

Investigating the impact of environmental indicators on the traditional financial performance of manufacturing companies

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Abstract

The purpose of this study is to investigate the impact of environmental indicators on the traditional financial performance of manufacturing companies admitted on the Tehran Stock Exchange. Today, many companies are facing environmental issues and are looking for a suitable way to report and disclose information to the public to assure the shareholders of the company's compliance with environmental issues and environmental protection. This research measures environmental indicators from the components of pollution control, prevention of environmental damage, research and development, conservation of natural resources and environmental policy, as well as the variables of return on equity, return on sales, and return on assets. Book market value, residual profit and return on investment were used to measure the financial performance of companies. Using the website of the stock exchange, accompanying notes and activity reports of the board of directors to the assembly of 108 manufacturing companies admitted to the Tehran Stock Exchange during the period from 2013 to 2020, the required data was collected and using the method Multivariate regression was analyzed using the F test of Limer, Hausman, Brosch-Godfrey and Brosch-Pagan with the help of R software. The results of the hypothesis test showed that there is a positive and significant relationship between environmental indicators and traditional financial criteria. The results of this research will help managers to identify the environmental indicators that affect environmental performance in their companies and use them to increase the company's value and improve the company's financial performance.

Keywords: environmental indicators, environmental performance, traditional financial performance
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1 Introduction

Since the beginning of human history, the issue of the environment has been of concern, significant economic and social developments in the late 20th century created critical problems in the way of environmental management. These problems include pollution of the global environment, loss of biodiversity, soil degradation, and uncontrolled urban growth. In environmental management, the goal is increasingly to promote and spread the category of "sustainable development" [14].

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The sustainability of companies has always been a fundamental issue since ancient times. The term sustainability includes all activities related to production and economic growth, provided that the natural and environmental resources that the present and future societies depend on are preserved. One of the important and basic tools to achieve the goals of sustainable development is the evaluation of the environmental effects of development plans.

Despite the progress of environmental impact assessment in the world, many countries, including the Islamic Republic of Iran, need to support, strengthen and expand this knowledge due to their administrative structure and scientific capacity, and it should be noted that environmental impact assessment It was not a ceremonial move, but it is a management and mandatory plan to modify the construction methods and operation process of development projects, and in this direction, if possible, the necessary technology, efficiency, and accurate implementation The results of the studies and environmental criteria and standards achieved, a valuable experience will emerge not only for the country, but also for the region and the world [8].

An increasing number of companies and organizations want to make their operations sustainable and participate in sustainable development. Sustainability reporting can help organizations to measure and inform their economic, environmental, and social and governance performance. In fact the sustainability for a long time or indefinitely is based on performance in these four key areas [18].

The issue of alignment of financial performance and social responsibility is one of the issues that have always been a point of disagreement among theorists. Despite the high acceptability of the principles of corporate social responsibility, there has been a long debate about whether managers should include corporate social responsibility policies in their tactical and strategic decisions or not.

Critics believe that corporate social responsibility has a vague structure and managers are unable to determine what is their social responsibility.

On the other hand, social responsibility increases operating costs and destroys shareholder wealth. So the main concern of the critics of corporate social responsibility is that the costs related to the improvement of the social performance of the company may exceed its benefits [32]. The accounting information system as an important part of the management information system can play a significant role in helping to protect the environment from polluting production companies.

Environmental costs are one of the thousands of costs that occur in a business unit for the production of goods or services. Environmental accounting provides appropriate information to management by properly disclosing how environmental assets and liabilities are presented and how environmental expenditures are reflected. Environmental accounting is an important tool for understanding the role that the natural environment plays in the economy and refers to the reform of the national accounts system in the use or depletion of natural resources. Environmental accounting is a national mass data that links the environment to the economy and has long-term effects on economic and environmental decision-making policies. Therefore, proper environmental accounting will have a significant impact on economic development and is a prerequisite for sustainable development.

Clarkson and his colleagues [7] stated that the best social performance leads to the best financial performance.

Performance evaluation means measuring and examining how the company's resources and assets are used towards the company's goals.

Measuring financial and operational performance is the basis of many decisions, such as managers' rewards, stock prices, stock risk, investment decisions, and many other things.

These decisions should be made based on the results of evaluations and should be in accordance with the work process of the organization.

Therefore, the performance of commercial units is evaluated based on the achievement of short-term and long-term goals. Therefore, operational performance is considered a suitable criterion for reaching the set goals. Today, the performance of many companies and organizations is evaluated based on financial indicators [9].

Preston and O'Bannon [28] believed that their poor performance, the organization's inattention to society and failure to observe ethical principles in dealing with external stakeholders, can create many problems for the organization and questioned the legitimacy of the organization and its actions. As a result, there will be fines for the organization and it will affect the profit and position of the organization, which will reduce the social performance.

Considering that shareholders and creditors allocate their limited financial resources to economic enterprises, evaluating the performance of the enterprise in order to ensure the optimal allocation of limited resources is considered important and vital [28].

Evaluating the performance of economic enterprises requires knowledge of criteria and indicators, which are clas-

sified into two sets of financial and non-financial indicators.

Some of the financial criteria that are more important for evaluating the company's performance are: investment return rate, residual profit, sales return rate, economic added value, market added value and comprehensive performance measurement index.

According to the above, there are many criteria to measure the performance of the company. Environmental factors are used to provide information to help managers in performance evaluation, control, decision-making and reporting for an organization or region.

Environmental factors are based on concepts, criteria and environmental and economic values to evaluate its impact on the operational and financial indicators of the company.

Many countries are leaders in adopting responsible behaviors when it comes to ethical issues, working environment conditions, environmental sustainability, etc.

Environmental impact assessment in Iran was specifically legalized for the first time on 1994/20/5 in Paragraph of Note 82 of the Law of the Second Plan of Economic, Social and Cultural Development of the Islamic Republic of Iran.

According to this decree, the project managers of petrochemical factories, refineries, power plants, steel industries, dams and other water structures, industrial towns and airports were obliged to submit feasibility and location reports to Prepare an environmental impact assessment report.

