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The effect of disclosure on investment efficiency – Evidence from the listed companies of Bangladesh

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ABSTRACT

The general perception is that disclosure improves monitoring, which reduces managements' ability to exploit corporate resources. Hence, the purpose of the study is to investigate whether disclosure increases investment efficiencies. Thirty Dhaka Stock Exchange (DSE) listed companies, ranging from 2006 to 2020, are selected to test the hypothesis. Then, firm-specific investment is estimated as a function of sales growth. The residual from this estimation is considered as the deviation from the expected investment. Afterwards, a disclosure scoring system is developed based on 28 criteria that encompass both financial and non-financial disclosure. Using the multinomial logit model, the likelihood of under-invest or over-invest is predicted based on the disclosure practices. The overall disclosure level of Bangladeshi listed companies is quite low. The result suggests that disclosure practices have a significant impact on investment efficiency. If the disclosure increases, the likelihood of under-invest or over-invest decreases. The study is conducted on Bangladeshi data, which have not been done before. Moreover, in this study, both financial and non-financial disclosure is considered. Hence, the findings would be beneficial for academics, managers and regulators to have a better understanding of disclosure practices and their influence on investment efficiency.

ARTICLE INFO

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Disclosure, Investment efficiency, Dhaka stock exchange, Bangladesh.

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1. INTRODUCTION

In a frictionless world, stated in Modigliani & Miller (1958), projects or investments with positive net present value (NPV) should be financed, and negative NPV projects or investments should be avoided. Of course, in reality, it is somewhat difficult to allocate capital in such projects, because of the existence of various distortionary forces. Transaction costs and taxes are one of the forces. However, the most significant factor that affects the efficiency of the investment is the existence of information asymmetry (Stein, 2003). Companies can experience financing constraints if information asymmetry exists. Thus, they won't be able to invest in profitable ventures, leading to under-investment. Even if the funds are available, managers may not choose to invest in positive NPV projects. Instead, they may fund negative NPV projects to maximize their personal wealth (Hope & Thomas, 2008). Disclosure can reduce the information asymmetry between the management and investors (Biddle et al., 2009). According to Bushman & Smith (2001), accounting information can enhance a company's investment choices in two ways. Firstly, it reduces the information asymmetry between a company and investors. As a result, investors become confident about the company's prospects, resulting in a reduction of cost of capital. Secondly, it restricts managers from serving their own interest. This is because, board of directors will have more information to properly monitor managers' activities. Precisely, managers' financial resource allocation strategies. In our study, we examined the impact of disclosure practices on investment efficiency. Our study is centered on Bangladeshi listed companies. This choice is particularly significant given the unique characteristics of the Bangladeshi business landscape. Firstly, most of the previous studies explored the relationship between disclosure and investment efficiency in developed countries such as United States. The US financial market has reached a state of maturity. If listed companies fail to comply with disclosure regulations, they will face severe punishment. However, information asymmetry and agency problems are more evident in developing economies relative to developed economies. Although disclosure is mandatory in Bangladesh, the accuracy and reliability of the disclosed information are often in doubt. The prevailing incredibly low level of investor protection, as indicated by Bangladesh's ranking of 66 out of 137 countries in the World Bank's Strength of Investor Protection index and 168 out of 190 countries in the Ease of Doing Business index, underscores the urgency for effective disclosure practices. These rankings imply that disclosure may have a significant impact in reducing information asymmetry and agency cost, and ultimately it will improve investment efficiency. Thus, a deeper analysis is required to determine whether the economic impact of information disclosure in Bangladesh's annual reports is comparable to that of the US capital market. Secondly, the evolving interest of the Bangladesh Securities and Exchange Commission (BSEC) in the disclosure practices of listed companies adds a layer of significance to our study. Notably, in 2018, BSEC published a gazette incorporating additional rules and regulations designed to elevate financial reporting and disclosure quality. This regulatory evolution prompts an exploration into whether the disclosure practices of Bangladeshi listed companies, under this changing landscape, indeed influence investment efficiency. By delving into these multifaceted dynamics, we aim to contribute valuable insights into the evolving relationship between disclosure practices, and investment efficiency in the context of Bangladeshi listed companies. The paper is organized in the following ways. In section 2, we have described the relationship between disclosure and investment efficiency, based on the recent studies. In section 3, we have stated the hypothesis. We have described the features of the data and specified the empirical model in section 4. All the empirical results and interpretations are reported in section 5 and 6. Finally, section 7 includes the conclusion of this study.

