The Effect of Risk Disclosure on Investment Efficiency: An Applied Study

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Abstract

The purpose of the research: This study aims to investigate the effect of corporate risk disclosure (RD) on investment efficiency in the Egyptian environment. Data and materials and methodology: The researcher conducts an applied study using a sample of 376 firm-year observation from Egyptian firms listed on EGX100 after excluding the banking sector and insurance companies due to their special accounting nature in the time period 2017-2022 in order to avoid the negative effects of inflation in the Egyptian market. The researcher uses content analysis to calculate a risk disclosure index (RDI) from annual reports and studies how it impacts the efficiency of investment in companies. Results: The results demonstrated a significant positive effect of RD on investment efficiency, where RD decreases the underinvestment and increases the overinvestment which leads in sum to more investment efficiency. These results are consistent with some of the theories and previous studies that confirmed the role of RD in enhancing investment efficiency.

Keywords: Risk disclosure- Investment Efficiency- Overinvestment- Underinvestment.

1. Introduction

This study was guided by the agency theory which tends to address the issue of information asymmetry that leads to conflicts and divergent interests between the principals (shareholders) and the agent (manager) which often prompts managers to engage in opportunistic behavior attempting to influence investor perceptions for their private benefit (Ozkan , 2007).

One concern related to agency problem is the investment decisions made by the management. Shareholders desire managers to undertake projects that maximize the company's overall value. However, managers, whose compensation is linked to accounting profits, compare their personal benefits against the costs of investment decisions. Consequently, the decision to undertake or abandon a project is determined by comparing the benefits and costs associated with the project execution or abandonment as managers abuse the delegated administrative authority assigned to them by making investment decisions that maximize their personal interests at the expense of the shareholders' benefits which leads to overinvestment especially when there are available free cash flows and managers exceed the optimal investment level by exploitation of the this ample cash flows in poor performance projects with a negative net present value instead of returning it to shareholders.

Moreover, managers might reject investing in profitable projects with positive net present value because most of these projects yield their benefits in the later years of the project life. By that time, the current management may have retired, and a new generation of managers has emerged, prompting the current management to focus on short-term performance and choose projects with short-term gains which results in destroying company's long-term value and threatens its sustainability in the business world (Jensen, 1986); (Biddle *et al*., 2009); (Houcine, 2017).

On the other hand, the asymmetry of information resulted from agency problem creates the adverse selection problem. This problem occurs when management issues securities (stocks or bonds) to investors at a market value higher than the true value (lemon's problem) (McLean & Zhao, 2014); (Graham & Harveya, 2014); (Biddle et al., 2009). This can either lead to the management's success in obtaining additional funds from issuing stocks at inflated prices, utilizing their available free cash flows for risky or poor performance projects with a negative net present value leading to overinvestment problem. Or alternatively, it may result in management's failure to execute its plans due to investors refraining from investing in the company's stocks, sensing the risk to their investments. This could prompt investors to either limit their investment size or demand higher interest rates on their investments, thus increasing the cost of external financing. Consequently, companies may be forced to abandon projects with positive net present value due to the constrained ability to raise the necessary funding for investment at a reasonable cost, leading to underinvestment problem (Myers & Majluf, 1984); (Biddle et al., 2009); (Abdelmageed & Al sayegh, 2015).

Agency theory posits that, in order to alleviate information asymmetry and agency conflicts between management and shareholders, there is a need for companies to disclose more risk information (Lambert, 2001; Buckby et al., 2015; Neifar & Jarboui, 2018).

RD alleviates information asymmetry and agency costs by lowering the risk of the adverse selection problem (Tan et al., 2017; Togok et al., 2016). Elzahar & Hussainey (2012) confirms that providing reliable information about risk by the management (the insider who has risk information) to the investors and debtholders (the outsiders who usually do not have that information) will reduce information asymmetry problem. Lajili & Zeghal (2005) indicated that RD improve disclosure quality and promote transparency by reducing information asymmetries.

Al-Hadi et al. (2017) revealed that Market RD reduces information asymmetry, limits the opportunistic behavior of firm managers and improves managerial decision making regarding investments.

Neifar & Jarboui (2018) have provided practical evidence on the critical role of risk disclosure as it contributes from the standpoint of agency theory to solve the problems of adverse selection and moral hazards that arise within the framework of the relationship between managers and owners by limiting conflicts of interest.

Nahar et al. (2016) confirmed that RD enhances companies' financial flexibility, thereby diminishing the investors' demand for extra information by lowering information asymmetry and agency costs, leading to a decrease in the retention of cash, and other cash that is kept for hedging purposes.