In the law of the third development program, in article 105, all large production and service plans and projects must be carried out before implementation and in two stages of feasibility and location studies, based on the criteria proposed by the Supreme Council for Environmental Protection and approved by the board. The ministers were required to carry out an environmental assessment and it was mandatory for them to comply with the results of the assessment, and in Article 71 of the Law of the Fourth Plan, the implementation of the aforementioned article was considered by the legislator [8].

The issue that will be investigated in this research is the impact of environmental indicators on traditional financial criteria in companies.

2 Literature Review

2.1 Environmental accounting

Since the late 1965s, when environmental and social accounting found its place in the accounting literature, researchers and experts have provided many definitions of this accounting model, these definitions were gradually completed and various dimensions were added to it. The definition of Linux was one of the first definitions of the environmental accounting model. In 1968, this researcher introduced a model called socio-economic accounting. During the 1980s, the environment and attention to it became very important. Various pro-environmental and pro-environmental social groups have identified companies as a major factor influencing the environment, and have strongly called for companies to be reciprocated by the activities they carry out and these activities. Affects the Environment They must be accountable and explicitly disclose the social and environmental impacts of their activities and accept the consequences and costs of these activities on the environment. The environment means all the objects that surround us; but the modern meaning of this word is a complex and intertwined phenomenon that includes social, biological and physical environments that any unreasonable manipulation, both in structure and in their composition, destroys the whole interconnected chain of the environment. It is also said that in some cases it cannot be repaired or it takes decades to repair.

2.2 Environmental performance

Environmental performance is a set of operations of a company that is synchronous and environmentally friendly, and this performance is mainly measured through criteria and scales set by relevant institutions and agencies, both national and international [30].

Klassen and Hobark have defined the result of environmental management performance as the impact of corporate activities on the environment. Companies use policies, techniques, and procedures with the primary goal of controlling and monitoring their operational impact on the environment [27].

Some of the environmental laws and regulations that have been approved in Chapter 3 of the Law on How to Prevent Air Pollution, Factories and Workshops and Power Plants, which require production, units to implement them in the field of environmental protection are as follows:

Article 12- The construction of new factories and workshops and the development and change of location or production line of existing factories and workshops require the observance of the rules and criteria of the Environmental Protection Organization.

Article 15- The Environmental Protection Organization shall determine the factories, workshops and power plants whose pollution exceeds the permissible standards of environmental standards and will notify the owners or officials of factories, workshops and power plants by determining the type and amount of pollution, to take action to eliminate the pollution or to close their work and activities until the elimination of the pollution within a certain period of time determined by the organization with the cooperation and participation of the relevant agencies.

In the executive regulations of Article 45 of the Law on Receipt of Some Government Revenues, the following articles are mentioned, which oblige the factories to implement these laws:

Article 4: Factories are required to deposit one in a thousand of their sales to a separate account each year and pay the costs related to environmental protection and pollution control from its funds.

Article 5: The above expenses are under the supervision of the organization and are considered as tax eligible expenses.

If the amount of one per thousand sales is not completed at the end of the fiscal year, it will be reimbursable in subsequent years and will be considered as tax eligible expenses of the year in which the expense was incurred.

Article 7: The activities that can be done from the location of one in a thousand funds are as follows:

- Conducting applied studies and research to prevent and control pollution
- Supply and installation of devices and measuring stations for air pollution control
- Establishment of laboratory and wastewater treatment system
- Providing appropriate equipment and tools for effective prevention and prevention of contamination
- Create wooded green space in the factory or other areas at the discretion of the organization
- Compensation for damage to the environment and natural resources
- Holding training courses to promote the environment

2.3 Company financial performance

The performance of a company itself is an important variable that can affect different groups of stakeholders, including shareholders, managers, employees and creditors. Performance appraisal is one of the basic and key tasks of managers to identify weaknesses and strengths of activities performed to improve and improve.

Evaluating the performance of enterprises requires recognizing the criteria and indicators that are classified into two sets of financial and non-financial indicators.

In general, there are two models of performance appraisal in relation to determining the value of the company and the performance of managers, which are: accounting model and economic model.

The accounting criteria for evaluating a company's performance are: profit, profit growth, cash flows, earnings per share, dividend per share, market value to book, residual earnings, return on investment and financial ratios (including: return on assets, stock returns), Price-to-profit ratio and Q-Tobin) and economic criteria for evaluating company performance are: economic value added, market value added and adjusted economic value added, cash value added, shareholder value added.

In this research, the criteria of return on equity, return on sales, return on assets, and market to book value, residual profit and return on capital will be used to measure the financial performance of companies.

2.4 Impact of environmental performance on financial performance of companies

Studies show that the financial performance of the company has various dimensions that can affect the environmental performance of companies that have different characteristics.

The theories that have been examined in this study to examine environmental performance and financial performance are as follows:

1. **Shareholder theory:** [17] defined the stakeholder as any individual or entity whose activities can affect the purpose of an organization and possibly be influenced by the activities of that organization. A stakeholder can also refer to an individual or entity that participates in an organization's activities and therefore expects the organization to pay attention to it. The concept of shareholder theory was first used by Ansoff [2] to describe his company's goals. Later in the early 1980s, Freeman assessed the role of several stakeholders in the corporate environment and highlighted two main groups: internal and external stakeholders who believed they could influence corporate behavior. Roof et al. [29] added environmental constituents to the two main stakeholder groups previously identified by Freeman [16].

In other words, stakeholders indirectly or directly seek to secure their interests through organizations, thereby granting community legitimacy to such companies.

A proposal was made by Freeman [16] that guides companies to minimize social costs while meeting the demands of shareholders. Meeting the demands of stakeholders will not necessarily give a company a competitive advantage that offers all the jobs in an industry with the same shareholders. It is important for a company to realize that it has entered into contracts with several stakeholders, and that such a relationship can help to understand the relationship between the company's social and financial performance. However, when all relevant parties are critically examined, one may play a key role while the other stakeholder group may be overlooked for this reason. To further clarify the usefulness of stakeholder theory, Donaldson and Preston [12] emphasized three main forms (normative, instrumental, and descriptive).