2. LITERATURE REVIEW

2.1 Disclosure

Until now, a lot of scholars has focused their attention on disclosure practices. Much of the initial studies analyze the influence of disclosure on stock price and firm value (for example, Beaver, 1968; Watts & Zimmerman, 1986). Numerous studies argue that disclosure has three potential outcomes: improved liquidity (Kim & Verrecchia, 1994), reduced cost of capital (Botosan, 1997; Botosan & Plumlee, 2002), and decreased information asymmetry (Bhushan, 1989; Lang & Lundholm, 2000). According to Healy & Palepu (1993), firms those anticipating debt or equity issuing in near future have a motivation to voluntarily disclose. In 2001, these scholars (Healy & Palepu, 2001) published a paper where the scholars reviewed the empirical researches on disclosure. The study concluded that there is a market-driven demand for transparent financial reports. Companies' disclosure choices are contingent upon the political situation and the efficiency level of the capital market. It also added that disclosure practices certainly influence the stock price, bid-ask spreads and institutional ownership. In the same year, Lobo & Zhou, (2001) conducted a study examining the relationship between disclosure quality and earning

management on a sample of 803 firm-year observations. They found that firms those engage in earning management are less evident in their disclosure policies. However, Skinner (1994) argued that firms with large negative earnings voluntarily disclose bad earnings news to avoid potentially costly shareholder lawsuits.

In the year 2005, Noravesh & Ebrahimi (2005) examined the relationship between shareholder composition and disclosure policy among the firms listed on the Tehran stock exchange. The study stated that firms with more institutional investors are less opaque. According to Beekes & Brown (2006), ownership concentration is another factor that may influence disclosure practices. Firms with high ownership concentration tend to provide more information about future cash flows. According to Husted and de Sousa-Filho (2019), Environmental, Social and Governance (ESG) disclosure is positively influenced by board size and the presence of independent directors, whereas the presence of women on the board and CEO duality have a negative impact on ESG disclosure. They conducted their study on Latin America using a four-year panel obtained from the Bloomberg and Capital IQ databases. In the Middle East and North Africa (MENA) countries, having a Sharia supervisory board is linked with a higher degree of disclosure in a positive way. At the bank level, ownership structures have a favorable impact on the extent of disclosure. At the country level, control of corruption improves disclosure (Elamer et al., 2019). In Poland, banks with varying ownership structures exhibit significant variations in the extent of their CSR disclosures. Both the foreign majority shareholder group and the state majority shareholder group exert a favorable impact on CSR disclosure as opposed to the Polish majority shareholder (PMS) group (Matuszak et al., 2019). CSR disclosure in India is negatively associated by factors such as board age, employee CSR training, and women on the board whereas board independence, and CEO duality have positive influence on CSR disclosure (Fahad & Rahman, 2020).

LaFond & Watts (2008) argued that investment opportunities may affect disclosure policies. Firms are likely to disclose less when they have too many investments opportunity. On the contrary, they have higher financial reporting quality, if the opportunity for future growth is lower. Haldar & Raithatha (2017) examined the impact of corporate governance practices on financial disclosure. Researchers conducted this study on 200 listed Indian firms. Their findings suggest that the quality of governance is positively associated with financial disclosure. Predominantly, audit committee composition has a statistically significant effect on disclosure. Similarly, Fuller et al. (2021) concluded that audit committee effectiveness influences managements' disclosure decisions. When auditor decreases the level of detail in their report, management decrease financial disclosure. Conversely, if the audit committee is effective and their report attempts to explain complex financial estimations, management presumptively increase financial disclosure. Complex financial estimation often leads to poor investment decision (Rennekamp, 2012). According to Huhmann (2017), the lack of readability of a financial document is one of the reasons for financial problems. Arora & Chakraborty (2021) also stated a similar result in their study. These scholars did an experiment to investigate whether easy (difficult) to read financial disclosure documents positively (negatively) influence an investment decision. The scholars concluded that the human mind positively responds to easy-to-read financial information. Investors, regulators and managers are becoming more interested in non-financial disclosures. Non-financial disclosure is recognized as the sustainability reports (Commission, 2011). These reports include the environmental, social, and governance (ESG) performance of a company. Non-financial disclosure practices of both U.S. and Europe have significantly increased between 2002 and 2015 (Stolowy & Paugam, 2018). Compared to U.S. companies, European companies have better non-financial disclosure practices.

Gao et al. (2016) did a study on the Netherlands and investigated the economic consequences of non-financial disclosure. They have considered corporate social responsibility (CSR) ratings to measure the nonfinancial disclosure quality. They have argued that firms with higher disclosure quality have greater stock marketability. Moreover, those firms can raise more money in the seasoned equity offering. García-Sánchez *et al.*, (2019) delved into the same subject matter. Precisely, their analysis centers on whether financial market investors consider these disclosures significant, and if so, whether disclosures are viewed positively by participants in the financial market. After analyzing data for all firm from the global indices covering the years 2007 to 2016, they found evidence that the availability of information regarding a company's CSR efforts can facilitate their access to financial resources. Moreover, they observed that the quality of CSR disclosure and external validation thereof can bolster the link between disclosure and access to finance. In the year 2020, Rossi & Harjoto (2020) investigated the impact of non-financial disclosure on firm value, risks and agency costs for Italian listed firms. Using standard ethics rating (SER) as a proxy for non-financial disclosure, the study stated that non-financial disclosure can essentially reduce agency costs. Furthermore, this study provides evidence that non-financial disclosure is negatively associated with the firm's risk and positively associated with firm value.

