The Impact of Board Influence on the Role of Eco-innovation in the Company Success and Non-Success[1]

Vahid Bekhradi Nasab[2,] Sayyed Mehdi Afzali[3]

Abstract
Considering that today's competitive environment is growing and the movement of organizations towards complexity and dynamism has started, the ability to learn earlier and faster than competitors will be the only relative advantage in the next decade and should The prospects and long-term and short-term contributions of organizations should be examined in a different way, and creativity, innovation along with the use of current information should be an inseparable part of managers' decision-making, and only an organization can claim superiority and success that To use the capabilities, commitment and learning capacity of employees at all levels of the organization in the best way. Based on this, the current research has studied the Board influence on the role of environmental innovation in the success and stock price risk. The statistical population of the research is all the Companies listed in Tehran Stock Exchange to the stock exchange, the period from 2014 to 2019 and the sample is 153 companies. Based on the investigations, the findings showed that environmental innovation has a positive and significant effect on the company's long-term success, and with the Board influence in the company, the role of environmental innovation on the company's long-term success shows a better effect. Also, environmental innovation has a positive and significant effect on the company's success in the short term, and with the Board influence in the company, the role of environmental innovation on the company's short-term success becomes more colorful (intense). Finally, environmental innovation has a negative and significant effect on the Stock price risk in the long run.

2. Ph.D in Accounting, Department of Accounting, Najafabad Branch, Islamic Azad University, Najafabad, Iran. vahid.bekhradinasab@gmail.com
3. Department of Accounting, Feiz Non-Governmental Non-Profit Institute of Higher Education, Khomeini Shahr, Isfahan, Iran. afzaliabadan@gmail.com

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1. Introduction

The Board influence on firm performance has been the primary focus of organizational behavioral research (Deutsch, 2005; Kouaib and Jarboui, 2016; Pham et al. 2011; Yilmaz and Mazzeo, 2014). Various board characteristics have been examined and acknowledged as effective factors in creating value for shareholders. While this line of research facilitates discussion of the link between the board of directors and firm performance, with return on assets (ROA), return on equity (ROE), and Tobin's Q being the measures that are generally used to represent short-term performance (Ararat et al. 2015; Bhagat and Bolton, 2008; Kaczmarek et al. 2012; Masulis et al. 2012; Pham et al. 2011; Welch, 2003), evidence on whether and how the board of directors contributes to firms' long-term survival and prosperity is scarce.

The shift toward examining the link between the board of directors and the firm's long-term performance is more important than ever, following changes in regulations and market initiatives in recent years. In the United Kingdom, the Financial Reporting Council (FRC) published its new Corporate Governance Code in July 2018. The code stresses the role of directors to identify and explain factors that affect the long-term success and future viability of the company (FRC, 2018). In the United States, the S&P Dow Jones Indices' Long-Term Value Creation Global Index, formed in 2016, measures stocks ranking not only on financial quality criteria but also on the ability of firms to survive in the long term (FCLT, 2016). In Australia, the Principles of Good Corporate Governance and Best Practice Recommendations was revised in 2014 to stress the role of boards in providing strategic advice for investment decision making, extending the focus of boards beyond the goal of maximizing shareholder value to the long-term survival and prosperity of the company (ASX, 2014). With increasing attention given to firms' long-term success, investigating the relationship between the board of directors and firms' long-term performance has never been more timely and relevant. This study, therefore, seeks to add to the limited evidence regarding this relationship in the Iran context by examining if board effectiveness contributes to firms' investment efficiency, a key factor that affects firms' long-term survival.

We focus on firm investment efficiency for two reasons. First, firm investment efficiency measures the quality of firm investment decisions regarding resource allocation, which is critical to firm growth and long-term prosperity. Compared to the commonly used firm performance measures, firm investment efficiency is a forward-looking measure of firm performance. Second, firm investment efficiency is the direct outcome of board effectiveness. Being responsible for firms strategic planning, effective boards not only influence firm investment efficiency through monitoring management and maintaining stakeholder relationships, but also work closely with management and directly participate in firm investment decision making (Pugliese et al. 2015).

We look to the organizational behavioral literature that considers the board of directors as a team, and argue that board effectiveness is driven by how well resources can be integrated with a firm's internal processes to produce positive organizational outcomes that are unique to that firm (Barroso et al. 2011; Macus, 2008). In the organizational behavioral literature, the resources that enable the board to resolve a variety of complex tasks competently are referred to as board potential while the internal processes and interactions among directors to integrate resources are referred to as board dynamics. In this study, we develop a composite measure of board potential and board dynamics by using two sets of board characteristics that represent the level of board potential and board dynamics respectively. Specifically, we examine if board potential and board dynamics drive board effectiveness toward investment efficiency.

The contribution of this study is three-fold. The first contribution is to theory. In examining the effects of board characteristics on firm performance, prior studies usually refer to a

particular function of the board. Some studies refer to the monitoring role under agency theory, while others refer to the stewardship role that aligns the goals of the board and managers. Further, the role of the board as a resource provider in line with resource dependency theory is also used in some studies. While these studies provide interesting insights into board characteristics that tend to correlate with firm performance, considering one role of the board at a time provides narrow views on the effects of boards on firm performance (Murphy and McIntyre, 2007). To appreciate that boards can play several roles simultaneously, the present paper looks beyond a single theory and places more emphasis on the adequate configuration of board potential and board dynamics that are involved in board decision processes. We also suggest an approach to measure board potential and board dynamics. By focusing on the configuration of board potential and board dynamics, we provide a greater understanding of the collective functions of boards in firms' investment decision making. The second contribution is empirical. This paper is distinctive in its focus on firms' long-term survival and prosperity. Prior studies have provided rich evidence on how boards influence firms' short-term performance (Christensen et al. 2010; Kiel and Nicholson, 2003; Vafaei et al. 2015; Yermack, 1996). Yet, little is known about how board effectiveness enhances firms' long-term financial success. This study fills this gap in the literature by providing a unique insight into how board effectiveness contributes to firms' longterm performance, emphasizing the view that a forward-thinking perspective must be taken by boards to help firms develop in the long term. Finally, this paper contributes to the growing literature on firm investment efficiency where prior studies have linked it to financial reporting quality (Biddle et al. 2009), disclosure quality (Cheng et al. 2013), accounting conservatism (García Lara et al. 2016), auditors' knowledge and resources (Bae et al. 2017), and managerial ability (García-Sánchez and García-Meca, 2018). To the best of our knowledge, this paper is the first to examine empirically the relationship between board effectiveness and firm investment efficiency. In particular, while García-Sánchez and García-Meca (2018) suggest that boards have an indirect moderating role on the association between managerial ability and investment efficiency, our study establishes that board effectiveness contributes to firm investment efficiency directly.