The three aspects described by Donaldson and Preston are discussed in the following paragraphs to ensure that the implications of stakeholder theory are fully understood [12].

- **Descriptive or experimental:** This theory has been used by some researchers to explain and describe the nature of enterprises, which has been proven by Brenner and Cochran [5] in their research.

Also, managers' views on management policies and what the board considers to be the interests of the company, as well as how some businesses are managed, can be explained by shareholder theory. Although several studies have been conducted on descriptive stakeholder theory, Jawaher and McLaughlin [21] address the descriptive aspect in detail. In addition to organizational life cycle models, they developed a descriptive stakeholder theory based on resource dependence and vision theory.

- **Instrumental:** In terms of tools, it is emphasized that in general, with a descriptive aspect, this theory can be used to identify the possible relationship between shareholder management and achieving the company's goals (for example, maximum profit and growth). Letza et al. (2004) point out that stakeholder theory is only interested in the "means" through which stakeholder value can be used to improve firm performance and efficiency. Several studies have empirically concluded that if companies adhere to the principles of stakeholders and ensure their interests, the company's goals can be achieved. As argued by Jones [22], stakeholder theory suggests that managers of firms that have established cooperation and trust with their shareholders do not have a competitive advantage over other firms. However, there was no attempt to clarify how trust could be built [24].
- **Normative:** The basis of this form of stakeholder theory is the presentation of an organization from its moral and philosophical procedures for the management of that organization. In this example, stakeholders should be considered as "goals" and not as a means to an end and therefore should be involved in the future direction of the organization [24]. In this regard, there is no important criterion for the relationship between performance and shareholder management. Instead, an attempt is made to interpret the association's performance on the basis of moral and philosophical principles. For example, property rights given to one person limit their use in a way that does not harm others close to them. In other words, stakeholders expect companies to comply more with the standard legal requirements for doing business. Donaldson and Preston (1995) made it clear that these three forms of shareholder theory are interrelated. In their view, the normative form of how managers treat corporate shareholders is the most important and fundamental stakeholder theory [12].

2. **Contingency theory:** Contingency theory, as Donaldson (2001) pointed out, is a subset of the contingency scientific approach. According to him, the contingency approach is where the effect of one variable on another depends on the effect of the third variable. Therefore, a change in the third variable or factor affects the relationship between the two variables studied. With this knowledge, companies tend to adopt a structure tailored to their contingency level. In other words, there is a contingent relationship in the organizational structure [11].

Donaldson also stated that the organizational structure changes when unexpected circumstances change in unexpected events. In addition, organizational performance is placed in proportion.

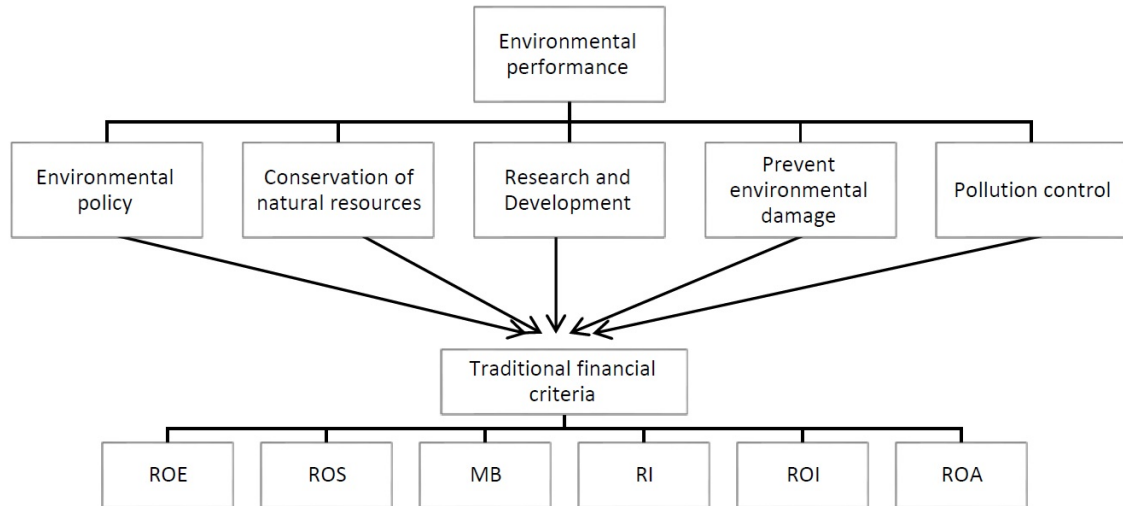


Figure 1: Conceptual model

2.5 Empirical Background of the Research

Atasel et al. [3] examined the impact of environmental information disclosure on stock cost and financial performance in an emerging market in Turkey. They said that financial instability, financial crises and business frauds undermine public confidence in companies. Similarly, economic uncertainty increases as a result of social problems such as rapid consumption of natural resources, climate change, water scarcity, and human rights violations. For these reasons, the reliability and credibility of the reports published by the companies has been questioned. To overcome these problems and gain the trust of investors, companies made voluntary disclosures such as environmental, social and sustainability. In this regard, the purpose of this study was to investigate the impact of information disclosure, including environmental disclosure, in the field of sustainability on stock costs. At the same time, this study examined the effect of information disclosure on financial performance in terms of firm value and profitability. As a result, it was found that disclosure of information has a negative impact on stock costs while having a positive impact on the value and profitability of the company.

Dirila et al. [10], in their research, the impact of environmental performance and environmental costs on financial performance, using the Social Responsibility Committee as an intervening variable on the mining companies listed on the Indonesian Stock Exchange and They studied in 2015-2018. This research was used as an important consideration in creating environmental performance policies and as a tool to measure financial performance for the progress of companies. The researchers hoped that this research could be used as an evaluation element to decide whether to invest in the company.