2.2 Disclosure and Investment Efficiency

According to the neo-classical theory, companies usually invest to maximize their value, and they continue to invest until the benefits equal the costs (Hayashi, 1982; Yoshikawa, 1980). On the contrary, under the Keynesian model, growth and financial security are the key determinants for making an investment decision. That is, if the expected profit is higher relative to cash flow commitments to owner's and creditors, then management will be willing to invest. This is because, it will instantaneously ensure both growth and financial security (Crotty, 1992). The agency theory dictates that if information asymmetry exists, companies may deviate from the expected investment – they may over-invest or under-invest (Myers, 1977). In an ideal scenario, firms should finance all positive net present value (NPV) projects. Yet, numerous studies oppose this theory (for example, Bertrand & Mullainathan, 2003; Hubbard, 1997). Agency problems and market inefficiencies can instigate firms to finance negative NPV projects (over-investment) and reject positive NPV projects (under-investment). Under the agency theory framework, information asymmetries can lead to both under-investment and over-investment. Myers & Majluf (1984) developed a model that can explain the role of moral hazard and adverse selection in investment efficiency. From the moral hazard perspective, when there is any disparity between managers and shareholders' incentives, managers may invest in negative NPV projects. Moreover, lack of shareholder interest or lack of monitoring can lead to empire building and over-investment (Hope & Thomas, 2008). With regard to adverse selection, proficient managers may over-invest, if they have surplus funds. To alleviate this, investors can raise the cost of capital (Biddle et al., 2009; Lambert et al., 2012).

According to the agency theory, information asymmetries can be reduced by confirming disclosure, which will ensure better control over managerial activities. Then, shareholders can effortlessly identify the value destruction activities, such as inefficient fund allocation, waste, and exploitation of resources. Ultimately, that will refrain managers from serving their own interests (Bushman & Smith, 2001; Hope & Thomas, 2008). In recent times, a lot of scholars has examined the implications of financial reporting quality (FRQ) and disclosure practices. Higher FRQ and disclosure lessens information asymmetries and, subsequently moral hazard and adverse selection. Moreover, these practices reduce the cost of capital (Francis et al., 2005), ease access to the debt markets (Bharath et al., 2008), and assist to manage less restrictive covenants for bank financing. According to McNichols & Stubben, (2008), FRQ assists managers to recognize better projects, thereby allowing managers to make a better investment decision. Perhaps, it can also reduce under-investment and over-investment. Cheng et al. (2013) explored the relationship between disclosure and investment efficiency. Precisely, the study investigated the investment nature of the companies, which disclosed internal control weaknesses. It found evidence that when the companies are not disclosing the material weaknesses, they tend to over-invest or under-invest compared to the control companies. However, their investment inefficiency recedes when they start to disclose internal weakness.

In the following year, Gomariz & Ballesta, (2014) published a paper where they have investigated the effect of financial reporting quality and debt maturity on investment efficiency for the period starting from 1998 to 2008. They have estimated the expected level of investment based on the sales growth. To estimate financial reporting quality, they have taken an average of three measures. The measures are based on discretionary revenues, discretionary accruals, and accruals quality. Their study suggests that financial reporting quality significantly reduce over-investment. Similarly, short term debt enhances investment efficiency – decreasing over-investment and under-investment. Furthermore, their study finds evidence that FRQ has a higher effect on investment efficiency for those firms with lower short-term debt than for those firms with higher short-term debt. Lai et al. (2014) are another group of scholars that studied the relationship between disclosure and investment efficiency. The study employed the Information Disclosure and Transparency Rankings System (IDTRS) as a proxy for disclosure practices. This ranking system, created by the Taiwan Securities and Futures Institute (TSFI), is based on the disclosure activities – disclosure of financial projections, disclosure of compliance with regulation, and disclosure of material financial information in the annual reports. This paper suggests a significant negative relationship between disclosure level and investment inefficiency.

Houcine (2017) conducted a similar study on Tunisia, sample covers 25 Tunisian listed companies for the period starting from 1997 to 2013. This study employs four proxies for FRQ, namely accruals quality, accounting conservatism, smoothness, and value. The study concluded

that reliability and smoothness increase investment inefficiency, while conservatism and relevance have no statistically significant effect on investment efficiency. Li et al. (2019) examined the impact of corporate disclosure on investment efficiency. They computed a Risk Disclosure Index (RDI) based on the information found in annual reports of Chinese A-Share market, and then investigated its impact on investment efficiency. They found a positive correlation between the frequency of risk disclosure in sections such as "Significant Risk Factors and MD&A" and corporate investment efficiency. In other words, as the frequency of risk disclosure increases, so does the investment efficiency of the company. Upon conducting additional analysis, they discovered that the impact of risk disclosure on corporate investment efficiency is amplified when there is a positive disclosure tone or a greater number of keywords related to the investment. Furthermore, when investors exhibit higher information demands and possess greater information processing capabilities, the effect of risk disclosure on investment efficiency becomes more apparent.