The remainder of this paper is structured as follows. Section 2 introduces the theoretical framework applied in this study and presents the overarching proposition. Section 3 describes the data and research design. Section 4 presents the results as well as sensitivity tests. Section 5 concludes the paper.

Research development and Theoretical framework

The concept of board effectiveness has attracted considerable attention in accounting and finance literature (Petrovic, 2008). Board effectiveness is defined as the board's ability to add value to a firm through fulfilling its roles (Aguilera, 2005; Nicholson and Kiel, 2004; Psaros, 2009; Pye and Pettigrew, 2005). In the liter ature, three roles have been assigned to the board, and each of them is underlined by a different theoretical perspective (Bennett and Robson, 2004). First, agency theory posits that managers tend to behave opportunistically, thus stressing the monitoring role of the board to avoid such opportunistic behavior (Eisenhardt, 1989; Fama and Jensen, 1983; Jensen and Meckling, 1976). Second, stewardship theory posits that when the goals of the board and managers are aligned, people are motivated to do well and act unselfishly. Thus the role of the board is to support managers in their strategic activities (Donaldson, 1990; Donaldson and Davis, 1991; Muth and Donaldson, 1998). Third, resource dependency theory considers that resources are key to firm success and views the role of the board as a resource provider to the firm (Hillman et al. 2000; Pfeffer, 1972; Pfeffer and Salancik, 1978). Most of the extant literature focuses on one of these three roles and examines the link between board characteristics and firm performance. Despite the preponderance of these studies, a significant number of scholars believe that there is no clear

distinction between these roles. In practice, the board can fulfill several roles simultaneously (Barroso et al. 2011; Hendry and Kiel, 2004; Macus, 2008). Consequently, multi-theoretic perspec tives of boards that consider several board roles simultaneously are encouraged (Daily et al. 2003; Lynall et al. 2003). Macus (2008) proposes a theoretical model that combines various perspectives on board roles as well as board processes. He argues that board effectiveness depends on directors' ability to integrate resources that can be used in order to respond and act competently in the face of various problems and chal lenges. Barroso et al. (2011) refine this concept by suggesting that board effectiveness is driven by two components, namely, board potential and board dynamics. In their work, board po tential includes resources that enable the board to resolve a variety of complex tasks competently while board dynamics are the interactions among directors, and among directors and top management, which bring individual directors' problem-solving potential to bear on a particular task. The more intense the interactions among directors, the better the individual director's knowledge, experience, and social relations can be used. We posit that board potential, as well as board dynamics, drive board effectiveness toward firm investment efficiency. Specifically, the former determines the board's task-solving potential while the latter determines the extent to which board potential can be utilized for investment decision making. We, therefore, examine how board potential and board dynamics affect firm investment efficiency. Notably, board potential is valuable for board effectiveness (Barney, 1991). The distribution of directors' potential with the unique board dynamics in each firm suggests that board effectiveness is het erogeneously distributed across firms. This heterogeneity implies that, first, boards may vary significantly on the level of board effectiveness; second, some board potential may be critical to cer tain firms but not to others; and finally, the investment efficiency equilibrium is different across firms (Barroso et al. 2011).

Conceptually, stock price crash literature is based on the agency framework which focuses on the role of information asymmetry arising due to separation of ownership (i.e. principal) and control (i.e. agent) (Jensen & Meckling, 1976). Owners being outsiders rely on controlling agents (i.e. management) for information to make decisions (Fama & Jensen, 1983; Jensen & Meckling, 1976). Despite being required to provide owners with timely, fair and relevant information, the agents delay the disclosure of information (particularly if it is negative) for an extended period for strategic or non-strategic reasons (Jin & Myers, 2006). However, the managers can only retain this information for a specific time until it has to be released (Jin & Myers, 2006). Upon sudden release of such information, the market reacts negatively, and it causes a large dip in the company's stock price – often referred to as stock price crash. Since stock price crash risk mainly arises due to firm-specific or managerial characteristics, owners cannot mitigate it through portfolio diversification (Kim et al. 2014). Therefore, a growing body of researchers has attempted to explore the factors that encourage/discourages manager to hoard information. In this manner, studies suggest that the stock price crash can arise from the nature of companies' activities and business operations (Habib et al. 2018). For instance, Ben-Nasr and Ghouma (2018) have examined the companies' excessive employee welfare activities and how this can shape stock price crash risk. Their finding indicates that generous employee welfare schemes promote managerial ability to hoard information for an extended period – increasing the stock price crash risk. Similarly, Kim et al. (2014) focused on the companies' CSR commitment and explored whether such commitment deters managers from hoarding negative information, or managers use such commitment intentionally to obfuscate what is really happening. In contrast to the information obfuscation hypothesis, their findings suggest that more socially responsible companies commit to a higher standard of transparency and thus engage less in information hoarding – leading to lower stock price crash risk. More recently, Ben-Nasr et al. (2021) have investigated the role of companies'

general innovation activities on stock price crash risk. Their findings indicate that companies' innovation activities send high-quality signal and reduce propriety information cost, which reduce information asymmetry, enhance disclosure and eventually lead to lower crash risk. We extend such studies and examined the impact of innovation that focused on the generation of a positive effect of companies' operations/services on external environment, i.e. eco-innovation on stock price crash risk.