From this perspective, the underlying reason behind the increased interest in the issue of RD is thus the willingness of shareholders to solve the problem of information asymmetry due to the separation of companies' ownership and management, consequently alleviating the problems of moral hazard and adverse selection which are the key obstacles against achieving investment efficiency.

Furthermore, previous researches revealed that the occurrence of several significant corporate scandals, involving Enron and WorldCom, along with the global financial crisis of 2008, were primarily stemmed from the failure to apply effective frameworks for corporate governance, particularly the failure to develop proactive risk anticipation strategies, and inadequate or insufficient RD in corporate annual reports (Buckby et al., 2015; Drogalas & Siopi, 2017; Tan et al., 2017; Quick & Gauch, 2021; Kashani & Shiri, 2022; Jiang et al., 2023). This corporate scandals and the COVID-19 pandemic have underscored the ongoing risks companies and their shareholders encounter which have additionally focused stakeholder attention on the importance of RD.

Unfortunately, the Egyptian environment suffers from insufficient RD practices, especially non-financial RD, as well as suffering from the existence of a so-called "risk information" gap between financial statement preparers and users (Mokhtar & Mellett, 2013), as there is no established accounting standard governing RD including both financial and non-financial

aspects, and specifying the minimum level for such disclosures, leading to inconsistencies and often insufficient level of RD in the financial reports. The mandatory disclosure of risks in its current condition fall short of addressing the comprehensive needs of financial report users, overlooking numerous financial and non-financial elements, and not keeping pace with the increased demands for information by stakeholders.

Based on the foregoing, the study problem can be formulated in the following question:

What is the effect of risk disclosure on investment efficiency?

2. Literature Review and Hypotheses Development:

Khan et al. (2021) examined the effect of RD level and quantity on investment efficiency as well as investigating voluntary and mandatory RD and its effect on the investment efficiency. The results revealed that RD plays a critical role in reducing both overinvestment and underinvestment particularly in high opacity, large firms and financially distressed firms. Additionally, the results indicated that while the higher level of RD enhances investment efficiency, excessive quantity of RD can lead to inefficient investment. Furthermore, the study also differentiated between the effect of mandatory and voluntary RD, showing that voluntary RD are associated with higher investment inefficiency and attributed this result to the fact that investors interpret increased voluntary RD as a signal of heightened uncertainty, potentially prompting them to withdraw their investments or demand compensation thereby reducing investment opportunities and causing investment inefficiency. On the other hand, the result indicated that mandatory RD doesn't affect investment efficiency, as investors perceive it as a regulatory compliance rather than a reflection of underlying uncertainty.

Chen et al. (2017) examined the relation between voluntary non-financial disclosure and investment efficiency as well as examining the moderating effect of corporate governance on that relationship. The results indicated that voluntary non-financial disclosure has a significant positive association with investment efficiency for strong corporate governance firms and an insignificant relation for companies with weak corporate governance. The study attributes this result to good corporate governance which constrains managerial opportunistic behavior and thus enhancing the credibility, confidence and value relevance of voluntary non-financial disclosure thus outside investors can employ these disclosures to effectively monitoring the management, mitigating overinvestment and underinvestment and thus achieving higher investment efficiency.

Al-Hadi et al. (2017) investigated how market risk disclosures (MRDs) impact the investment efficiency. The findings reveal a significant and negative correlation between (MRDs) and both underinvestment and overinvestment tendencies, particularly amplified in larger firms. The study attributed these results to the fact that MRDs mitigate information asymmetry and moral hazard issues, limit the opportunistic behavior of firm managers and improve managerial decision making regarding investments, ultimately enhancing investment efficiency.

Ali & Konishi (2005) indicated that RD encourages better risk management, guarantees equal treatment for all investors and enhances investor protection, improve accountability for

stewardship, improve financial reporting usefulness and reduce the cost of capital. Tan et al. (2015) and Athanasakou & Hussainy (2014) found that disclosing future information (including RD) represents one of the key determinants of financial reporting quality, as it enhances the supervisory role of shareholders on managers' performance, and contributes in improving the company's reputation and its relationship with stakeholders, which is reflected in an increase in investment efficiency. In this context, Biddle et al. (2009), Hewitt et al. (2014) and Houcine et al. (2022) emphasized that financial reporting quality is positively associated with investment efficiency by mitigating information asymmetry, adverse selection, ethical risks, improves liquidity and facilitating financing long - term and high - return investment projects. Moreover, Hewitt et al. (2014), Boubaker et al. (2014), Li & Wang (2010) highlighted that high - quality financial reports could restrict managerial incentives to engage in value destroying activities such as empire building in companies with abundance capital by enhancing the board of directors' ability to control management's activities, allows investors to better monitor managerial investment decisions, reinforcing shareholders' supervisory capabilities over managers, this creates a supervisory role in the capital market in a way that contributes to reduce agency problems and external financing costs, facilitates writing better contracts that prevent inefficient investment, improve management performance when choosing among investment projects. This ultimately reinforces investment efficiency. Bens & Monahan (2004) call this the monitoring effect of disclosure.