Chen et al. (2021) used a different approach to measure the impact of disclosure on investment efficiency. They have used project-level disclosure as opposed to proxies for accounting information quality. This study is focused on Chinese listed companies for the period ranging from 2007 to 2011. The scholars found that project-level disclosure has a positive relationship with investment efficiency when the governance is strong. Their study further discovers that strong-governance companies are less likely to suffer from financial constraints. If, however, the growth opportunities are low, they sell more assets. Allman & Won (2021) examined the effect of environmental, social and governance (ESG) disclosure on investment efficiency. Using the difference-and-difference technique, the study compares U.S. companies that are subjected to EU NFRD Directive, to companies that are not affected by the directive. The study states a significant reduction of under-investment for the companies that are exposed to the directive. This result implies that non-financial disclosure can alleviate the adverse selection problem. Another scholar Ellili (2022) investigated how investment efficiency is affected by disclosure and the quality of financial reporting (FRQ). Using the United Arab Emirates (UAE) as a sample, the academic found that ESG disclosure and FRQ affect investment efficiency. Moreover, the impact of disclosure is more pronounced for underinvestment. ESG disclosure in India results in a reduction in the cost of capital for companies, allowing them to access funding at a more affordable rate (Mulchandani et al., 2022). By disclosing ESG information, companies are able to provide investors with greater transparency and clarity, which can lead to increased investor confidence and the creation of long-term value. This, in turn, helps to reduce information asymmetry between companies and investors.

Wang *et al.* (2020) also explored the effect of environmental information disclosure (EID) on investment efficiency. Their study is focused on Chinese publicly listed companies. They suggested a robust and strong relationship between EID and investment efficiency. They further investigated whether the relationship intensity varies among the industries. The relationship is stronger for heavy industries, whereas it is weaker for non-heavy industries. Regarding mandatory corporate social responsibility (CSR) disclosure, as stated by Makosa et al. (2020), firms' investment efficiency improves when they disclose their CSR activities. Particularly, their over-investment diminishes. This is because those firms reallocate their funds from investment to CSR activities.

3. RESEARCH HYPOTHESIS

When the quality of disclosure is improved, it increases information transparency for firms, resulting in investors perceiving lower risk (Roulstone, 1999). This, in turn, contributes to the mitigation of information asymmetry and the resolution of agency problems, ultimately improving investment efficiency. Moreover, when a company's management discloses its corporate risks, it suggests that the firm is investing prudently within acceptable limits. These disclosed risks not only update the corporate risk profile but also uncover previously unknown risk factors, thereby increasing the amount of information available to the public. Such disclosures also signal the managers' confidence in handling risks, leading to an improved understanding of the company by investors. This, in turn, promotes oversight of management's investments. Furthermore, financial disclosure assists investors in anticipating potential future fluctuations in earnings. Consequently, this could lead to a decrease in the necessary compensation for risks and result in more accurate pricing. This can ensure the optimal amount of capital for the firms, avoid excessive investment, and address underinvestment, ultimately leading to improved investment efficiency. On the contrary, if the level of information transparency is low for a company, investors may view it as a high-risk entity. When market participants face difficulty in comprehending information, they may fear unknown risks (Kravet & Muslu, 2013). The growing complexity of risk disclosure exacerbates the information asymmetry between investors and firms (Campbell et al., 2014). Due to their inability to assess the true circumstances of a firm, investors may interpret the disclosure of risk information as an indication that the firm is facing substantial risks. Consequently, investors may require recompense to mitigate unknown risks or even divest their ownership of the shares. Ultimately, the firm may face a dearth of capital or a high cost of capital, which will lead to underinvestment. A corporate manager, who possesses knowledge of the actual operating conditions, may selectively disclose or conceal risk information to impact investors' decisions for their personal gain, potentially leading to a negative effect on investment efficiency. Accordingly, we formulate the following hypothesis.

Hypothesis: Disclosure is significantly associated with investment efficiency.

Here, most of the study either focuses on financial or non-financial disclosure practices. In several of them, researchers used various proxies to measure disclosure. Moreover, those studies are conducted on developed economies or large economies. However, in our study, we include both financial and non-financial disclosure practices of Bangladeshi listed companies and investigate whether disclosure improves investment efficiency.