We argue that eco-innovative firms are susceptible to stock price crash risk for several reasons. Eco-innovative firms may be prone to a higher stock price crash risk because of inherent innovation characteristics that are embedded in eco-innovation.7 For instance, uncertainty, higher capital cost, delayed payback period and high failure-to-success ratio associated with innovation may generate more bad news for such firms, which is a key antecedent of stock price crash risk. Similarly, like any other innovation that aims to provide a competitive advantage to firms, the underlying proprietary information behind eco-innovation may reduce their disclosure ability and thereby increase the stock price crash risk probability. However, despite the aforementioned similarities, eco-innovation has many distinct features from general innovation which make such companies less susceptible to stock price crash risk. First, unlike general innovation, eco-innovation is not much exploratory focused, i.e. radical changes in processes or generation of patent. Rather, it focuses on the incremental development of existing technology or processes/services to reduce corporate environmental externalities. Hence, compared to general innovation, the probability of hoarding information in an eco-innovative firm will be limited. As such the availability of more information for eco-innovation activities may send positive signals to the market and reduce the stock price crash risk. Against this backdrop, Vieira and Radonjičc (2020), specifically investigated whether companies communicate eco-innovation activities. Their finding suggests that a large number of eco-innovative companies disclose information on different types of eco-innovation activities. Other studies have also highlighted the disclosure aspect of eco-innovative firms. For example, Fondevila et al. (2019) found eco-innovation is a key driver for disclosure among Spanish firms. Likewise, García-S´ anchez, Raimo, et al. (2021) note there is a positive relationship between firms' eco-innovation activities and voluntary disclosure.

Second, due to the nature of eco-innovation activities particularly their focus on lowering corporate environmental impact might lead such companies to more institutional shareholders and equity analyst following. The presence of large institutions to ecoinnovative firms is highly plausible due to a significant upward spike in SRI that consider companies' environmental aspects. For example, most recently Eccles and Klimenko (2019) interviewed 70 executives from 43 global investing institutions. Their analysis suggests global investment institutions actively consider environmental footprints of investees who need to decide where to put their money. Similarly, the 2018 report by Global Sustainability Investment Alliance, has noted a 34% increase in SRI asset value (i.e. 30.7 trillion) in 2018 compared to 22.8 trillion in 2016.8 we believe the presence of such institutions makes it difficult for companies to hoard information and thus reduces stock price crash risk. Our inference is based on the documented literature that considers such institutions (i.e. shareholders and equity analyst) a major stakeholder influencing corporate strategies and managerial decisions (Chang, Dasgupta, & Hilary, 2006; McCahery, Sautner, & Starks, 2016). Supporting this, An and Zhang (2013) suggest that institutional monitoring mitigates managerial bad information hoarding and decreases stock price crash risk. Likewise, Kim, Lu, et al. (2019) discovered a significant increase in a firm ex-ante expected stock price crash risk following an exogenous drop in analyst coverage. Based on the above discussion, we expect eco-innovative firms to be less prone to future stock price crash risk and posit the following hypothesis

The role of Environmental innovation on the company's long-term success

Protecting natural resources, preventing global warming, sustainable use of resources, reducing noise and biological pollution are some of the concerns that humanity is suffering from today, and marketing as a science that is always trying to It is identifying and satisfying human needs and desires, it has identified this concern and public need and is trying to satisfy this public need by using tools. In the new century, the main challenge of mankind is to find a fair and sustainable way to produce, consume and live. Environmental issues have become very important in the modern era, and if they are not paid attention to, they may cause many problems. Therefore, companies must significantly reduce their negative environmental impacts in production, distribution, supply of raw materials and energy consumption. Otherwise, they will be pushed back by the laws and the stubborn demand of customers (Pudine-Hajipour et al. 2016). Considering the extensive changes in global and domestic markets, it has become very difficult for cooperative companies to maintain competitive advantages. One of the main factors that has a great impact on maintaining the competitive advantages of these companies is having green marketing strategies. The strategies of Environmental innovation are beneficial in the marketing performance of the company's product. Companies can improve their image and reputation among customers by adopting green action strategies such as environmentally friendly products, pricing, suppliers, advertising, distribution, research and development, and green packaging. Also, an implemented green marketing program increases the sales rate, because it allows companies to access new market segments; Therefore, the strategies of Environmental innovation cause the return of capital of companies (Khalili et al. 2020). Therefore, it can be said that Environmental innovation lead to the long-term success of the company. Based on the first hypothesis of the research, it is as follows.

H1. Environmental innovation has a positive and significant effect on the success of the company in the long term.

Examining the Board influence in the company on the effect of the role of Environmental innovation in the long-term success of the company

It is argued that managers with multiple managements can help companies to obtain necessary resources and reduce uncertainty in investment activities for three reasons. First, being a member of several boards simultaneously allows managers to observe investment decision-making processes and the consequences of those investment decisions, thereby enabling them to have a comprehensive view of the issues. Create strategic and management and produce innovative alternatives and solutions (Carpenter and Westfall, 2001). Second, multiple managements provide managers with timely information about environmental events and trends, as well as the capability and potential of alternative projects (Kur and Sundaramoorthy, 2009), thus reducing the impact of uncertainty in the investment environment. Reduces Regarding board knowledge diversity, the presence and use of knowledge and skills enable the board to make better investment decisions (Chen, 2014; Huang et al. 2014). However, greater diversity of board knowledge may not lead to better investment decisions, as highly diverse boards may suffer from "process losses," i.e. interactional problems that prevent the board from reaching its full potential. (Canella et al. 2008; Forbes and Milliken, 1999). Differences between board directors can slow down decision-making (Baranchuk and Deboig, 2009) and are often associated with ineffective conflict (Chatman and Flynn, 2001; Harrison et al. 2002; Putnam, 2007). In support of According to this view, Gray and Noland (2017) use Australian data and find that shareholders benefit only when boards of directors limit their diversity to a subset of business specializations. The tenure of the board of directors also affects the potential level of the board of directors. The long tenure of the board of directors may have a positive effect on the investment efficiency of the company in three ways. First, long board tenure enables managers to acquire more firm-specific knowledge and skills (Forbes and Milliken, 1999). As