Widodo et al. [26] studied economic and environmental performance management on a new perspective on government ownership. Their study was conducted to investigate the relationship between environmental performance, government ownership and corporate financial performance. The study consisted of 151 companies listed on the Indonesia Stock Exchange and surveyed from 2017-2014. This study used evidence from state-owned companies that did not focus much on environmental and financial performance research. In addition, they used appropriate metrics to measure environmental performance. The above research showed that environmental performance has a positive effect on financial performance by considering the three variables of return on assets, return on equity and Q Tobin. The results of this study for the management of companies on how to turn important issues into the environment, important points that should be considered to improve company performance. For the government, the results of this study can also be effective in creating environmental management policies.

Zuoming [25] examined the unraveling of the complex relationship between environmental and financial performance. His findings show that the firm's environmental performance and financial performance are generally positively correlated with each other, indicating that an economically active strategy is generally useful in improving future financial performance (e.g., being green). Check out). In his study, Zooming argued that not all companies in all sectors of the industry can imitate and benefit from this strategy alone. The heterogeneity of environmental performance and financial performance under different contexts at the company level and industry level shows that the real impact of the company's environmental performance on financial performance can be different from the overall effect and largely due to its specific characteristics and the industrial sector depends on it. The two-way causal relationship between

environmental performance and financial performance also shows that companies need to have sufficient financial resources to implement environmental prevention strategies and initiatives.

Cheng et al. [6] examined a meta-analysis of causality between environmental performance and financial performance. The aim of their study was to elucidate the causal effects between environmental performance and financial performance using comprehensive analysis of 893 empirical estimates from 142 studies on environmental performance and operational performance. Their results showed that in the short term (1 year), financial resources can increase the environmental performance of the company. However, its effects disappear in the long run. Conversely, an increase in environmental performance has no short-term effect on a firm's financial performance, while a firm will reap significant profits in the long run, which is in line with Porter's hypothesis. In general, their results showed that causality between environmental performance and financial performance depends on the time horizon.

Konado [23] studied corporate environmental performance and corporate financial performance in the UK. Considering the relationship between environmental management performance and company financial performance, it was found that environmental policies, supervision, processes and management systems are significantly related to company financial performance. They also concluded that it is a complete intermediary between environmental policies, oversight, management systems and asset returns, return on capital and stock prices.

Soleimani and Majbourni Yazdi [31] examined the impact of the company's environmental strategy, senior management commitment and environmental uncertainty by emphasizing the role of environmental management accounting on the company's environmental performance. The above research was based on the structural equation model and 48 companies that had ISO 14001 certification in Tehran Stock Exchange were listed. Then, a questionnaire was sent to 171 company managers, of which 151 received questionnaires. The results of this study showed that environmental strategies have a positive and significant effect on the environmental performance of companies. Environmental strategies had an indirect positive impact on the company's environmental performance through environmental management accounting. Senior management commitment had a positive and significant effect on organizational environmental performance. Senior management commitment had an indirect, positive and significant effect on the environmental performance of the company through environmental management accounting and perceived environmental uncertainty had a significant positive effect on the use of environmental management accounting .

Hasas Yeganeh et al. [19] analyzed the analysis of sustainable environmental performance and its impact on the cost of capital of companies listed on the Tehran Stock Exchange. The purpose of this study was to analyze the status of environmental sustainable performance reporting and its relationship with the cost of capital in companies listed on the Tehran Stock Exchange. Their findings showed that the companies surveyed in this study had better reporting in the component of "raw materials, energy and water" than other components, but in terms of sustainable environmental performance compared to the research foreign was rated low.

Fakhari et al. [15] examined the components and indicators of environmental reporting of companies listed on the Tehran Stock Exchange during the period 2003 to 2011. Their results showed that the level of disclosure of environmental information has been variable.

El Beigi et al. [13] examined the environmental system and financial performance of the organization, the mediating role of competitive advantage and the moderator of replacement costs. The statistical population of the above research was the managers, deputies and financial experts of the companies who collected opinions using a questionnaire. They used correlation and regression tests to test hypotheses and Kolmogorov-Smirnov test to detect normal data and based on the results, all their hypotheses were confirmed in the study.

Aziz Mohammadloo and Mohammadnejad [4] studied the effect of environmental pressures on the performance of the organization with emphasis on the choice of green technology. The purpose of this study was to investigate the effect of environmental pressures on organizational performance with emphasis on the choice of green technology in small and medium enterprises in the chemical paint industry. The results of this study showed that macro conditions have the greatest impact on the choice of green technology and improving environmental performance leads to improving the performance of the organization.

Darabi and Akbari [9] examined the factors affecting the implementation of environmental accounting. The purpose of this study was to investigate the theoretical foundations required for the implementation of environmental accounting in companies listed on the Tehran Stock Exchange and the factors affecting it. The statistical population included senior managers and financial managers of companies listed on the Tehran Stock Exchange during 2014. The research findings indicate that the effect of all variables on environmental accounting has been confirmed. In addition, the variable of barriers in current accounting to measure the activity of companies in the environment was the first priority and the variable of creating risk due to environmental threats was the last priority. In prioritizing the hypotheses, it was concluded that all the variables discussed are effective on environmental accounting. In addition, the variable of

barriers in current accounting to measure the activity of companies in the environment was the first priority and the variable of creating risk due to environmental threats was the last priority.

Haidarpour and Qarni [20] examined the impact of environmental accounting on the financial and operational indicators of manufacturing companies. The purpose of this study was to investigate the impact of environmental accounting on financial and operational indicators and determine the position of accounting. In this research, Student t test has been used to confirm or not confirm the hypotheses. The results show the impact of environmental accounting on the financial and operational indicators of companies, which include the amount of production of manufacturing companies, the type of goods produced and the ratio of service debt (repayment of principal and interest on long-term debts) to total corporate debt has been productive.

Abbasi and Mohammadi [1] examined the financial reporting of environmental performance of polluting companies listed on the Tehran Stock Exchange. In this research, an attempt was made to investigate the research topic using a descriptive-survey method. For this purpose, five issues of environmental performance reports in 47 polluting companies from 9 industries for the years 2002 to 2008 have been studied. The results of the Community Success Ratio test show that polluting companies have disclosed their environmental financial performance in at least 50% of their observations in the notes to the financial statements and the reports of the board of directors to the general meeting of shareholders. The research findings showed that the polluting companies listed on the Tehran Stock Exchange disclose their environmental financial performance in the explanatory notes to the financial statements and the report of the board of directors to the general meeting of shareholders. Also, as long as disclosure of environmental performance information is non-mandatory and voluntary, companies use different procedures for reporting and the rate of disclosure of corporate environmental performance fluctuates.