Elzahar & Hussainy (2012) confirmed that the quality of RD may contribute to enhance risk management as well as improving transparency, oversight, investor protection and reporting quality, which may be reflected in the efficiency of investment. In this context, García-Sánchez & García-Meca (2018) emphasized that enhancing and strengthen investor protection mechanisms contributes in solving underinvestment problem by reducing agency costs of monitoring and controlling the management behavior as well as encouraging investors to provide their money to companies, which in turn helps managers better accessing to more external financial resources, implementing profitable projects and thus, improving investment efficiency.

Beretta & Bozzolan (2004) indicated that RD would positively affects the accuracy of analysts' expectations regarding the firm's value and profits, and confirmed that disclosing risk information especially future information will contribute to improve corporate governance. In this context, Lajili & Zeghal (2005) and Alzead & Hussainey (2017) confirmed that RD is a key element in corporate governance, as RD helps investors and stakeholders in evaluating the company's future performance and judging the management's ability and efficiency to face risks and provide appropriate solutions without affecting the firm's market value. Kashani & Shiri (2022) indicated that sound corporate governance can reduce agency conflict, information asymmetry, agency costs and information search costs and increase information transparency and allows investors to experience fewer investment errors, ensure that while a company's managers

have the incentive to make their own profits, they attempt to increase the interests of investors and the firm value and finally positively affects investment efficiency.

Chang et al. (2014) indicated that future information disclosure (including RD) contributes in reducing asymmetric information between the management and capital suppliers, which in turn leads to reduce the cost of external financing, increase liquidity, enhance resources allocation efficiency, improve the accuracy of financial analysts' forecasts.

In this context, Brogaard et al. (2019) indicated that financial analysts coverage can positively affect investment efficiency through:

- Increase gaining of information, which improves information characteristics, which represent an input for administrative decision-making.
- Enhances corporate governance, which mitigates the problem of moral hazard.
- Alleviating financial constraints that provide sufficient financial resources to implement successful projects.

Maredi (2021) stated that transparent RD boosts confidence in the firm's management and attract debt and equity investors.

Elshandidy & Neri (2015) claim that disclosing risk exposures might reduce investors' uncertainty related to future cash flows, which reduces as a result their risk premiums. In this context, Tan et al. (2017) confirmed that decreased risk premiums lead to a lower required rate of return, which is widely used in practice as a discount factor for investors' future cash flows.

(Linsley & Shrives, 2006) emphasized that if the management wants to reduce the cost of external finance by increasing market confidence, it must disclose risk information, as this step will lead to reduce the problem of information asymmetry between investors and managers and thus improving investor relations and corporate governance. In this context, Schleicher et al. (2010) indicated that high information asymmetry is one of the main obstacles that hinders achieving investment efficiency, increases the difficulty of obtaining external capital to finance profitable investment opportunities, thus increases the management's dependence on internally generated cash flow (investment sensitivity to internally generated cash flow) and consequently investment inefficiency.

Adamu (2013) confirmed that providing adequate RD will enable investors to include these risks in the context of their investment valuation and thus reduce excess demand that can make the share price dangerously higher and thus achieve accurate valuation of stocks.

Miihkinen (2013) emphasized that RD could be informative and useful for investors by providing direct information on a firm's risk profile, which in turn affect investors' assessments of expected cash flows, predicting stock returns, as well as enhancing the financial market efficiency.

Mokhtar & Mellett (2013) stated that RD should include both good news about business opportunities and risk management systems to reassure investors, reduce the cost of capital and avoid damage to the company's reputation, as well as disclosing bad news to avoid litigation

processes as a result of withholding information and misleading the users. In this context, Linsley & Shrives (2006) mentioned that directors usually withhold bad news because they wouldn't like to signal a negative image of their management. However, withholding bad information may be more dangerous on the company's image than if the information was disclosed and may raise suspicions about the management and its integrity, leading to damage their reputations. Rather, directors can disclose bad news and attribute it to external factors out of their control and therefore deflect blame away from their own management actions and abilities (Mohobbot, 2005).

Neifar & Jarboui, (2018) have provided practical evidence on the importance of RD as it contributes from the perspective of agency theory to solve the problems of adverse selection and moral hazards that arise within the framework of the relationship between managers and owners by limiting conflicts of interest.

Watts & Zimmerman (1986) stated that under agency conflicts, given that managers enjoy sufficient latitude in applying the generally accepted accounting principles, they are likely to have motives and ability to take actions that maximize their own interest, even if those actions don't maximize owners' wealth.