board tenure increases, managers expand their knowledge and experience through learning. Give and improve (Wu et al. 2005), and therefore can better evaluate managers' investment proposals and reject those that may harm shareholder value. Second, long board tenure reflects a high level of board cohesion, which encourages knowledge sharing and encourages directors to participate in group decision-making, thus leading to an effective board. (Forbes and Milliken, 1999). Third, longer board tenure is associated with stronger social and business networks, which may contribute to knowledge-based investment decisions as well as capital generation (Chen, 2011; Rosier and Antonsich, 2007). Achieving investment efficiency requires managers to evaluate complex economic factors. External networks of long-standing managers may provide valuable business advice, assist in technical support, and assist in knowledge acquisition (Field et al. 2013). Board activity usually refers to the frequency of board meetings, which are formal occasions where managers interact with other board members, exchange information and opinions, and make strategic decisions for the company. Lipton and Lorsch (1992) argue that one of the common problems that limit the ability of the board of directors is the lack of time to carry out its responsibilities. Boards that do not or rarely meet are unlikely to make effective decisions (Kanagartnam et al. 2007; Menon and Williams, 1994; Main and Verhoeven, 2013). Using Australian data, Christensen et al. (2010, 2015) found that the number of board meetings is positively related to firm performance. Regarding board size, there are two major schools of thought regarding the relationship between board size and board effectiveness. One school claims that large boards of directors have a potential advantage in their advisory role and have more access to resources (Bone et al. 2007; Goodstein et al. 1994; Kiel and Nicholson, 2003). The other school believes that in small boards, decision makers are faster than in large boards, because their coordination is easier (Chancharat et al. 2012; Lipton and Loresh, 1992). From Hay et al.'s (2020) perspective, larger boards have access to better information to make judgments when evaluating investment projects, and as a result are more likely to make correct decisions. In addition, more intensive discussion among larger board members may lead to the possibility of rejecting bad projects. Based on these arguments, we expect that larger boards have better dynamics that drive board effectiveness toward investment efficiency. On the other hand, board independence refers to the recommendation that the majority of the board of directors of a business entity should be independent directors. The argument is that in a board with more independent directors, the dynamics of the board will be formed in two ways. First, a board with a higher proportion of independent directors is more likely to be heterogeneous in terms of directors' backgrounds and therefore more likely to provide a wider range of views and a wider variety of investment opportunities for the board. Provide board discussion (Kim et al. 2009). Second, it is assumed that the integration of more independent directors in the board of directors may align the risk preference of managers with the shareholders, thus improving the dynamics of the board of directors and avoiding the managerial conservatism that is the "silent killer" of risky projects. But it is potentially avoidable (Sandheim, 2013). Recent studies also show that foreign managers encourage risky innovative projects (Ballsmeier et al. 2017; Lu and Wang, 2017). In the next step, the manager's shareholding is also considered to show the dynamic level of the board of directors. Owning stock in the firm for which directors serve is likely to weaken their identification with the director role and strengthen their identification with the shareholder role, and shift investment strategies toward long-term value creation and competitiveness rather than short-term financial performance. In accordance with this argument, Yermak (2004) shows that director's shareholding has a positive effect on company performance. Also, Bhagat and Bolton (2013) found that the dollar value of director stock ownership is positively related to operational performance. Additionally, firms with more director equity are less likely to engage in value-destroying investments, such as acquisitions; they will

attend. Another factor in board dynamics is board gender diversity. According to the psychological and management behavioral literature, it has been acknowledged that women act differently than men (Byrnes et al. 1999; Crowson and Gnizzy, 2009; Bacha and Azzozzi, 2019). The difference in attitude between women and men shows that their performance as managers of a company may be different. For example, women may provide a fresh perspective on complex issues that can help correct information biases in strategy formulation for venture capital (Faccio et al. 2016; Kim and Starks, 2016; Taylor and Wozniak, 2018). With their male counterparts, female directors are more likely to play active roles on the board by demonstrating collaborative leadership and collaborative skills (Green and Homeroy, 2018; Virtanen, 2012). The literature shows that female directors bring positive effects to the board of directors, such as reducing board conflict (Nielsen and Haas, 2010), and improving the level of public disclosure (Gol et al. 2011), earnings quality (Srinidi et al. 2011), and company performance (Terjesen et al. 2016). Based on these arguments, female managers can inject new dynamics into the board of directors and positively influence investment decisions (Hay et al. 2020). Therefore, according to the theoretical foundations, it is expected that the Board influence (Board potential and dynamics) will have a positive effect on the long-term success of the company (investment efficiency). Based on the second hypothesis of the research, it is as follows.

H2. With the Board influence in the company, the role of environmental innovation on the long-term success of the company becomes more colorful (intense).

The role of Environmental innovation on the company's success in the short term

In recent years, many studies have focused on the company's environmental performance to investigate its determinants and economic consequences (Cormier et al. 2004). One of the most important social responsibilities of the company is environmental performance. Environmental performance is a set of company activities, which are aligned and compatible with the environment; this performance is mainly measured through the criteria and scales determined by the relevant institutions and agencies, both national and international (Sarumpat, 2005). Obviously, no organization can pave the way for sustainable development without paying attention to environmental issues. In developing countries, the natural environment is usually the first part that is damaged in the development process, which quickly undergoes irreparable damage; but the development that is based on the destruction of resources will not last long and its unfortunate consequences will soon appear; It means the loss of valuable natural resources. Since the 60s, companies have realized the importance of social resources, including the environment; in such a way that this importance was revealed in social reporting a decade later. Also, the sudden fluctuations of stock prices in recent years, especially after the financial crisis of 2008, have attracted a lot of attention. These fluctuations generally occur in two ways, falling and growing stock prices; however, due to the fact that investors attach special importance to the return of their shares, researchers have paid more attention to the event of falling stock prices, which causes a sharp decrease in returns, compared to growth (Houghton et al. 2009). According to the research results of Kai and Hay (2014), environmental performance affects the cumulative abnormal return, operating efficiency, stock return and stock price (Kai and Hay, 2014). In fact, environmentally friendly companies by publishing Information related to their environmental performance, they disclose more non-financial information to promote information transparency, and by disclosing such information, information asymmetry between investors and managers is voluntarily reduced; Therefore, such companies have a higher level of quality in financial reporting. Also, investors and financial market analysts can use the non-financial information provided by environmentally friendly companies to evaluate the moral integrity of managers. These companies are likely to avoid hoarding unpleasant news; As a

result, the risk of falling stock prices is lower, or in other words, stock returns are higher (Akhgar et al. 2022). Based on the third hypothesis of the research, it is as follows.