3 Methodology of research

This research is applied in terms of purpose-based classification and the research method is quantitative. The research method in terms of data collection is descriptive-correlational. In order to test the hypotheses of information research, the site of the stock exchange, accompanying notes and report of the activities of the board of directors to the assembly will be used. Several regression models were used to measure the research variables.

The statistical population of the study was all companies listed on the Tehran Stock Exchange in the period 2013 to 2020 after applying the conditions.

The above conditions are as follows:

1. The date of their acceptance in the Securities Exchange Organization is before 2013 and they should be in the list of listed companies until the end of 2020.
2. The end of the financial year of the companies in the industry is March 20 of each year.
3. Due to the nature of research and the need to compare companies in various industries, including pharmaceutical materials and products, automobiles and parts manufacturing, metal products, machinery and equipment, cement, lime and gypsum, base metals, rubber and plastics Petroleum products, coke and nuclear fuel, automobile and parts manufacturing, metal ore mining and chemical products were selected. These industries constitute a large volume of the market and despite being considered, they also have homogeneous information.
4. The information used in this research is available during the research period.

The sample population of this research consists of 108 companies.

According to the theoretical foundations and research background, research hypotheses are formulated as follows:

Main Hypothesis; environmental indicators have an effect on the traditional financial performance of the company.

Sub-1; the pollution control component is effective on the financial performance of companies with an emphasis on traditional financial criteria.

Sub-2; the component of preventing environmental damage is effective on the financial performance of companies with emphasis on traditional financial criteria.

Sub-3; the research and development component is effective on the performance of companies with an emphasis on traditional financial criteria.

Sub-4; the component of preserving natural resources is effective on the performance of companies with emphasis on traditional financial criteria.

Sub-5; the component of environmental policy is effective on the financial performance of companies with emphasis on traditional financial criteria.

3.1 Research Model

In this study, the environmental index was selected based on the research conducted by Konado [23], which examined the environmental performance of companies and the financial performance of companies, and was used as an independent variable. Traditional financial performance was used as dependent variables and company size, financial leverage, capital intensity and CEO duality as research control variables. The following regression models will be used to measure the environmental index on the financial performance of companies:

$$TFP_{it} = \beta_0 + \beta_1 EI_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon \quad (3.1)$$

TFP: traditional financial performance, *EI*: Environmental Indicators, *SIZE*: Firm Size, *LEV*: Financial Leverage, *CI*: Capital Intensity, *CD*: CEO Duality

TFP_{it}: The traditional financial criteria are calculated as follows:

$$TFP = ROE_{it} + ROS_{it} + ROA_{it} + MB_{it} + RI_{it} + ROI_{it}$$

Return on assets (ROA): It is the ratio of profit before tax to total assets.

$$ROA = \frac{\text{Profits before taxes}}{\text{Total assets}}$$

Return on Equity (ROE): Net profit after tax is divided by total equity.

$$ROE = \frac{\text{Net Profit after tax}}{\text{Total equity}}$$

Return on sales (ROS): It is obtained by dividing the net profit by the total sales revenue of the company.

$$ROS = \frac{\text{Net Profit}}{\text{Total Sales}}$$

Market to book value (MB): It is obtained from the ratio of the company's market value to the total value of the company's assets in the financial period.

$$MB = \frac{\text{Total Market Value}}{\text{Total Asset Value}}$$

Residual profit (RI): is the operating profit after tax deduction minus the cost of capital.

$$RI = \text{earnings} - (ke \cdot \text{capita})$$

earnings: operating profit, *ke*: minimum expected return, *capita*: book value of shares

$$Ke = Rf + \beta(Rm - Rf)$$

ke: minimum expected return, *Rf*: risk free rate of return, *Rm*: market rate of return, β : Beta of the share

Return on investment (ROI): The rate of return on investment is calculated by subtracting the cost from the total revenue and dividing it by the total cost.

$$ROI = \frac{\text{Profit from investment} - \text{Investment cost}}{\text{Investment cost}}$$

$$TFP_{it} = \beta_0 + \beta_1 PO_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon \quad (3.2)$$

PO: Pollution control

$$TFP_{it} = \beta_0 + \beta_1 PED_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon \quad (3.3)$$

PED: Prevention of environmental damage

$$TFP_{it} = \beta_0 + \beta_1 R\&D_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon \quad (3.4)$$

R&D: Research and Development

$$TFP_{it} = \beta_0 + \beta_1 CNR_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon \quad (3.5)$$

CNR: Conservation of Natural Resources

$$TFP_{it} = \beta_0 + \beta_1 EP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon \quad (3.6)$$

EP: Environmental policy

According to a study by Konado [23], the following variables were considered as control variables:

SIZE: The natural value of a company's total assets is obtained through natural logarithms.

LEV: Total liabilities are divided by the total assets of the company.

CI: is obtained by dividing the total assets of the company by the total sales of the company.

CD: The managing director holds the titles of chairman or vice chairman of the board.

4 Research Analyses and Finding

4.1 Descriptive Statistics

Descriptive statistics are prepared in order to make the information contained in the data concise and tangible to some extent and to obtain general information about the characteristics of the studied samples. This information includes: central indicators and dispersion such as mean, median, standard deviation, minimum and maximum, range of changes. The table of descriptive statistics for the research variables is as follows.