Jensen (1986) revealed that the problem of moral hazard leads to investment inefficiency if the party that owns the information (management) seeks to achieve personal interests, and uses fraud to cause losses to the other party, the management may manipulate the earnings per share, thus investment in this stock becomes more attractive to shareholders, so it is bought even if at a high price, as shareholders lack awareness about this manipulation due to the existence of an information gap between the shareholder and management, which leads to provide additional funds to the management. The management uses those additional funds to finance investment projects with a negative net present value, which in turn leads to waste the company's resources and sinking its funds into idle projects, leading to overinvestment (which always reflects the severity of agency conflict between shareholders and managers).

Chang et al. (2014), McLean & Zhao (2014), Graham & Harveya (2014), Biddle et al. (2009) indicated that various models of the adverse selection problem state that if managers have more information about investment opportunities available to the company than the investors, then these managers will attempt to control the issuance time of the equity shares in order to issue these shares at a price higher than their nominal value (lemon's problem). If the managers succeed in this, they may overinvest these proceeds, which prompts investors to reduce providing their funds to the company if they realize a threat to their investments. It eventually results in restricting the company's ability to get the necessary financing, and restricting management's freedom to invest, and thus under-investment.

In this context, Ferrero et al. (2016) suggested that the capital provider doesn't have the ability to properly evaluate the company's performance, which causes him to refrain providing the necessary capital to finance profitable projects, in case of believing that the company's

performance is weak, leading to an underinvestment, or an overinvestment occurs if the financing provider believes that the company's performance is good, contrary to the truth.

Myers & Majluf (1984) show that if the company needs to raise capital to finance an existing project with positive net present value, managers may refuse to raise funds at a discounted price even if this means missing profitable investment opportunities, as a result, this problem leads to investment inefficiency, as well as it contributes in reducing the efficiency of the company's resource allocation.

Through reviewing previous studies, the researcher concludes that there is a significant consensus among previous studies on the urgent need for RD practices - in context of the expansion of voluntary nonfinancial disclosures - by governments, regulatory agencies, professional organizations, investors and other reports' users in RD especially after the occurrence of a number of significant corporate scandals and the global financial crisis in 2008.

In addition, previous studies highlighted that the underlying reason behind the increasing demand by stakeholders to enhance RD is their willingness to mitigates agency conflicts due to the separation between ownership and control, as well as the divergent objectives between shareholders and managers and the subsequent asymmetric information between them, thereby restricting managerial opportunistic behavior and ensuring that managers act in the interest of investors as well as forcing them to keen on maximizing investors' interests and firms' value by monitoring management's actions, early detecting wasteful investment ultimately leads to efficient investment decisions whether by diminishing overinvesting or underinvesting.

The researcher also concludes that there is a significant consensus among previous studies which confirmed that RD significantly contributes in mitigating the problem of information asymmetry due to the separation of companies' ownership and management, consequently alleviating the problems of moral hazard and adverse selection, enhancing the quality and usefulness of financial reporting, thereby making them potentially useful to investors, influencing the decisions of stakeholders, especially investment decisions, integrating corporate governance mechanisms and goals, increasing investors' ability to effectively monitor managers and ensuring that managers act in the interest of investors, limiting the opportunistic behavior of firm managers and improving managerial decision making regarding investments, improve the accuracy of financial analysts' forecasts regarding the firm's value and profits, improving the company's reputation, attracting debt and equity investors, reduce the cost of external financing, increasing companies' opportunities to obtain the necessary external financial resources and obtain more capital for undertaking positive net present value projects, thus reducing the likelihood of underinvestment.

Furthermore, the monitoring effect of RD prevents the management from engaging in opportunistic behavior or underperforming projects with negative net present value to pursue self-interests, thereby reducing the problem of overinvestment.