H3. Environmental innovation has a positive and significant effect on the company's success in the short term.

Examining the Board influence in the company on the effect of the role of Environmental innovation in the short-term success of the company

Agency theory and company guidelines suggest a suitable corporate governance system for more transparent disclosure of information about the company. Weak corporate governance leads to a decrease in market confidence. Therefore, examining the pillars of corporate governance is important. Disclosure of information is an important and effective means to support shareholders and therefore the heart of corporate governance. More information disclosure leads to reduction of information asymmetry and conflict of interest between shareholders and management. Different types of information are disclosed in financial reports (Hetai et al. 2012). Environmental disclosure is one of the phenomena used by companies (Gray et al. 2001) and is influenced by different explanatory factors. Many companies communicate with environmental strategies through voluntary disclosure of environmental information (Bremer and Pavlin, 2008). Environmental reporting represents a means of providing environmental information for stakeholders and reflecting environmental performance and corporate issues related to the environment (Shearer, 2002). Based on agency theory, companies are responsible for reporting environmental information, and the disclosure of this information is done for the benefit of shareholders (Bonyamin et al. 2010). (Kurtz and Pencerda, 2010) believe that the disclosure of environmental information is part of the social responsibility of companies and if it causes environmental destruction, it is the responsibility of the companies. Voluntary disclosure is the provision of information beyond legal obligations established by legislative bodies. Companies that voluntarily disclose information that is not required to be disclosed by legislative authorities, try to meet the expectations of market participants, and therefore, by disclosing additional information, they can trade. (Madhani, 2009). Voluntary disclosure is a key complementary mechanism for the corporate governance mechanism and the reporting system that reduces the costs associated with information asymmetry (Gisbert Clemente and Navalas Labat, 2009). Therefore, according to the theoretical literature, it can be said that the board of directors improves the environmental performance, and according to the theoretical foundations presented in the third hypothesis, the board of directors causes an increase in stock returns, so it is expected that the influence The board of directors should increase the influence of the role of Environmental innovation on the company's short-term success (stock returns). Based on the fourth hypothesis of the research, it is as follows.

H4. With the Board influence in the company, the role of environmental innovation on the short-term success of the company becomes more colorful (intense).

Investigating environmental innovation on Stock price risk

Since the risk of falling stock price is mainly caused by the specific characteristics of the company or management, the owners cannot reduce it through portfolio diversification (Kim et al. 2014). Therefore, a growing number of researchers have attempted to identify the factors that encourage or discourage managers to hoard information. In this way, studies show that the fall in stock prices can be caused by the nature of activities and business operations of companies (Habib et al. 2018). For example, Ben Nasr and Ghouma (2018) have examined the excessive welfare activities of company employees and how this can shape the risk of falling stock prices. Their findings suggest that generous employee benefit plans promote management's ability to accumulate information over a long period of time and increase stock price downside risk. Similarly, Kim et al. (2014) focused on corporate social responsibility commitment and investigated whether such commitment prevents managers

from accumulating negative information or whether managers use such commitment intentionally to obscure what is really happening. They do. Contrary to the information ambiguity hypothesis, their findings suggest that more socially responsible firms are committed to a higher standard of transparency and therefore less likely to engage in information hoarding, which leads to lower stock price crash risk. Recently, Ben Nasr et al. (2021) have investigated the role of firms' public innovation activities on stock price crash risk. Their findings show that firms' innovative activities send high-quality signals and reduce the cost of appropriate information, which reduces information asymmetry, increases disclosure, and ultimately leads to reduced crash risk. Based on the fifth hypothesis of the research, it is as follows.

H5. Environmental innovation has a negative and significant effect on the Stock price risk.

Research Method

The implementation steps of the research include collecting the data required for the research from the statistical population in this study, i.e. the data related to the companies listed in the list of financial markets of Iran, then sampling for the research of the subject on the studied sample. After sampling, the stage of modeling the studied variables and identifying dependent and independent variables is to create the desired model of this research. After the construction of the statistical model, the analysis of the multivariate regression model with time series data is done. And the results of this analysis are analyzed. The statistical population is the companies admitted to the Tehran Stock Exchange in the period from 2014 to 2019. Sampling in research is done randomly. Companies accepted in Tehran Stock Exchange in the period of 2014 to 2019. In this research, the systematic elimination sampling method was used to select the statistical sample. According to this method, conditions are considered for sample selection, which include:

1. The end of the financial year of the companies should be the end of March and during the time period for data collection (2014 to 2019) there was no change in activity or financial year.

2. The selected companies are not part of banks and financial institutions, investment companies, financial intermediaries, holding and leasing companies, and must be productive.

3. The information required in this research regarding the companies should be available from 2014 to 2019.

4. Be admitted to the Tehran Stock Exchange before 2014 and be present on the stock exchange until the end of 2014.

The data required for this research is collected from the financial reports and other published reports of the companies admitted to the Tehran Stock Exchange on the codal website and the website of the stock exchange organization. The multivariable regression model is used to analyze the results of this research and the correlation and examination of the relationship between the effectiveness of the board of directors on the success of the company in the long term, and the method of ordinary least squares is used to estimate the parameters of the problem, and at first, to identify and state the observations related to each variable, it is analyzed descriptively. The descriptive characteristics of each variable have been evaluated in the descriptive analysis section.

The First and Second Hypothesis Test Model

The test model of the first and second hypothesis of the research follows the researches of Hay et al. (2020) and Astiot et al.