Table 1: Descriptive statistics corresponding to research variables

Variable	Average	Middle	Standard deviation	Min	Max	Skewness coefficient	Slenderness ratio
TFP	44.255549	203646.46	300960.74	-735197.45	1519234.27	1.56	3.54
SIZE	38.14	14.10	1.51	11.04	19.14	0.962	1.100
LEV	576.0	0.578	0.197	0.09	1.79	0.503	3.05
CI	252.0	0.206	0.174	0.017	0.932	1.14	0.975
CD	28.0	0.0	0.448	0	1	0.994	-1.014
EI	751.0	0.800	0.271	0	1	-2.02	3.08
PO	88.0	1	0.320	0	1	-2.41	3.80
PED	88.0	1	0.324	0	1	-2.35	3.55
R&D	22.0	0	0.417	0	1	1.33	-0.230
CNR	88.0	1	0.330	0	1	-2.289	3.24
EP	89.0	1	0.316	0	1	-2.46	4.06

In this research, 108 companies have been investigated in the academic period of 2011 to 2018. The results of the above table show that all the information required in this research related to 864 companies (8×108) has been fully extracted. Among the research variables, the dispersion of observations according to the range of changes that results from the difference of the two mentioned values is more for traditional financial performance criteria and company size than other research variables. The mean and standard deviation of the research variables show that the dispersion of traditional financial variables and company size is more compared to other research variables and the variable of capital intensity shows the lowest standard deviation and dispersion.

4.2 Test hypotheses and analysis of Research findings

Main Hypothesis) Environmental indicators affect the financial performance of the company.

To test this hypothesis, the following regression model is fitted:

$$TFP_{it} = \beta_0 + \beta_1 EI_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon$$

Before testing the regression model, it is necessary to perform tests in order to select the best regression model. The tests performed are as follows:

The first test is the F-Limer test. If P-value is less than 0.05, panel regression method and otherwise OLS regression is selected.

Table 2: The results of the tests used for the first research hypothesis

Type of test	Test statistics	P-value
F-Limer	6.98	0.000
Hausmann	15.59	0.008
Brush-Godfrey	223.78	0.000
Brush-Pagen	23.69	0.000

The F-Limer test indicates that at the 5% error level between the OLS method and the panel method, the panel method should be used. After the panel model was selected, it was used to correctly identify the model. The fixed effects are the subject of the estimation method or the random effects model, the Hausman test was used. As can be seen, the P-value is greater than 0.05. Therefore, for the first model, the random effects method is selected. To test whether the errors of the model used are serially correlated, the Bruffrey-Godfrey test was used and the P-value is less than 5%, so the autocorrelation of the model error is accepted. To test whether the error of the model used has variance heterogeneity, we use the Brugen-Pagen test, which shows that the P-value for the model is more than 5%, so the variance homogeneity of the first model error is accepted. The following table presents the estimation of regression coefficients for each of the prediction variables of the regression model. In this regard, by summarizing the regression assumptions, it has been concluded that we should use the generalized method to fit the model.

After performing this regression, the model results are as follows:

Table 3: Results of regression model fitting

Coefficients	VIF	Variable coefficients in the model	Standard error deviation	t-statistics	P-value	Result
Width of origin	–	–216343	96942	–2.23	0.026	Significance in the model
EI	1.85	194689	36553	5.326	0.000	Significance in the model
SIZE	1.37	32410	6583	4.923	0.000	Significance in the model
LEV	1.62	–95002	50373	–1.886	0.059	Lack of significance in the model
CI	1.90	–319137	56763	5.622	0.000	Significance in the model
CD	1.73	–17942	21914	–0.818	0.413	Lack of significance in the model
The coefficient of determination					0.298	
Model significance test				Statistics F	18.73	
				P-value	0.000	
Watson Camera Test				Camera-Watson Statistics	2.017	
				P-value	0.770	

As can be seen in the table above, the maximum VIF values are less than 10, so the existence of all variables in the model will not be distorted. Also, the P-value (0.000) of the test confirms the significance of the model and the

suitability of the model. According to the results of the above table, t-statistic (326.5) shows that the independent variable EI in this model is statistically significant at the level of 95% confidence, because firstly, the absolute values of this statistic are greater than 1.96, secondly, P - The amount (0.000) is less than 5%. Therefore, the environmental index is effective on the financial performance of companies with an emphasis on traditional financial criteria.

Sub-1) the pollution control component is effective on the financial performance of companies with an emphasis on traditional financial criteria.

To test this hypothesis, the following regression model is fitted:

$$TFP_{it} = \beta_0 + \beta_1 PO_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon$$

Similar to the previous hypothesis, the results of diagnostic tests for panel data are presented below.

Table 4: Results of tests used for the first sub-hypothesis of the research

Type of test	Test statistics	P-value
F-Limer	7.18	0.000
Hausmann	10.22	0.07
Brush-Godfrey	232.74	0.000
Brush-Pagen	19.25	0.002

The F-Limer test indicates that at the 5% error level between the OLS method and the panel method, the panel method should be used. Using the Hausmann test, as observed, the P-value is greater than 0.05, so the random effects method is selected. The Bruch-Godfrey test showed that the P-value is less than 5%, so the model error correlation is accepted, and in the Bruch-Pagen test, the results indicated that the P-value is more than 5%, so the homogeneity variance of the first model is accepted.

Summarizing the regression assumptions, we came to the conclusion that we should use the generalized method to fit the model.

After performing regression, the results of the model are as follows:

Table 5: Results of regression model fitting

Coefficients	VIF	Variable coefficients in the model	Standard error deviation	t-statistics	P-value	Result
Width of origin	-	-191723.6	97536	-1.97	0.049	Significance in the model
PO	1.49	122585.2	31023.6	3.95	0.000	Significance in the model
SIZE	1.06	33643.7	6628.3	5.075	0.000	Significance in the model
LEV	1.63	-96235.4	50738.2	-1.89	0.058	Lack of significance in the model
CI	1.08	-337915.2	56968.2	-5.93	0.000	Significance in the model
CD	1.22	-15078.9	22058.4	-0.684	0.494	Lack of significance in the model
The coefficient of determination					0.285	
Model significance test				Statistics F	15.99	
				P-value	0.000	
Watson Camera Test				Camera-Watson Statistics	1.998	
				P-value	0.773	

Noted, the maximum VIF values are also less than 10, so the existence of all variables in the model will not be distorted. Also, the P-value (0.000) of the model significance test confirms the suitability of the model. According to the results of the above table, t-statistic (3.95) shows that the independent variable PO in this model at the level of 95% confidence is statistically significant because firstly, the absolute values of this statistic are more than 1.96

and secondly, P- The amount (0.000) is less than 5%. Therefore, the pollution control component is effective on the financial performance of companies with emphasis on traditional financial criteria.