4. DATA AND METHODOLOGY

Our sample consists of thirty Dhaka Stock Exchange (DSE) listed companies, ranging from the year 2006 to 2020. We have collected investment, sales, cash, total debt, total asset and Property Plant and Equipment (PPE) data of each of the thirty companies from their respective annual reports. For investment, we have considered the sum of capital expenditures, R&D expenditures, and acquisitions minus sales of PPE. Then, we model the firm-specific expected investment as a function of growth opportunities, measured by sales growth, as it was done in Biddle et al. (2009)

$$Investment^i_{t+1} = \alpha_i + \beta^i_1 Sales\ Growth^i_t + \varepsilon^i_{t+1} \quad (1)$$

Here, $Investment^i_{t+1}$ is the total investment in the year t+1, $Sales\ Growth^i_t$ is the percentage change in sales from the year t-1 to t, and $\varepsilon^i_{t+1}$is the residual. The residual captures the deviation from the expected investment. We also control for the total asset, PPE, cash to total asset and cash to PPE. Afterwards, we categorize the residuals into three distinct groups. The bottom quartile is designated as under-investment. Conversely, the top quartile residuals fall into the over-investment category, indicating instances where the investments surpass expectations. The remaining 50%, located between the bottom and top quartiles, are classified as the benchmark, representing instances where the observed values align closely with expectations. Subsequently, we construct a disclosure scoring system – developed to measure the quality of disclosure practices of thirty DSE listed companies. A total of 28 criteria are used to assess each company in our sample. Companies that do not conform with a specific criterion are given a score of 1, that meet the minimum requirement of a specific criterion are given 2 and that surpass the minimum criteria are given a score of 3. We then calculate the average disclosure score – an equally weighted score of 28 criteria – for every company year.

To test our hypotheses, we estimate a multinomial logit model that predicts the likelihood that a company will under-invest or over-invest as opposed to the benchmark (equations 2 & 3) based on their disclosure score.

$$ln\left(\frac{P(Underinvestment)}{P(Benchmark)}\right) = \gamma^i_0 + \gamma^i_1 Score^i_t \quad (2)$$

$$ln\left(\frac{P(Overinvestment)}{P(Benchmark)}\right) = \gamma^i_2 + \gamma^i_3 Score^i_t \quad (3)$$

Here, $Score^i_t$ is the equally weighted average disclosure score. Underinvestment occurs when investments fall below expectations, while overinvestment happens when observed values exceed expectations; the Benchmark aligns with the expected investment. If the relative-risk ratios of Equations 2 and 3 are less than 1, the likelihood of under-investment and over-investment is higher for companies with low disclosure scores.

5. DATA ANALYSIS

5.1 Investments

Our sample consists of 301 company-year observations – thirty listed companies ranging from 2006 to 2020. Table 1 states the descriptive statistics of the investment that is made by each of the thirty companies. To calculate investment, at first, we sum the capital expenditures, R&D expenditures, and acquisitions. Then, we deduct the property, plant and equipment sales data from the summed value. In our sample, the highest investment made by any company is BDT 31.3 billion. The average investment is positive for all the companies. However, among the thirty companies, four companies have never invested more than a hundred million BDT in a year. Moreover, there are some instances, three

companies, where the value of the investment is negative. The negative investment implies that in some years, the proceeds from the sale of fixed assets are greater than the capital expenditures, R&D expenditures, and acquisitions.

Table 1 also implies that most of the companies invest large amounts occasionally, as they have very high kurtosis. In addition, it is evident from the standard deviation that the magnitude of investments, for all the companies, from year to year varies quite significantly.

Table 1: Descriptive Statistics of Investments

Company	μ	min	max	σ	Skewness	Kurtosis	N
1	1.34E+09	-1.76E+09	4.83E+09	1.88E+09	0.326	2.397	13
2	6084655.7	0	48336396	14965896	2.589	7.863	10
3	21932791	-40937858	74732356	33538456	0.108	3.03	10
4	39774777	2839253	95332138	31504322	0.658	2.05	10
5	3.51E+09	6.80E+08	7.99E+09	2.39E+09	0.699	2.464	10
6	60080192	36439622	1.46E+08	34703778	1.706	4.844	10
7	1.72E+08	69125504	2.43E+08	57161227	-0.466	2.07	10
8	3.73E+09	80874175	3.13E+10	1.03E+10	2.474	7.122	9
9	2.82E+09	9.91E+08	6.62E+09	1.61E+09	1.225	3.879	11
10	1.00E+09	1.31E+08	2.54E+09	8.26E+08	0.83	2.413	9
11	4.37E+09	1.26E+09	8.08E+09	2.70E+09	0.277	1.555	12
12	1.05E+08	4124349	7.49E+08	2.27E+08	2.633	8.007	10
13	52282533	26396761	82986357	22070247	0.171	1.54	8
14	1.98E+10	1.12E+10	3.04E+10	6.50E+09	0.29	2.047	9
15	6.75E+08	1.57E+08	2.96E+09	9.48E+08	2.059	5.553	8
16	6.95E+08	4717645	4.60E+09	1.37E+09	2.389	7.415	11
17	9.48E+08	1.39E+08	5.77E+09	1.64E+09	2.603	8.241	11
18	4.14E+08	84946000	9.69E+08	2.77E+08	0.668	2.596	11
19	1.61E+08	51559172	3.19E+08	1.02E+08	0.399	1.71	10
20	9.11E+08	2.84E+08	1.78E+09	4.36E+08	0.42	2.685	10
21	5.03E+08	0	1.47E+09	4.93E+08	1.132	2.823	9
22	4.93E+08	1.40E+08	1.81E+09	4.87E+08	2.191	6.578	10
23	1.65E+09	1.02E+09	2.61E+09	6.44E+08	0.667	1.747	11
24	83138724	-5229748	2.94E+08	94050369	1.307	3.82	9
25	1.52E+08	1823637	5.80E+08	2.21E+08	1.342	3.126	11
26	3.38E+09	2.10E+09	5.29E+09	1.10E+09	0.653	1.981	10
27	67718335	6897220	1.32E+08	44545234	0.065	1.582	8
28	5.22E+08	18904656	1.14E+09	3.28E+08	0.507	2.653	10
29	3.33E+09	3.80E+08	1.86E+10	5.26E+09	2.508	7.876	11
30	2.72E+08	22664601	6.37E+08	2.01E+08	0.313	2.081	10