Model (1)

$$= \beta_0 + \beta_1 ECO - Innovation_{it} + \beta_2 Board\ Efficiency_{it} + \beta_3 ECO - Innovation_{it}$$
$$\times Board\ Efficiency_{it} + \sum_{i=1}^{13} CONTROL_{it} + \varepsilon_{it}$$

The Third and Fourth Hypothesis Test Model
The test model of the third and fourth hypothesis of the research follows the researches of Hay et al. (2020) and Astiot et al.
Model (2)

$$
\begin{aligned}
Short - Term\ Success_{it} &= \beta_0 + \beta_1 ECO - Innovation_{it} + \beta_2 Board\ Efficiency_{it} + \beta_3 ECO \\
&- Innovation_{it} \times Board\ Efficiency_{it} + \sum_{i=1}^{13} CONTROL_{it} + \varepsilon_{it}
\end{aligned}
$$

The Fifth Hypothesis Test Model
The test model of the fifth hypothesis of the research follows the research of Zaman et al. (2021) as described in model (3).
model (3)

$$
StockPiceCrash_{it+1} = \beta_0 + \beta_1 ECO - Innovation_{it} + \sum_{i=1}^{13} CONTROL_{it} + \varepsilon_{it}
$$

The way to measure the variables is as follows.
The dependent variables: Long-Term Success: The first dependent variable of this research is long-term success. The success of the company in the long term is estimated by following the research of Hay et al. (2020) using the investment efficiency model. In this research, the absolute value of the residual of the Richardson model (2006) is used to calculate the investment efficiency. Positive residuals (positive deviation from expected investment) indicate the selection of projects with negative net present value or overinvestment, and negative residuals (negative deviation from expected investment) indicate passing on investment opportunities with positive net present value or, in fact, underinvestment. (Li and Wang, 2010; Das and Pandit, 2010). Therefore, the higher values of the absolute value of the residual value of the model indicate the inefficiency of the investment, as a result, the values of the absolute value of the residual value of the model are multiplied by negative one (1). This model is fitted cross-sectionally.
Model (4)

$$
Inv_{it} = \beta_0 + \beta_1 Grow_{it-1} + \sum_{i=1}^{13} CONTROL_{it-1} + \varepsilon_{it}
$$

Where in:
Inv: change in fixed assets, long-term investments, and intangible assets divided by the average total assets of firm i in year t.
Grow it-1: the sales growth rate of company i in year t-1.
Control t-1: control variables that include:
Levit-1: financial leverage of company i in year t-1 (the ratio of total liabilities to total assets)
Ageit-1: Age of company i in year t-1.
Cashit-1: cash ratio (cash plus short-term investments divided by average assets in year t-1).
Sizeit-1: Company size (natural logarithm of total assets in year t-1).
Retit-1: Annual return on stock of company i in year t-1.
Short-Term Success:
The second dependent variable of this research is short-term success. The success of the company in the short term is estimated by following the research of Hay et al. (2020) using stock returns.

Stock Price Crash Risk: The third dependent variable of this research is the risk of stock price crash.

According to Habib's research (2016), if the share price of a company has fallen sharply in the period under review, the share price of that company has fallen in that period.

Since the sharp drop in stock prices may be the result of a general drop in prices in the market, one should also pay attention to the general state of the market and should mean a sharp drop in stock returns compared to market returns (Habib, 2016).

Based on this, in the present study, it has been used to measure the probability of the company's stock price falling according to the study of Chen et al. (2001).

This variable is the negative conditional skewness (NSKEW) which is introduced as a dependent variable in Bentley et al.'s combined strategy index (2013) and Habib's research (2016). Both of these criteria are based on the expected weekly return at the level of the company's activity.

The remaining value shows the influence of the market model, which is to ensure the suitability of the factors related to the company's activity to show the risk of the stock price falling and its lack of influence from the general market movements. First, relation (5) fits.

Model (5)

$$r_j\tau = \alpha_j + \beta_1 j\, rm_{\tau-2} + \beta_2 jrm_{\tau-1} + \beta_3\, jrm_\tau + \beta_4\, jrm_{\tau+1} + \beta_5 jrm_{\tau+2} + \varepsilon j_\tau$$

In the above relation:

rjt: weekly return of the company

rmt: weekly market return

T-1: month-year

In this regard, rj,τ is the return of company j in week t, and rm,τ is the weighted average return of the CRSP market in week .

In this situation, the return based on the market index in the current time and in the past is included in the equation in order to include the effect of non-simultaneous transactions in the model (Dimson, 1979).

The weekly return based on company activity for company j in week τ (Wj τ) is calculated based on the natural logarithm of one plus the residual return resulting from equation (1). In other words, the remainder of the above relationship shows the company's specific return to the market, which will be used to bring their distribution closer to the normal distribution.

Equation (1)

$$W_{it} = Ln(1 + \varepsilon_{it})$$

In relation (6), Wit represents the specific return of the company. According to this definition, under the assumption of normality of the specific return distribution, the period of collapse is a period during which the standard deviation of the specific return of the company is less than the average of the specific return of that company.

In model (3), each of the observations related to the company-year must have at least 26 cases of weekly stock returns.

The measure of stock price risk (NCSKEW) is the negative conditional skewness of the weekly return at the level of the company's activity during the financial year.

The NCSKEW measure represents the negative skewness of the company's specific monthly return (Wit).

This criterion has been calculated by using negative values related to the weekly return related to the company's activity for each year and has been standardized and homogenized according to the standard deviation of the weekly return to the power of three.

Specifically, for each firm j in year τ, NCSKEW is calculated through equation (2).

Equation (2)

$$NCSKEW = -\frac{\left[\dfrac{n(n-1)^{3/2}}{\sum w_{j\tau}^3}\right]}{(n-1)(n-2)\left(\sum w_{j\tau}^2\right)^{3/2}}$$

In this regard, n is the number of months in which the return will be calculated.