According to the foregoing, the researcher illustrates the relation between RD and investment efficiency through the following figure:
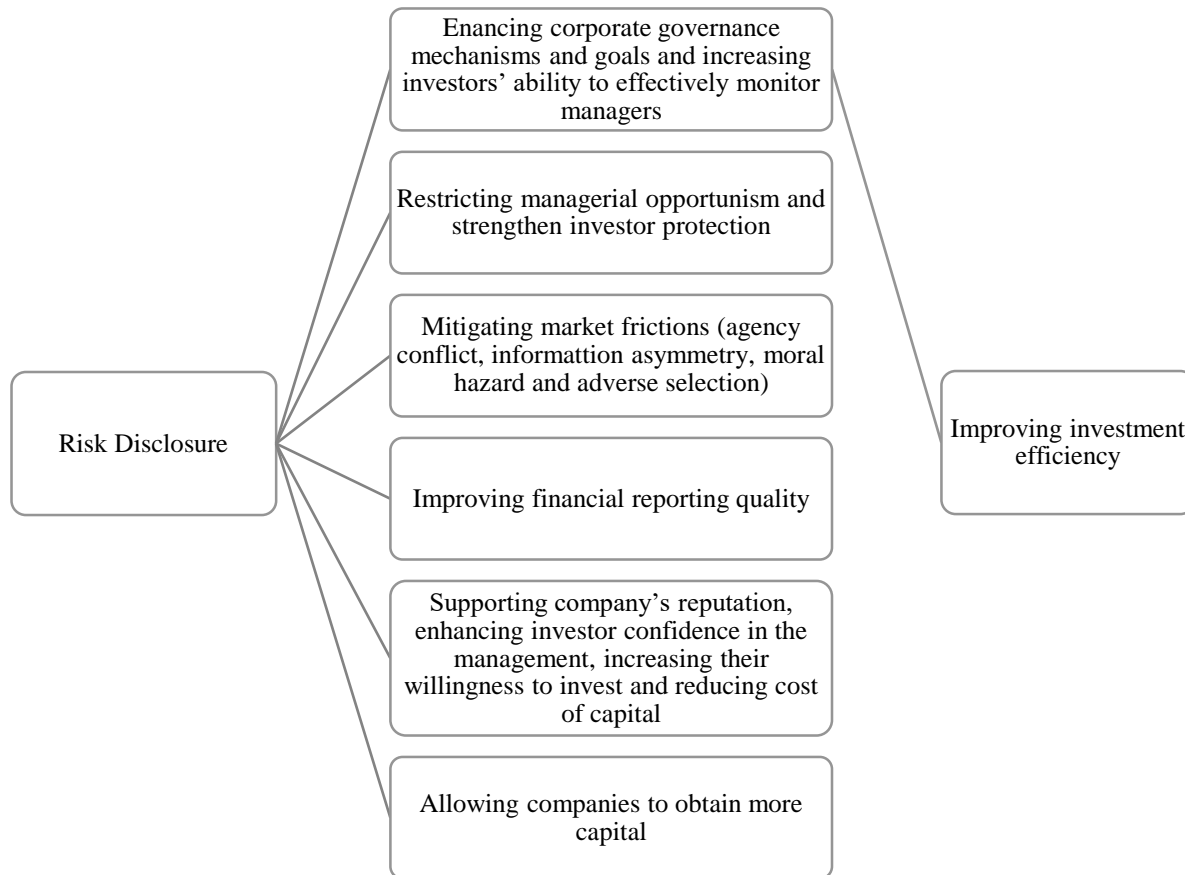

Figure No. (1): The impact of risk disclosure on investment efficiency
Source: prepared by the researcher

According to the foregoing, the following hypothesis was formulated and tested in the course of the study:

H1: There is a significant effect of risk disclosure on the investment efficiency.

The following sub- hypotheses are derived from this main hypothesis:

H1a: There is a significant effect of risk disclosure on overinvestment.

H1b: There is a significant effect of risk disclosure on underinvestment.

3. Theoretical framework

3.1 Risk Disclosure

RD is defined as informing the financial statements' users about any opportunity, potential risk, damage or threat which may influence the company' current or future performance as well

as disclosing information about managing these opportunities or risks (Linsley & Shrives, 2006; Anthony & Godwin, 2015).

The accounting literature presented two streams of theories that explain companies' incentives for RD which are the economic theory approach and social and political theory approach (Khlif & Hussainey, 2016).

The economic theory approach depends on self-interest and profit maximization of economic agents and uses agency theory and signaling theory to explain RD incentives (Habbash et al., 2016), while social and political theory approach relies on the political and social relationships linking firms to stakeholders in the society and uses legitimacy theory, stakeholder theory, political theory and positive theory to explain RD incentives.

From agency theory perspective, companies tend to disclose risk information in order to reduce agency costs and reduce conflicts between management and shareholders (Lambert, 2001; Buckby et al., 2015), while signaling theory argue that the management tends to disclose risks to signal about their ability to manage and overcome risks efficiently and to protect and create value for investors compared to other companies (Bazine & Vural, 2011), from legitimacy theory perspective, companies tend to disclose information about risks and potential threats to obtain shareholders' support or endorsement and legitimize many actions, avoid litigation and reputational costs and reduce the need for additional regulations (Bazine & Vural, 2011; Farhat, 2016), while the stakeholder theory argue that the management has moral obligations towards stakeholders, therefore it must disclose risk information in order to help them make appropriate decisions and preserve their wealth, leading to increase trust between the company and stakeholders and improve the company's reputation (Habbash et al., 2016). The Political Theory and the Positive Theory argue that companies are politically sensitive, which may result in wealth transfers. Therefore, they may tend to disclose risk information in order to avoid more political considerations and reduce control costs, as well as avoid reputational damage (Farhat, 2016).

