45	Kweichow Moutai Co Ltd	14
46	Shandong Chenming Paper Holdings Ltd	14
47	Tianhe Chemicals Group	14
48	Harbin Pharmaceutical Group Co Ltd (Hayao Group)	14
49	Wuhan Iron & Steel Co Ltd	13
50	Country Garden Holdings Co Ltd	13
51	Foshan Electrical & Lighting Co Ltd	13
52	China Poly Group Corporation	13
53	Shanghai Metersbonwe Fashion & Accessories Co Ltd	13
54	Guangzhou Automobile Group Co Ltd (GAC Group)	12
55	China National Building Materials Group Corporation (CNBM)	12
56	Yingli Green Energy Holding Co Ltd	12
57	Huaneng Power International Inc	12
58	China Vanke Co Ltd	12
59	Great Wall Motor Co Ltd	12
60	China Modern Dairy Holdings Ltd	12
61	Nanjing Textiles Import & Export Corp Ltd	12
62	Sinopec Shanghai Petrochemical Co Ltd	11
63	United Laboratories International Holdings Limited	11
64	NVC Lighting Holding Ltd	11
65	Shanghai Pharmaceuticals Holding Co Ltd	11
66	Hontex International Holdings Co Ltd	11
67	TCL Corp	11
68	Tingyi Cayman Islands Holding	11
69	Shenzhen Noposion Agrochemical Co Ltd (Noposion Corp)	11
70	Huadian Power International Co Ltd	10

**Appendix II. Full Company List (including financial companies)**

<b>No.</b>	<b>Company Name</b>	<b>Reprisk#</b>
1	China National Petroleum Corporation (CNPC)	523
2	China Petroleum & Chemical Corp (SINOPEC Group)	319
3	PetroChina Co Ltd	300
4	China National Offshore Oil Corporation (CNOOC)	173
5	Industrial and Commercial Bank of China (ICBC)	165
6	Bank of China Ltd	134
7	Sinohydro Corp (China Hydraulic and Hydroelectric Construction Group Corp)	133
8	Export-Import Bank of China (China Eximbank)	89
9	Agricultural Bank of China (ABC)	89
10	ZTE Corp	78
11	China Construction Bank Corp (CCB)	75
12	China Development Bank (CDB)	75
13	Zijin Mining Group Co Ltd	72
14	China North Industries Corporation (Norinco)	57
15	Aluminum Corporation of China (CHINALCO)	54
16	China Railway Construction Corporation Limited (CRCC)	53
17	WH Group Limited (formerly Shuanghui International Holdings Ltd)	44
18	Dongfeng Motor Corporation	43
19	Bank of Communications Co Ltd (BoCom; BoComm)	40
20	China Southern Airlines Co Ltd	39
21	CITIC Securities Co Ltd	37
22	Ping An Insurance (Ping An Group) Co of China Ltd	36
23	China Gezhouba Group Co Ltd (CGGC)	35
24	Baosteel Group Corporation (Baosteel Group)	34
25	China Mengniu Dairy Co Ltd	33
26	China Shenhua Energy Co Ltd	31
27	Alibaba Group Holding Ltd	31
28	Air China Ltd	31
29	China Telecom Corp Ltd	31
30	China Railway Group Ltd	30
31	Datang International Power Generation Co Ltd	30
32	China United Network Communications Group Co Ltd (China Unicom)	30
33	China Eastern Air Holding Co	28
34	China Nonferrous Metal Mining (Group) Co Ltd (CNMC)	27
35	Suntech Power Holdings Co Ltd	27
36	China Communications Construction Co Ltd (CCCC)	27
37	Everbright Securities Co Ltd	25
38	Baidu Inc	25
39	Yunnan Baiyao Group Co Ltd	24
40	Tencent Holdings Ltd	23
41	China Merchants Bank Co Ltd	23