5.2 Disclosure Score

Table 2 presents the descriptive statistics of disclosure scores. We use a total of 28 criteria to assess the disclosure quality of each company. These criteria are developed from a gazette published by Bangladesh Securities and Exchange Commission (BSEC). These criteria include both financial and non-financial disclosure aspects. The average score is less than 2 for most of the companies, which depicts that those companies rarely surpass the minimum requirement of a specific criterion. This can be clarified by our scoring system. If a company complies with the mandatory requirement, then a score of 2 is given. If the company exceeds the requirement, then a score of 3 is given. However, if the company does not comply with the requirement, then a score of 1 is given. Then, we calculate the equally weighted average score for each company year.

Here, the standard deviations are quite low for almost every company. These low standard deviations imply that the disclosure policy of these companies has not been changed considerably over the years. Moreover, one company has zero standard deviation, which means that this company hasn't changed their disclosure practices in the previous nine years. Overall, it can be concluded that the disclosures of these companies are quite low.

5.3 Over-investment or Under-investment

Figure 1 portrays the residuals of equation 01. In equation 01, we estimate the expected investment and the residual from that estimation represents the deviation from the expected investment.

Table 2: Descriptive Statistics of Disclosure Score

Company	μ	min	max	σ	N
1	2.275	2.179	2.464	0.118	13
2	1.75	1.393	2.107	0.212	10
3	1.882	1.536	2.286	0.273	10
4	1.95	1.643	2.321	0.308	10
5	2.146	1.964	2.357	0.117	10
6	1.654	1.357	2.107	0.329	10
7	1.464	1.393	1.75	0.151	10
8	1.853	1.607	2.179	0.209	9
9	1.658	1.333	2.214	0.327	11

Company	μ	min	max	σ	N
10	2.099	1.536	2.536	0.428	9
11	1.58	1.321	1.857	0.213	12
12	1.664	1.429	1.964	0.238	10
13	1.319	1.107	1.536	0.227	8
14	2.365	1.929	2.714	0.414	9
15	1.866	1.429	2.286	0.423	8
16	1.523	1.393	1.679	0.114	11
17	1.795	1.429	2.107	0.325	11
18	1.984	1.643	2.321	0.324	11
19	1.879	1.607	2.143	0.265	10
20	2.021	1.679	2.25	0.295	10
21	1.464	1.464	1.464	0	9
22	2.043	1.786	2.214	0.221	10
23	1.594	1.321	1.821	0.261	11
24	1.845	1.321	2.107	0.393	9
25	1.773	1.429	2.107	0.317	11
26	1.914	1.679	2.107	0.177	10
27	1.603	1.536	1.643	0.055	8
28	1.736	1.536	1.964	0.204	10
29	2.097	1.821	2.393	0.283	11
30	1.768	1.393	2.179	0.375	10

Here, each line graph represents a single company. The red-coloured line is the expected investment. If the line graph is below (above) the red line, the company is under-investing (over-investing). Out of thirty companies, three companies are under-investing every year, even though they have the prospect to grow (as measured by sales growth). On the contrary, six companies are over-investing. The investment activities of the remaining twenty-one companies have fluctuated over the years. Among these companies, three of them are showing a trend in their investment activities. These three companies are increasing their investments relative to their growth opportunity over the last few years.

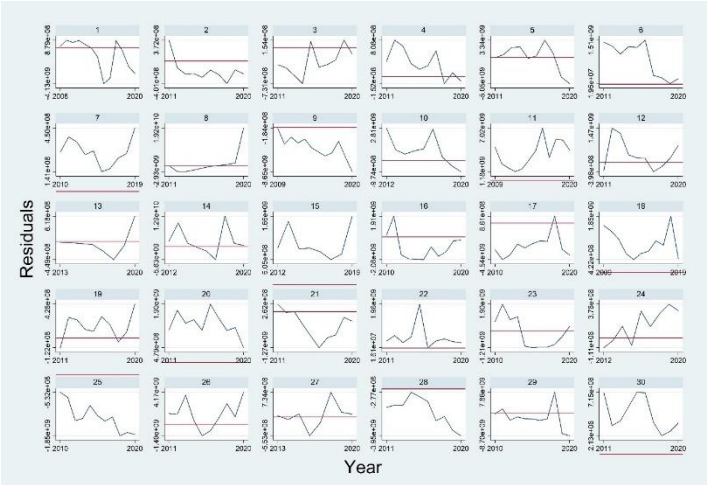

Figure 1: Deviation from Expected Investment.