Sub-2) the component of preventing environmental damage is effective on the financial performance of companies with emphasis on traditional financial criteria.

To test this hypothesis, the following regression model is fitted:

$$TFP_{it} = \beta_0 + \beta_1 PED_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon$$

Similar to the previous hypotheses, the results of diagnostic tests for panel data are presented below.

Table 6: Test results used for the second sub-hypothesis of the research

Type of test	Test statistics	P-value
F-Limer	7.18	0.000
Hausmann	9.50	0.091
Brush-Godfrey	232.6	0.000
Brush-Pagen	16.83	0.001

The F-Limer test indicates that at the 5% error level between the OLS method and the panel method, the panel method should be used. The results of Hausman test showed that P-value is greater than 0.05. Hence the method of random effects is chosen. In the Bruch-Godfrey test, the P-value is less than 5%, so the model error autocorrelation is accepted, and in the Bruges-Pagen test, the observed results show that the P-value is more than 5%, so the homogeneity variance of the first model is accepted. To summarize the regression assumptions, we concluded that we should use the generalized method to fit the model. After performing this regression, the results of these two models are as follows:

Table 7: Results of regression model fitting

Coefficients	VIF	Variable coefficients in the model	Standard error deviation	t-statistics	P-value	Result
Width of origin	–	–192936.3	97546.9	–1.98	0.048	Significance in the model
PED	1.47	122009.1	30600.2	3.98	0.000	Significance in the model
SIZE	1.57	33788	6621.8	5.10	0.000	Significance in the model
LEV	1.26	–95190.3	50731.4	–1.87	0.061	Lack of significance in the model
CI	1.66	–339319.8	56942.5	–5.96	0.000	Significance in the model
CD	1.32	–15714.5	22062.1	–0.712	0.476	Lack of significance in the model
The coefficient of determination					0.285	
Model significance test				Statistics F	16.05	
				P-value	0.000	
Watson Camera Test				Camera-Watson Statistics	2.00	
				P-value	0.773	

As can be seen, the maximum VIF values are also less than 10, so the existence of all variables in the model will not be distorted. The P-value (0.000) of the model significance test also confirms the suitability of the model. According to the results obtained in the table above, t-statistic (3.98) shows that the independent variable PED in this model at the level of 95% confidence, is statistically significant because first, the absolute value of this statistic is more than 1.96 Secondly, the P-value (0.000) is less than 5%. Therefore, the component of preventing environmental damage is effective on the financial performance of companies by emphasizing traditional financial criteria.

Sub-3) the research and development component is effective on the performance of companies with an emphasis on traditional financial criteria.

To test this hypothesis, the following regression model is fitted:

$$TFP_{it} = \beta_0 + \beta_1 R\&D_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon$$

Similar to the previous hypotheses, the results of diagnostic tests for panel data are presented below.

Table 8: Results of tests used for the third sub-hypothesis of the research

Type of test	Test statistics	P-value
F-Limer	7.07	0.000
Hausmann	28.92	0.000
Brush-Godfrey	214.2	0.000
Brush-Pagen	17.04	0.004

The F-Limer test indicates that at the 5% error level between the OLS method and the panel method, the panel method should be used. In the Hausman test, as can be seen, the P-value is greater than 0.05. Hence the method of random effects is chosen. From the Bruch-Godfrey test, it is concluded that the P-value is less than 5%, so the model error autocorrelation is accepted. In Bruges-Pagen test, it is observed that P-value is more than 5%, so the homogeneity variance of the first model is accepted and the second model is rejected. In this regard, by summarizing the regression assumptions, we came to the conclusion that we should use the generalized method to fit the model.

After performing this regression, the results of this model are as follows:

Table 9: Results of regression model fitting

Coefficients	VIF	Variable coefficients in the model	Standard error deviation	t-statistics	P-value	Result
Width of origin	–	–157418.6	95761.5	–1.64	0.100	Significance in the model
R&D	1.55	124949.7	23886	5.23	0.000	Significance in the model
SIZE	1.35	36113.3	6532.6	5.53	0.000	Significance in the model
LEV	1.05	–94434	50402.3	–1.87	0.061	Lack of significance in the model
CI	1.54	–294435.2	57463.3	–5.12	0.000	Significance in the model
CD	1.48	–19880.5	21952.8	–0.91	0.365	Lack of significance in the model
The coefficient of determination					0.197	
Model significance test				Statistics F	18.51	
				P-value	0.000	
Watson Camera Test				Camera-Watson Statistics	2.038	
				P-value	0.770	

As can be seen, the maximum VIF values are also less than 10, so the existence of all variables in the model will not be distorted. Also, the P-value (0.000) of the model significance test confirms the suitability of the model. According to the results, t-statistic (5.23) shows that the independent variable R&D in this model at the level of 95% confidence is statistically significant because firstly, the absolute magnitude values of this statistic are more than 1.96 and secondly, P-value (0.044) is less than 5%. Therefore, the research and development component is effective on the financial performance of companies with emphasis on traditional financial criteria.

Sub-4) the component of preserving natural resources is effective on the performance of companies with emphasis on traditional financial criteria.

To test these hypotheses, the following two regression models are fitted:

$$TFP_{it} = \beta_0 + \beta_1 CNR_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon$$

Similar to the previous hypotheses, the results of diagnostic tests for panel data are presented below.