Independent variable:

Environmental innovation (ECO-Innovation): Environmental innovation aimed at reducing environmental impacts and improving financial performance has been accepted among companies around the world. The indicators of pollution prevention, green supply management, and green product development are the effects of environmental innovation that companies adopt if they comply with the National Standards Organization of Iran ISO 14001. Based on this, in the present research, following the research of Astiot et al. (2021), the variable of environmental innovation is measured virtually, and if the company has ISO 14001 standard, it is given a number of one and otherwise, a number of zero.

Modifier variable:

The Board influence in the company (Board Efficiency): The Board influence in the company is estimated using two variables: the potential of the board of directors and the dynamics of the board of directors. The potential of the board of directors is estimated by using the diversity of knowledge of the board of directors and the tenure of the board of directors and the multiplicity of duties of the board members. Board dynamics is estimated using board activity, board size, board independence, director's share percentage and gender diversity. Each of these eight board characteristics (diversity of board knowledge and board tenure, multitasking of board members, board activity, board size, board independence, director share percentage, and gender diversity) are measured by company-year. Each of these board characteristics is then ranked in quantiles per business and year. Observations in the highest quantiles are marked with a score of 5 and so on, while observations in the lowest quantiles are marked with a score of 1. Scores, in three (five) parameters, are aggregated by company-year for board potential (board dynamics) so that each company can receive a range of 3 to 15 (5 to 25) for board potential (board dynamics), members the board is influential. If a company receives 3 to 15 points from the potential of the board of directors and 5 to 25 points from the (dynamics of the board of directors), a number of one will be assigned, otherwise, a number of zero will be assigned.

Control variables:

Financial reporting quality (FRQ): standard deviation of the regression residuals ΔWC_t on CFO_t, CFO_{t-1}, CFO_{t+1}, $\Delta Sales_t$ and net PPE for year t-5 to t-1 divided by total assets.

Ownership Concentration (SUBSHA): The percentage of total shares held by major shareholders who own more than 5% of a company's outstanding common stock.

Firm Size (FSIZE): The natural logarithm of total market capitalization

Tangible assets (TANGI): net value of property and assets divided by total assets

Volatility of circulating cash flow (VOL_OCF): Standard deviation of circulating cash flow for year's t-1 to t-5 divided by the average of total assets.

Sales Volatility (VOL_S): Standard deviation of sales for year's t-1 to t-5 divided by the average of total assets.

Age of the company (F_AGE): history of the company's activity in the stock market.

LOSS: A dummy variable that is equal to one if the profit is negative and zero otherwise

Financial leverage (LEV): total liabilities divided by total assets

Cash flow (CASH): ratio of cash to total assets

Research findings

Descriptive Statistics

After collecting the data and calculating the variables used in the research, the descriptive parameters of each variable were calculated separately and the results can be seen in Table (1) that these parameters include information related to central indicators such as average, median, minimum and maximum. And also the information related to dispersion indices such as standard deviation and skewness coefficient.

Table (1): Descriptive Statistics

Variable name	mean	median	maximum	minimum	standard deviation	skewness coefficient
Environmental innovation	0.10	0	1	0	0.30	1.67
Long-Term Success of the company	0.01	-0.03	1.24	-0.45	0.16	0.56
Short-Term Success of company	0.69	0.12	0.60	-0.45	1.30	1.51
Stock price risk	-0.31	0.27	3.57	-3.86	2.03	-0.30
The Board influence in the company	0.57	1	1	0	0.50	-0.29
financial reporting quality	0.01	0.01	0.98	-0.67	0.17	0.65
Concentration of ownership	0.76	0.79	0.98	0.12	0.14	-1.26
size of the company	13.59	13.58	15.25	11.91	.76	-0.02
Tangible assets	0.24	0.19	0.93	0.08	0.18	1.91
Fluctuations in circulating cash flow	0.76	0.58	1.68	0.15	0.57	1.31
Sales fluctuations	0.22	0.16	1.70	-0.93	0.39	0.63
Life of the company	3.05	3.04	3.98	2.48	0.32	0.66
damaging	0.21	0	1	0	0.12	-1.19
Financial Leverage	0.54	0.59	0.82	0.02	0.22	0.85
Cash flow	0.14	0.12	0.53	0.01	0.12	1.69
Descriptive statistics of dichotomous variables						
Variable name		Abundance		Frequency		
Environmental innovation		73		0.10		
The Board influence in the company		436		0.57		
damaging		160		0.21		

Inferential statistics

Relying on statistical results without considering the assumptions of the regression model is not very valid and cannot be used for making decisions.

Therefore, in this research, in order to achieve the developed goals, it is necessary to estimate the collected data and use a model that expresses these goals and their relationship, but it is necessary to analyze the data of each of the stated models.

Before processing them and testing the hypotheses, the classical assumptions of the model should be tested. One of the classic statistical assumptions is the homogeneity of the variance of the residuals, which is considered one of the basic hypotheses of any relationship, it is also necessary to perform the necessary statistical tests to explain the type of data in order to determine whether the data is tabular or consolidated and in If the type of data is detected as a panel, the type of its effects should be specified. To investigate the hypothesis of heterogeneity of variance in this research, White's test was used, the results of which are presented in Table (2):

Table (2): The results of the regression assumptions test

Model	Hausman test		Limer's F test		heterogeneity of variance test	
	Significance level	Test statistics	Significance level	Test statistics	Significance level	Test statistics
First	0.001	3.14	0.0001	2.19	0	36.81
Second	0	2.66	0	8.97	0	703.7
Third	0.0337	1.92	0.0009	3.65	0.0015	23.35

The results shown in Table (2) show that the probability statistic calculated in White's test for the research models is less than the error level of 0.05, which indicates the heterogeneity of variance and the estimation method of these models is generalized square regression. In connection with the type of data estimation, the results of Limer's F test for three models are less than 0.05 level, based on these results, the null hypothesis of the data is rejected and the data is estimated as a panel. According to Limer's F test, it is necessary to perform the Hausman test to determine the type of panel data. As can be seen in picture (2), the result of the Hausman test for the research models shows that the significance value in the Hausman test is less than 5%, as a result of these models on the target variable based on the panel data approach with fixed effects. It is estimated, then, considering the results of statistical pre-tests, the main model of the research is estimated.