5.4 Likelihood of under-investment and over-investment

Here, we model the relationship between disclosure practices – disclosure score – and the likelihood of over or under-investment. At first, we generate a variable that takes the value of 1, if the residual from equation 1 is in the bottom quartile (classified as under-investment), the value of 2 if it is in the top quartile (classified as over-investment), and the value of 0 if it is between the two classes (classified as the benchmark).

The table 3 represents the estimation from the following equations

$$ln\left(\frac{P(Underinvestment)}{P(Benchmark)}\right) = \gamma_0^i + \gamma_1^i Score_t^i$$

$$ln\left(\frac{P(Overinvestment)}{P(Benchmark)}\right) = \gamma_2^i + \gamma_3^i Score_t^i$$

Here, $Score_t^i$ refers to the equally weighted average disclosure score. *Underinvestment* represents cases where the investment values fall below expectations. *Overinvestment*, on the other hand, indicates instances where the observed values exceed expectations. The *Benchmark* corresponds to the expected investment. Standard errors are in parenthesis.

Table 3: Likelihood of Underinvestment and Overinvestment

Category	Coefficient		RRR		Probability	
Underinvestment						
Disclosure score	-1.123324	***	0.325	***		
	(0.414)		(0.135)			
Constant	2.480127	***	11.943	***		
	(0.789)		(9.42)			
Disclosure Score						
1					0.4564481	***
					(0.076)	
2					0.3890677	***
					(0.032)	
3					0.2448549	***
					(0.082)	
Overinvestment						
Disclosure Score	-1.304768	***	0.271	***		
	(0.437)		(0.119)			
Constant	2.592592	***	13.364	***		
	(0.825)		(11.032)			
Disclosure Score						
1					0.4260243	***
					(0.077)	
2					0.3028783	***
					(0.030)	
3					0.1589835	**
					(0.062)	
Benchmark						
Disclosure Score						
1					0.1175275	***
					(3.150)	
2					0.308054	***
					(10.440)	
3					0.5961616	***
					(5.640)	

*** $p<.01$, ** $p<.05$, * $p<.1$

Table 3 presents the likelihood of the multinomial logit model. Nearly all the estimations are statistically significant at 1% level. The relative-risk ratio for under-investment is 0.325, implying that with each one-unit increase in the disclosure score variable, the risk of falling into the under-investment category, as opposed to belonging to the benchmark, is expected to change by a factor of 0.325. To put it differently, an increase in the disclosure score is associated with a reduced likelihood of under-investment and an increased probability of securing the anticipated investment. Furthermore, if a company maintains an equally-weighted average disclosure score of 1, the probability of under-investment is estimated at 45.64%. In contrast, with a score of 3, the probability decreases to 24.49%. Companies with higher disclosure scores exhibit a lower likelihood of over-investment. This is reflected in the RRR for over-investment, which comes in at 0.271. In simpler terms, for each unit increase in disclosure score, the relative risk of over-investment is

multiplied by 0.271. For companies maintaining an equally-weighted average disclosure score of 1, the estimated probability of over-investment stands at 42.6%. Conversely, with a score of 2, the probability decreases to 30.3%, and with a score of 3, it further drops to 15.9%. In essence, companies with strong disclosure practices are more likely to make the expected investment.

6. ROBUSTNESS TEST

We perform robustness test in our paper. We alter the method of assessing investment efficiency. Apart from the model specified in Biddle *et al.* (2009), investment efficiency can be measured in various ways. We employ Richardson's (2006) model to improve the accuracy and dependability of the outcomes (table 04 panel A). The model is as follows:

$$Investment^i_{t+1} = \alpha_i + \beta^i_1 Size^i_t + \beta^i_2 Invest^i_t + \beta^i_3 Cash^i_t + \beta^i_4 Growth^i_t + \beta^i_5 Lev^i_t + \varepsilon^i_{t+1} \quad (4)$$

Panel A of this table represents the estimation from the following equations.

$$Investment^i_{t+1} = \alpha_i + \beta^i_1 Size^i_t + \beta^i_2 Invest^i_t + \beta^i_3 Cash^i_t + \beta^i_4 Growth^i_t + \beta^i_5 Lev^i_t + \varepsilon^i_{t+1}$$

$Investment^i_{t+1}$ is the total investment in year t+1, $Size^i_t$ is total assets, $Invest^i_t$ is current year's total investment, $Cash^i_t$ is cash and cash equivalents, $Growth^i_t$ is the percentage change from the previous year, Lev^i_t is the debt to asset ratio, and ε^i_{t+1} represents the residual.