However, it should be noted that RD isn't always beneficial to the company, and that companies will be less motivated to provide more risks information if the costs exceed the benefits, and despite the expected benefits of RD, it has a number of limitations (Lajili & Zeghal, 2005). The researcher can summarize the negative effects of RD as follows:

1. RD may harm the company's competitive position and its sustainability if detailed information about risks is disclosed as if the competitor is being aware of such information, the company's plans and strategies will become clear to him, this will create an advantage to competitors who exploit this information at the expense of the company and impose a serious cost on it (Adamu, 2013; Anthony & Godwin, 2015).

2. RD may sometimes be inaccurate due to its nature, as a result the company's management may enter lawsuits and legal disputes that affect their credibility and reputation, which drives management to limit or avoid RD in order to avoid such judicial

disputes (Elshandidy et al., 2017), this was confirmed by (Adamu, 2013) who stated that managers may fear litigation and reputational costs as a result of providing voluntary risk information to investors, therefore they are often reluctant to report this type of risk information because it is inherently unreliable and can leave them exposed to potential claims from investors and other stakeholders who made decisions based on this information, hence there is a need for rules and regulations that can protect managers from litigation.

3. There is a difficulty in predicting forward-looking information without forecasting errors, thus managers are also disinclined to disclose future risk information to avoid the litigation costs due to the inherent unreliability, low accuracy and the high level of uncertainty of future information compared to historical information (Cabedo and Tirado, 2004).

4. In cases where the RD is inaccurate, there may be a negative impact of such disclosure on the market value of the company, because in such cases investors will lose confidence in the management's ability to predict future trends and events (Tan et al., 2017).

5. RD may draw the market's attention to the company's riskiness (Elshandidy et al., 2013) or increase investors' perceptions of risk, causing them to increase their risk premium to compensate for the high risk exposure (Kravet & Muslu, 2013; Campbell et al., 2014). So, Managers generally tend to disclose risk information that is minimalistic, vague and provides little useful information (Buckby et al., 2015).

6. Most risk disclosures focus on financial and market risks and lack uniformity, quantification, and forward-looking information (Lajili & Zeghal, 2005).

7. Identifying risk information and disclosing it in a timely and accurate manner is costly and time consuming (Adamu, 2013).

3.2 Investment Efficiency

Investment efficiency can be achieved by identifying and implementing profitable projects with a positive net present value and avoiding or early termination of poor performance or losing projects with a negative net present value. However, the separation between ownership and management and the subsequent information asymmetry provide managers with opportunities to take actions that maximize their own interest, even if those actions don't maximize owners' wealth (Jensen, 1986; Watts & Zimmerman, 1986), namely opportunistic behavior that occurs when a particular party takes advantage of its superior knowledge to maximize his own interests and withholding such information from the other party (Ozkan , 2007).

Self-interested managerial behavior arising from agency conflicts involves a variety of suboptimal activities at the expense of shareholders' interest for example: empire building, exploitation of the company's free cash flows in poor projects (with a negative net present value) instead of returning it to shareholders, rejecting optimal risk investments, the consumption of corporate resources as privileges or bonuses, manipulating financial data to maximize

compensation, diversifying acquisitions, supporting the weak-performing departments through the cash generated from the profitable departments (Richardon, 2006).

Accordingly, companies in fact are often characterized by investment inefficiency (Biddle et al., 2009; Chen et al., 2011), as it takes one of two cases, the first case is represented by companies characterized by high investment inefficiency (overinvestment) which means that their current investments are more than the optimal level of investment, this sometimes results from undertaking of negative or zero net present value projects that serve managers' self-interest at the expense of the owners' interest (Jensen, 1986), while companies in the second case are characterized by low investment inefficiency (underinvestment) which means that their current investments are less than the optimal level of investment, this sometimes results from avoiding undertaking positive net present value projects due to management's preference for a quiet life or due to the existence of a gap between the cost of internal and external capital as a result of agency problems (Bertrand & Mullainathan, 2003).

4. Research Design

The researcher conducts an applied study which is interested in the relationship between the risk disclosure and investment efficiency using a sample of 376 observation from Egyptian firms listed on EGX100 between 2017 and 2022.