Estimation results of research models

Based on the results of Limer's F test, the estimation of the research models can be estimated based on the panel data approach with fixed effects, but considering that the first and second models are estimated to calculate the dependent and independent variables and require the estimation of the tests These tests were done, so the analysis of the estimation results of the main research model will be done in the following. As can be seen in Table (3), the results indicate that the probability value of the regression F statistic for the main research model is less than 0.01, which can be said to be significant and valid at the 99% confidence level. Based on these results, the Durbin-Watson statistic for the research model is between 1.50 and 2.50, and the adjusted coefficient of determination for the models shows that the independent and control variables of the research model explain the changes of the dependent variable through the regression model to the mentioned extent.

Table (3): Results related to the estimation of the first research model

variable	coefficient	t-statistic	Prob
ECO−Innovation	0.008	3.68	0.00
Board Efficiency	0.25	11.29	0.00
ECO−Innovation* Board Efficiency	0.10	19.18	0.00
FRQ	0.01	0.62	0.52
SUBSHA	0.01	1.64	0.09
FSIZE	1.48	2.56	0.01
TANGI	0.05	0.94	0.34
VOL_OCF	-0.47	-2.87	0.00
VOL_S	-0.72	-1.69	0.08
F_AGE	5.90	4.81	0.00
LOSS	-0.07	-0.15	0.88
LEV	-1.31	-1.66	0.09
CASH	0.29	0.51	0.60
C	-0.85	-0.88	0.37
F statistic		D-W	R2

variable	coefficient	t-statistic	Prob
22.47	0.00	2.02	0.61

Table (4): Results related to the estimation of the second research model

variable	coefficient	t-statistic	Prob
ECO−Innovation	0.04	2.03	0.04
Board Efficiency	0.010	6.005	0.00
ECO−Innovation* Board Efficiency	0.08	2.49	0.01
FRQ	0.003	1.087	0.27
SUBSHA	0.09	4.67	0.00
FSIZE	0.008	0.38	0.69
TANGI	0.03	1.62	0.10
VOL_OCF	-0.03	-2.65	0.00
VOL_S	-0.02	-1.67	0.09
F_AGE	1.23	2.27	0.02
LOSS	-0.28	-6.007	0.00
LEV	-0.13	-1.15	0.24
CASH	1.84	4.39	0.00
C	0.94	1.08	0.27
F statistic		D-W	R2
18.35	0.00	2.03	0.52

Table (5): Results related to the estimation of the tried research model

variable	coefficient	t-statistic	Prob
ECO−Innovation	-1.23	-2.27	0.02
FRQ	-0.28	-6.007	0.00
SUBSHA	-0.13	-1.15	0.24
FSIZE	-1.84	-4.39	0.00
TANGI	-0.94	-1.08	0.27
VOL_OCF	-0.73	-1.26	0.20
VOL_S	-0.152	-0.25	0.79
F_AGE	-0.32	-0.63	0.52
LOSS	0.03	2.97	0.00
LEV	0.002	0.93	0.35
CASH	0.02	-1.68	0.09
C	3.90	4.93	0.00
F statistic		D-W	R2
42.25	0.00	2.08	0.54

Discussion and conclusion

As mentioned, the first hypothesis of the research seeks to answer the question whether environmental innovation has a positive and significant effect on the company's success in the long term or not. As can be seen in Table (3), the calculated coefficient for the environmental innovation variable is 0.008 and shows that the relationship between the two variables is direct, also considering that the significance level calculated for the environmental innovation variable is equal to 0.0002 is, as a result the null hypothesis was not rejected and with 95% confidence it can be acknowledged that environmental innovation has a positive and significant effect on the success of the company in the long term, as a result the first hypothesis of the research is confirmed. In addition, the second hypothesis of the research seeks to answer the question whether with the Board influence in the company, the role of environmental innovation on the long-term success of the company becomes more

colorful or not? As can be seen in Table (3), the estimated coefficient for the interaction effect variable of environmental innovation and the Board influence in the company is 0.106 and shows that the relationship between the two variables is direct, also considering that the value of the significance level calculated for the environmental innovation variable is equal to 0.0000, as a result the null hypothesis is not rejected and with 95% confidence it can be acknowledged that with the Board influence in the company, the role of environmental innovation on the long-term success of the company becomes more colorful (intense), in The result of the second hypothesis of the research is confirmed. In addition, the third hypothesis of the research seeks to answer the question whether environmental innovation has a positive and significant effect on the company's success in the short term or not? As can be seen in Table (3), the calculated coefficient for the environmental innovation variable is 0.045 and shows that the relationship between the two variables is direct, also considering that the significance level calculated for the environmental innovation variable is equal to 0.0421 As a result, the null hypothesis was not rejected and with 95% confidence it can be acknowledged that environmental innovation has a positive and significant effect on the success of the company in the short term, thus the third hypothesis of the research is confirmed. In addition to this, the fourth hypothesis of the research seeks to answer the question of whether the role of environmental innovation on the short-term success of the company becomes more colorful (intense) with the Board influence in the company or not? As can be seen in Table (3), the estimated coefficient for the interaction effect variable of environmental innovation and Board influence in the company is 0.083 and shows that the relationship between the two variables is direct, also considering that the value of the significance level calculated for the environmental innovation variable is equal to 0.0126, as a result the null hypothesis is not rejected and with 95% confidence it can be acknowledged that with the Board influence in the company, the role of environmental innovation on the short-term success of the company becomes more colorful (intense), in The result of the fourth hypothesis of the research is confirmed. Finally, the fifth hypothesis of the research seeks to answer the question whether environmental innovation has a negative and significant effect on the Stock price risk or not? As can be seen in Table (3), the estimated coefficient for the environmental innovation variable is -1.23 and shows that the relationship between the two variables is negative, also considering that the significance level calculated for the environmental innovation variable is equal to is 0.0231, as a result the null hypothesis is not rejected and with 95% confidence it can be acknowledged that environmental innovation has a negative and significant effect on the Stock price risk, as a result the fifth hypothesis of the research is confirmed.

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