In Panel B, Disclosure score is regressed with the negative residual (Underinvestment), and positive residual (Overinvestment).

We extend this area of research to a developing economy, Bangladesh. Precisely, we tested the hypothesis of whether disclosure quality is correlated with a better investment decision by diminishing under-investment and over-investment. The data set ranges from 2006 to 2020. We have used a multinomial logit model to estimate the likelihood of deviation from expected investment.

First, focusing on the disclosure activities, we find that only a small number of companies scored above 2, suggesting that Bangladeshi companies hardly disclose more than what is required. Second, the deviation from expected investment varies quite substantially – at times these companies over-invest and subsequently under-invest. Finally, to test our hypotheses, we have used a multinomial logit model to predict the likelihood of deviation from expected investment. The result suggests that companies with better disclosure scores are more likely to have better investment efficiencies, and our robustness test has yielded identical results. Overall, our results are consistent with the general understanding of academics and regulating authorities that increased disclosure enables shareholders to properly monitor management's activities thereby refraining managers from value-destroying activities.

In essence, our study provides evidence that disclosure can affect managers' investment decisions. However, it is possible that managers can discover new information from the financial report development process. Hence, a possible extension of our research is to examine whether the financial report development process enhances managers' expertise and, ultimately, improves investment decisions.

Table 4: The Robustness Tests

Category	Coef.	St.Err.	t-value	p-value	[95% Conf Interval]		Sig
			Panel A				
Size	0.057	0.008	7.01	0	0.041	0.072	***
Investment	0.465	0.056	8.27	0	0.355	0.575	***
Cash	0.064	0.049	1.31	0.191	-0.032	0.159	
Growth	-1.80E+08	3.11E+08	-0.58	0.563	-7.89E+08	4.30E+08	
Leverage	-41828261	90279278	-0.46	0.643	-2.19E+08	1.35E+08	
Constant	-80683674	2.89E+08	-0.28	0.78	-6.48E+08	4.86E+08	
			Panel B				
Underinvestment							
Disclosure Score	-35659575	15242579	-2.34	0.022	-65999169	-5319981	**
Constant	1.85E+08	30064734	6.15	0	1.25E+08	2.45E+08	***
Overinvestment							
Disclosure Score	-2.43E+09	3.87E+08	-6.29	0	-3.19E+09	-1.67E+09	***
Constant	5.82E+09	5.87E+08	9.91	0	4.66E+09	6.97E+09	***

*** $p<.01$, ** $p<.05$, * $p<.1$

Here, $Investment^i_{t+1}$ is the total investment in the year t+1, $Size^i_t$ is the amount of the total assets, $Invest^i_t$ is the total investment in the year t, $Cash^i_t$ is the amount of cash and cash equivalents, $Growth^i_t$ is the percentage change in value from the year t-1 to t, Lev^i_t is the debt to asset ratio, and ε^i_{t+1} is the residual. A negative residual will suggest underinvestment, whereas a positive residual will indicate overinvestment. Additionally, we change the method of assessing disclosure. We examine the yearly reports of selected companies spanning from 2006 to 2020 to determine if they disclose potential financial, industry, or market risks. Based on these criteria, we create a disclosure scoring system. After that, we regress the disclosure score with the residual from equation 4. The results in table 04 panel b show that there is a negative correlation between changes in risk disclosure and variations in investment efficiency, and this evidence further supports the robustness of this paper.

7. CONCLUSION

The objective of our study was to assess the consequences of disclosure practices on investment efficiency. Numerous studies, conducted on developed countries, have shown that better disclosure reduces investment inefficiencies by alleviating information asymmetry.

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APPENDIX

The table presents the 28 disclosure criteria.

No.	Disclosure Items
1	Clearly defined ownership structure
2	Board remuneration
3	Minority interests
4	Code of conduct for Board of Directors and Senior Management
5	The company's website includes information on the Audit Committee, Nomination and Remuneration Committee, Risk Management Committee, and CSR Committee
6	Auditors' remuneration
7	The safety and welfare of its employees
8	Outline the roles of key stakeholders
9	Mention environmental issues
10	Expected profitability
11	Financial risks
12	Growth opportunities
13	Industry or market risks
14	Investment projects
15	Product research, innovation and development
16	Advertising and marketing plan
17	Capital expenditure plan
18	Increased production/service
19	Sales target/ improved export
20	Quarterly financial statements
21	Chartered accountants for a consecutive period exceeding three years?
22	The depreciation methods used
23	The accounting policies adopted in measuring inventories, including the cost formula used.
24	The useful lives or the depreciation rates used
25	Inventories are sub-classification
26	The components of cash and cash equivalents items reported in the balance sheet
27	Income breakdown from investments.
28	Calculation of Net Asset Value Per Share Earnings Per Share (Basic & Diluted) Net Operating Cash Flow Per Share