4.1 Variables Measurement

The applied study aims to test the effect of risk disclosure on the investment efficiency. The researcher can show the measurement tools of applied study variables as follow:

4.1.1 Risk Disclosure

Risk disclosures is measured by content analysis, dividing the number of actual risk disclosure items by the number of standard risk disclosure items

4.1.2 Investment Efficiency

Richardson's (2006) model was used in this study. Measures of growth prospects, leverage, cash balance, firm age, firm size, stock return, industry-fixed effects, and annual fixed effects were among the investment factors. The residuals between total investment and expected investment were used to calculate unexpected investment which expresses either overinvestment or underinvestment .

$$I_t = \alpha + \beta_1 Q_{t-1} + \beta_2 Leverage_{t-1} + \beta_3 Cash_{t-1} + \beta_4 Age_{t-1} + \beta_5 Size_{t-1} +$$
$$\beta_6 Stock\ Return_{t-1} + \beta_7 I_{t-1} + \sum Year\ Indicator + \sum Industry\ Indicator + \varepsilon_t \quad (1)$$

Where I_t is total investment expenditure computed as the sum of total capital expenditure ($CAPEX_t$), research and development expenditures (RD_t), and acquisitions expenditures ($Acquisition_t$) minus cash receipt from the sale of property, plant and equipment ($Sale\ PPE_t$) scaled by total assets at the beginning of period.

Q_{t-1} represents the preceding year's growth prospects as expressed by Tobin's Q, $Leverage_{t-1}$ is the previous year's financial leverage, expressed as the ratio of total debt to total assets, $Cash_{t-1}$ is the deflated balance of cash and short-term investments divided by total assets

at the beginning of period, $Age_{t-1} +$ is the company's age since listing, $Size_{t-1}$ is the company size, given as a natural logarithm of total assets at the beginning of the year, $Stock\ Return_{t-1}$ is the rate of stock returns for the year preceding the investment year. The dummy variables are industry and year. Richardson (2006) classified corporate total investment into expected and unexpected investment. Overinvestment and underinvestment are examples of inefficient investment.

OverINV is overinvestment, which signifies inefficient investment. It is determined as the difference between total investment and expected investment from the side of positive residuals, minus the bottom 25%.

UnderINV is the absolute value of the negative residuals between total investment and projected investment, minus the bottom 25%.

4.2 Population and Sample Size

The population of the applied study related to the Egyptian firms listed on EGX100. Consequently, the researcher depends on intended sample from these listed firms in the time period 2017-2022 in order to avoid the negative effects of inflation in the Egyptian market. By scanning the Egyptian stock market on Egypt, it is obvious that there are 71 listed firms in this time period after excluding the banking sector and insurance companies due to their special accounting nature. So, the final sample of the applied study is 426 firm year-observations in the predetermined time period (71 firms × 6 years), by excluding 38 observations omitted values and 12 observations extreme values, the final sample will be 376 firm-year observations.

4.3 Design testing model

The applied study aims to examine the effect of risk disclosure on the investment efficiency. In this regard, the researcher can develop the testing model of H1 as follow:

INV (OverINV and UnderINV) = β0 + β1 RD + β2 Size + β3 Lev + β4 Tobin's Q + β5 Age + ε

(2)

Where INV (OverINV and UnderINV) is the investment decisions otherwise over or under, RD stands for risk disclosure, Size is defined as the natural logarithm of total assets, Lev is defined as financial leverage, Tobin's Q can be measured by dividing market value on the book value, finally Age is the company's age since listing.

4.4 Data Analysis and Results of the Applied Study

4.4.1 Descriptive Statistics

Table (1) shows the descriptive statistics for all research variables where the investment efficiency score is 0.000. In the other side, if Tobin's Q is greater than 1 this means that firms can create value, so in this research it is equal 192.375 so these firms can create value successfully, moreover the mean of overinvestment is 0.078 and -0.093 for the underinvestment this result indicate that investment efficiency is so weak.

Table (1): Summary statistics

Variable	Obs	Mean	Std. Dev.	Min.	Max.
RD	376	0.385	0.159	0.086	0.612
INV	374	0.000	0.171	-1.542	1.405
Over-Invest	203	0.078	0.144	0.001	1.405
Under-Invest	171	-0.093	0.152	-1.542	0.000
Size	376	9.406	0.738	7.228	11.142
Lev	376	0.555	0.511	0.005	7.015
Tobin's Q	376	192.375	1268.753	0.089	17333.130
Age	376	19.614	8.450	2.000	38.000

4.4.2 Correlation Matrix

Table (2): Correlation Matrix

Panel A: Pairwise correlations for total sample

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) RD	1.000					
(2) INV	0.014	1.000				
(3) Size	-0.186*	0.000	1.000			
(4) LEV	0.039	0.000	0.187*	1.000		
(5) Tobin's Q	0.149*	0.000	-0.274*	-0.051	1.000	
(6) Age	-0.001	0.000	-0.145*	-0.070	0.091	1.000