Table 10: Test results used for the fourth sub-hypothesis of the research

Type of test	Test statistics	P-value
F-Limer	7.28	0.000
Hausmann	14.58	0.012
Brush-Godfrey	230.79	0.000
Brush-Pagen	14.31	0.013

The F-Limer test indicates that at the 5% error level between the OLS method and the panel method, the panel method should be used. In Hausman test, it can be seen that the P-value is greater than 0.05. Hence the method of random effects is chosen. The results of Bruch-Godfrey test show that the P-value is less than 5%, so the model error autocorrelation is accepted. From Bruch-Pagen test it was concluded that P-value is more than 5%, so the variance homogeneity of the model error is accepted. After performing this regression, the results of this model are as follows:

Table 11: Results of regression model fitting

Coefficients	VIF	Variable coefficients in the model	Standard error deviation	t-statistics	P-value	Result
Width of origin	–	–180186.8	97740.7	–1.84	0.066	Lack of significance in the model
CNR	1.48	99262	30145.1	3.29	0.001	Significance in the model
SIZE	1.51	34301.9	6642.3	5.16	0.000	Significance in the model
LEV	1.44	–95523.8	50878.7	–1.88	0.060	Lack of significance in the model
CI	1.73	–341191.2	57104.4	–5.97	0.000	Significance in the model
CD	1.81	12043.2	22098.2	–0.454	0.585	Lack of significance in the model
The coefficient of determination					0.28	
Model significance test				Statistics F	14.96	
				P-value	0.000	
Watson Camera Test				Camera-Watson Statistics	2.003	
				P-value	0.770	

As can be seen in the table above, the maximum VIF values are also less than 10, so the existence of all variables in the model will not be distorted. Also, the P-value (0.000) of the model significance test confirms the suitability of the model. According to the results, t-statistic (3.29) shows that the independent variable in this model at the level of 95% confidence is statistically significant because, firstly, the absolute value of this statistic is more than 1.96 and secondly, P-value (0.000) is less than 5%. Therefore, the component of conservation of natural resources is effective on the financial performance of companies with emphasis on traditional financial standards.

Sub-5) the component of environmental policy is effective on the financial performance of companies with emphasis on traditional financial criteria.

To test this hypothesis, the following regression model is fitted:

$$TFP_{it} = \beta_0 + \beta_1 EP_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CI_{it} + \beta_5 CD_{it} + \varepsilon$$

Similar to the previous hypotheses, the results of diagnostic tests for panel data are presented below.

The F-Limer test indicates that at the 5% error level between the OLS method and the panel method, the panel method should be used. In Hausman test, it can be seen that the P-value is greater than 0.05. Therefore, for the above model, the method of random effects is selected. The Bruch-Godfrey test shows that the P-value is less than 5%, so the model error autocorrelation is accepted. In the results of Bruges-Pagen test, it was observed that P-value is more than 5%, so the variance homogeneity of the model error is accepted. In this regard, by summarizing the regression assumptions, we came to the conclusion that we should use the generalized method to fit both models. After performing this regression, the results of these two models are as follows:

Table 12: Test results used for the fourth sub-hypothesis of the research

Type of test	Test statistics	P-value
F-Limer	7.144	0.000
Hausmann	9.35	0.096
Brush-Godfrey	232.02	0.000
Brush-Pagen	19.86	0.001

Table 13: Results of regression model fitting

Coefficients	VIF	Variable coefficients in the model	Standard error deviation	t-statistics	P-value	Result
Width of origin	–	–191846	97242	–1.97	0.049	Significance in the model
EP	1.24	133446	31454	4.24	0.000	Significance in the model
SIZE	1.67	32972	6633	4.97	0.000	Significance in the model
LEV	1.33	–97333	50669	–1.92	0.055	Lack of significance in the model
CI	1.12	–336985	56892	–5.92	0.000	Significance in the model
CD	1.53	–14650	22022	–0.665	0.506	Lack of significance in the model
The coefficient of determination					0.187	
Model significance test				Statistics F	16.50	
				P-value	0.000	
Watson Camera Test				Camera-Watson Statistics	1.999	
				P-value	0.773	

As can be seen in the table above, the maximum VIF values are also less than 10, so the existence of all variables in the model will not be distorted. The P-value (0.000) of the model significance test also confirms the suitability of the model. According to the results, t-statistic (4.24) shows that the independent variable in this model at the level of 95% confidence is statistically significant because firstly, the absolute value of this statistic is more than 1.96 and secondly, P-value (0.000) is also less than 5%. Therefore, the environmental policy component is effective on the financial performance of companies with an emphasis on traditional financial standards.

5 Discussion and conclusion

Environmental factors and indicators are used to provide information to help managers in performance evaluation, control, decision-making and reporting for companies, and the effect of these indicators on traditional financial performance criteria in companies accepted in Tehran Stock Exchange was evaluated. The results of the research show that there is a direct relationship between the environmental indicators measured with the components of pollution control, prevention of environmental damage, research and development, conservation of natural resources and environmental policy with traditional financial criteria. Therefore, the main hypothesis and sub-hypotheses of the current research are confirmed. The results of this research are the same as [25] study, and the findings show that the environmental performance and financial performance of the company in general have a positive and significant relationship with each other. In a research conducted by [23] on the environmental performance and financial performance of companies in the UK, they concluded that there is a complete relationship between environmental policies and return on assets, return on capital and stock price. According to the present research, this relationship can be seen in sub-hypothesis 5 and the relationship of environmental policies on traditional financial performance is confirmed. [20] investigated the impact of environmental accounting on the financial and operational indicators of manufacturing companies, and the results of their study are the same as the results obtained in this research, and both researches on the impact of environmental factors, have reached the financial performance of companies. According to the results obtained from the research indicators, it is suggested that the companies pay attention to the environmental effects of their activities in order to be more transparent and respond to the beneficiaries, and seek to prepare and formulate social responsibility

strategies in the company. It is essential for managers to tailor their environmental practices to the impact they expect their environmental performance to have on financial performance measures. Modifying the content of the activity report of the board of directors and the annual reports of the companies, paying more attention to the disclosure of the environmental indicators were raised. It is suggested to the policy makers and interested institutions to include all environmental aspects as mandatory requirements. Policymakers can also encourage companies to report on other aspects of environmental performance that may have a significant impact on their business activities.

Considering the importance of the subject, it seems that the following suggestions can be made for future research:

- Examining the relationship between environmental indicators and balanced evaluation criteria
- Investigating the impact of environmental indicators in service sectors including hospitals
- Investigating the impact of environmental indicators on reducing the cost of products

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