42	China Minsheng Banking Corp Ltd (CMBC)	23
43	China CITIC Bank Corporation Ltd	22
44	China Eastern Airlines Corp Ltd	21
45	Li Ning Co Ltd	20
46	China Life Insurance Co Ltd	20
47	Tongling Nonferrous Metals Group Co Ltd (Tongling)	20
48	Dongfang Electric Corp Ltd (DEC Ltd)	20
49	Dongfeng Motor Group Co Ltd	18
50	GOME Electrical Appliances Holdings Ltd	18
51	China State Construction Engineering Corp (CSCEC)	18
52	China COSCO Holdings Co Ltd	17
53	China National Gold Group Corporation (CNGG)	17
54	Inner Mongolia Yili Industrial Group Co Ltd	17
55	BYD Co Ltd	17
56	China Coal Energy Co Ltd	17
57	Trina Solar Ltd	16
58	Yunnan Yuntou Ecology and Environment Technology (formerly known as Yunnan Green-Land Biological Technology Co Ltd)	16
59	Wuliangye Yibin Co Ltd	15
60	Sinovel Wind Group Co Ltd	15
61	Hua Xia Bank Co Ltd (Huaxia Bank)	15
62	JD.com Inc (formerly 360buy Jingdong Mall)	15
63	Yanzhou Coal Mining Co Ltd	14
64	Maanshan Iron & Steel Co Ltd (Masteel)	14
65	Kweichow Moutai Co Ltd	14
66	Haitong Securities Co Ltd	14
67	Shandong Chenming Paper Holdings Ltd	14
68	Tianhe Chemicals Group	14
69	China Everbright Bank Co Ltd	14
70	Harbin Pharmaceutical Group Co Ltd (Hayao Group)	14
71	Industrial Bank Co Ltd	13
72	Wuhan Iron & Steel Co Ltd	13
73	Country Garden Holdings Co Ltd	13
74	Foshan Electrical & Lighting Co Ltd	13
75	China Poly Group Corporation	13
76	Shanghai Metersbonwe Fashion & Accessories Co Ltd	13
77	Guangzhou Automobile Group Co Ltd (GAC Group)	12
78	China National Building Materials Group Corporation (CNBM)	12
79	Yingli Green Energy Holding Co Ltd	12
80	Huaneng Power International Inc	12
81	China Vanke Co Ltd	12
82	Great Wall Motor Co Ltd	12
83	China Modern Dairy Holdings Ltd	12
84	Nanjing Textiles Import & Export Corp Ltd	12
85	Shanghai Pudong Development Bank Co Ltd	12
86	Sinopec Shanghai Petrochemical Co Ltd	11

87	United Laboratories International Holdings Limited	11
88	NVC Lighting Holding Ltd	11
89	Shanghai Pharmaceuticals Holding Co Ltd	11
90	Hontex International Holdings Co Ltd	11
91	TCL Corp	11
92	Tingyi Cayman Islands Holding Corp (Master Kong Holdings Co Ltd)	11
93	Shenzhen Noposion Agrochemical Co Ltd (Noposion Corp)	11
94	Huadian Power International Co Ltd	10



**Appendix III. Full Company List Regression Results (including financial companies)**

Regression results are shown below including financial companies:

$$\text{Operating Margin} = c + b_1. \text{ ESG} + b_2. \text{ Total Asset} + b_3. \text{ Leverage Ratio}$$

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>ESG</b>	0.04085	0.8747			
<b>Leverage Ratio</b>	-3.79	0.0764	0.1135	0.06605	2.391
<b>Total Asset</b>	0.00000298	0.0116*			
<b>Intercept</b>	0.2208	0.0179*			

$$\text{Operating Margin} = c + b_1. \text{ Environmental} + b_2. \text{ Social} + b_3. \text{ Governance} + b_4. \text{ Total Asset} + b_5. \text{ Leverage Ratio}$$

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>Environment</b>	-0.4711	0.14948			
<b>Society</b>	0.291	0.28648			
<b>Governance</b>	-0.0044	0.98720	0.05152	-0.05386	0.4889
<b>Leverage Ratio</b>	-4.033	0.06007			
<b>Total Asset</b>	0.00000304	0.00834			
<b>Intercept</b>	0.2332	0.03058			

*Tobin's q* =  $c + b_1. Environmental + b_2. Social + b_3. Governance + b_4. ROCE + b_5. CAGR$

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>Environment</b>	0.011204	0.000349***			
<b>Society</b>	-0.007167	0.004696**			
<b>Governance</b>	-0.004815	0.048871*	0.2919	0.2251	4.37
<b>ROCE</b>	-0.001804	0.403156			
<b>CAGR</b>	-0.053288	0.045205			
<b>Intercept</b>	1.1275	0.03058***			

*CAGR* =  $c + b_1. Environmental + b_2. Social + b_3. Governance + b_4. Leverage Ratio + b_5. Total Asset$

	<b>Beta Coefficient</b>	<b>p-value</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-statistic</b>
<b>Environment</b>	0.01873	0.0843			
<b>Society</b>	-0.01726	0.0555`			
<b>Governance</b>	-0.001422	0.8742	0.09842	0.01494	1.179
<b>Leverage Ratio</b>	-0.004887	0.9434			
<b>Total Asset</b>	0.00000282	0.09434			
<b>Intercept</b>	0.01865	0.9568			