Panel B: Pairwise correlations for OverINV

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) RD	1.000					
(2) INV	0.543*	1.000				
(3) Size	-0.184*	-0.029	1.000			
(4) LEV	0.027	-0.045	0.205*	1.000		
(5) TobinsQ	0.122	0.190*	-0.072	-0.041	1.000	
(6) Age	-0.019	-0.006	-0.106	-0.107	0.049	1.000

Panel C: Pairwise correlations for UnderINV

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) RD	1.000					
(2) INV	-0.547*	1.000				
(3) Size	-0.202*	0.179*	1.000			
(4) LEV	0.079	0.032	0.221*	1.000		
(5) TobinsQ	0.176*	-0.119	-0.495*	-0.079	1.000	
(6) Age	0.030	-0.104	-0.170*	0.003	0.155*	1.000

*** $p<0.01$, ** $p<0.05$, * $p<0.1$*

According to the results in table (2), panel A revealed a positive relationship between risk disclosure and total investment score, besides a significant negative relationship between size and risk disclosure, and significant positive relationship between the risk disclosure and Tobin's Q, these results indicate that increasing the risk disclosure lead to increasing in the investment score and Tobin's Q.

In another vein, panel B revealed that the relationship between overinvestment and risk disclosure is so strong, significant and positive, so the researcher concludes that increasing the risk disclosure increases the overinvestment and wasting the firm resources.

Finally, panel C ensure a significant negative relationship between the risk disclosure and underinvestment, so the researcher concludes that increasing the risk disclosure decreases the underinvestment.

Furthermore, there was no strong correlation (all coefficients < 0.8) between the independent variables. As the correlation coefficients were relatively small, the researcher could consider that our model did not suffer from collinearity problems and the researcher will ensure this result by using variation inflation factor (VIF) analysis in the regression testing models.

4.4.3 Regression Results

Based on equation (2), the first and second column of table 3 show the results of relationship between risk disclosure and overinvestment depending on baseline model and the full model which including the control variables. The researcher found that risk disclosure has a significant positive effect on overinvestment where ($\beta = 0.443$; $T = 7.64 > 2$). Furthermore, the full model ensure this result where the risk disclosure also has a significant positive effect on overinvestment where ($\beta = 0.461$; $T = 7.69 > 2$). Also, the control variables related to size and Tobin's Q have positive significant effect on overinvestment where ($\beta = 0.030$, 0.000

respectively; T = 2.15, 3.26 > 2 respectively), while leverage has negative significant effect on overinvestment where (β = -0.023; T =-2.46)

Moreover, the third and fourth column of table 3 show the results of relationship between risk disclosure and underinvestment depending on baseline model and the full model which including the control variables. The researcher found that risk disclosure has a significant negative effect on underinvestment where (β = -0.552; T = -6.95 > 2). Furthermore, the full model ensure this result where the risk disclosure has a significant negative effect on underinvestment where (β = -0.543; T = -7.01 > 2). Also, the control variables are not significant.

Table (3): Regression analysis results

Variables	(1)	(2)	(3)	(4)
	Over investment		Under investment	
RD	0.443***	0.461***	-0.552***	-0.543***
	(7.64)	(7.69)	(-6.95)	(-7.01)
Size		0.030**		0.012
		(2.15)		(0.91)
LEV		-0.023**		0.051
		(-2.46)		(1.23)
TobinsQ		0.000***		0.000
		(3.26)		(0.55)
Age		-0.001		-0.003*
		(-0.64)		(-1.69)
Year fixed effect	Included	Included	Included	Included
Industry fixed effect	Included	Included	Included	Included
_cons	-0.101***	-0.383**	0.046	-0.066
	(-2.79)	(-2.52)	(0.82)	(-0.49)
N	203	203	171	171
R^2	0.39	0.42	0.32	0.35
adj. R^2	0.33	0.35	0.25	0.26

Moreover, adjusted R^2 equal to 33%, 35%, 25% & 26% respectively, which means a good indicator about our model where the F–statistic is significant. Furthermore, we found that VIF (MAX) of the variables was 2.533 & 2.169 respectively, indicating that multi collinearity was not a serious problem in this study.

Finally, these results ensure the positive relationship between the risk disclosure and investment efficiency, where risk disclosure increase the overinvestment and decrease the underinvestment, which indicate the adverse relationship between the overinvestment and underinvestment.

5. Conclusion

In this study, the researcher investigates whether there is an association between risk disclosures and investment efficiency. The results of the applied study demonstrated a significant positive relationship between the risk disclosure and investment efficiency, where risk disclosure increase the overinvestment and decrease the underinvestment. Consequently, the researcher can accept the first hypothesis.

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