Impact of Information Disclosure on Investment Efficiency: Integrated Interpretation of Evidence from Previous Studies through a Meta–Analysis Approach

Yuuki OTA

（令和 2 年 10 月 5 日受理）

Summary

This study aims to provide an integrated interpretation of evidence from previous studies that reveals the impact of information disclosure by firms on investment efficiency by adopting a meta–analysis approach. Using the correlation coefficients of primary studies from eight literature databases as effect sizes, I found evidence suggesting that high– quality financial reporting, proactive disclosure of nonfinancial information, and disclosure of CSR (Corporate Social Responsibility) and ESG (Environmental, Social, and Governance) information improve investment efficiency. In contrast, although the results confirm that IFRS (Internal Financial Reporting Standards) adoption improves investment efficiency, it is not robust. The findings of this study are useful for investors interested in integrated evidence rather than the results of numerous individual primary studies.

【Keywords】investment efficiency, information disclosure, meta–analysis

1. Introduction

This study aims to provide an integrated interpretation of evidence from previous studies revealing the impact of information disclosure by firms on investment efficiency by adopting a meta–analysis approach. Net Present Value (NPV) is important when considering investment efficiency. NPV is the difference between the present discounted value of future cash flows from the investment and the amount of investment. The NPV method of investment decision–making requires that managers implement investment projects that show a positive NPV. Overinvestment is defined as the implementation of negative NPV investment projects, and underinvestment is defined as not implementing positive investment projects. Both are considered inefficient investments. The reason that managers undertake inefficient investments is the information asymmetry between managers and external suppliers of capital [1]. Information asymmetry can cause moral hazard and adverse selection problems. If this information asymmetry becomes more significant, managers may proceed with inefficient investments owing to moral hazard and adverse selection problems.

One factor that mitigates the information asymmetry between managers and external suppliers of capital is firm information disclosure. Several studies indicate that firms' financial reporting leads to a reduction in information asymmetry (e.g., Leuz and Verrecchia, 2000; Bushman and Smith, 2001; Verrecchia, 2001). Furthermore, some studies report that proactive disclosure of corporate social responsibility (CSR) information is likely to reduce information asymmetry (e.g., Dhaliwal et al., 2011; Cho et al., 2013; Krüger, 2015). Based on these studies, information disclosure by firms is expected to reduce information asymmetry and improve investment efficiency. In this context, many studies on accounting or finance have examined the impact of information disclosure by firms on investment efficiency. However, the evidence provided in previous studies is inconsistent. In this situation, interpreting the evidence from several studies is more important than simply organizing individual primary studies. Inefficient investments have negative effects on future performance[2], so investors may decide whether to invest their funds in firms using evidence from investment efficiency studies. However, "they are not interested in the individual studies provided by academics and are more likely to be interested in evidence that integrates several studies" (Asano, 2018, p. 294). Thus, providing new evidence from a meta–analysis can be useful for investors.

A meta–analysis is "the integration of the results of several studies conducted on the same topic using statistical methods, i.e., statistical review" (Yamada and Inoue, 2012, p. 1). "The meta–analysis is sometimes referred to as systematic review" (Yamada and Inoue, 2012, p. 1). In contrast, the method wherein "reviewers read individual studies and summarize their findings" (Yamada and Inoue, 2012, p. 3) is referred to as a narrative review. A meta–analysis can provide new evidence that integrates primary studies, which is different from narrative review, in the following two situations. First, extant individual primary studies have weak statistical power due to small sample sizes and generally do not provide results that support the alternative hypothesis. Second, several primary studies provide conflicting or competing evidence for a particular hypothesis (Asano, 2018, p. 294). Research questions on the impact of information disclosure by firms on investment efficiency apply to many of these situations, and using a meta–analysis approach is worthwhile.

This paper is organized as follows. Section 2 provides a narrative review of previous studies examining the impact of information disclosure by firms on investment efficiency. Section 3 comprises an overview of methods for quantifying investment efficiency. Section 4 formulates the research questions to be identified using a meta–analysis approach and shows how to collect and evaluate the data. Section 5 reports the results of the meta–analysis. Section 6 summarizes the findings and provides the conclusions of the study.

2. Narrative review

2.1 The impact of information asymmetry on investment efficiency

Information asymmetry is "a phenomenon in which necessary information is not distributed to all parties to economic transactions, and information is unevenly distributed to only a few parties" (Suda, 2000, p. 13). Two problems can be attributed to information asymmetry (e.g., Suda, 2000; Cheng et al., 2013). The first is the moral hazard problem. This refers to "the fact that entering into a contract changes the behavior of the contracting parties and ultimately all parties to the contract suffer losses" (Suda, 2000, p. 18). The second problem is the adverse selection, which is when "low quality goods dominate the market" (Suda, 2000, p. 15).

In neoclassical economic theory, only marginal q can influence firms' investment policies (e.g., Yoshikawa, 1980; Hayashi, 1982; Abel, 1983)[3]. Basically, firms should increase (decrease) their investment when marginal q is above (below) 1. In addition, the optimal investment level of firms is determined such that the marginal cost is equal to the marginal benefit. However, when information asymmetry exists between managers and external suppliers of capital, managers may implement inefficient investments.

Jensen and Meckling (1976) emphasized the possibility of managers' overinvestment due to moral hazards. As the agency problem between managers and shareholders becomes more serious, managers are more likely to implement even value–destroying investment projects to enhance their own reputation through increased firm size. This motivated overinvestment has been referred to as "empire building" (e.g., Jensen, 1986). Stiglitz and Weiss (1981) highlight that the moral hazard problem leads to firms' underinvestment. Information asymmetry raises problems for financial institutions, as they become unable to distinguish whether the type of firm they are lending to qualifies as "safe" or "risky". If financing institutions were to lend to firms that qualify as "risky" funding would likely be used for less profitable investment projects. Stiglitz and Weiss (1981) indicated that financial institutions and other investors are aware of managers' incentives, which results in reduced funding and consequently underinvestment.

Contrary to studies that have focused on the moral hazard problem, Myers and Majluf (1984) examined the problem of firms' underinvestment due to adverse selection. Managers have relatively greater information advantages than investors. Thus, managers can issue securities at a higher price than the actual value of the firm. In contrast, investors demand higher premiums for firms because they may buy securities at higher prices than they should. Following this, the issuance of shares is a more costly funding source than the use of internal funds and debt. Myers and Majluf (1984) indicate that if managers prefer internal funding or debt financing to the issuance of shares (pecking order theory) and cannot fund their investments with them, they may stop implementing them, even if the they positive NPV on their investment project.

Therefore, the problem of underinvestment arises in firms with financial constraints.

2.2 Information disclosure and investment efficiency

2.2.1 Financial reporting quality

Information disclosure by firms can reduce information asymmetry. Several studies find that high quality financial reporting mitigates information asymmetry that causes moral hazard and adverse selection problems (Leuz and Verrecchia, 2000; Bushman and Smith, 2001; Verrecchia, 2001). First, high quality financial reporting can improve the ability of external suppliers of capital to monitor managers (e.g., Bushman and Smith, 2001; Lambert, 2001). This is because external suppliers of capital are more likely to use financial reporting information when they monitor managers. Based on this, high–quality financial reporting would mitigate the moral hazard problem for managers. Second, high–quality financial reporting can mitigate the adverse selection problem (e.g., Chang et al. 2009). Investors often use financial reporting information to calculate firm value. If Investors can access information based on high–quality financial reporting, their calculation of firm value is likely to approximate intrinsic value. Thus, the premium on firms for new issuance of shares will likely decrease, which is expected to mitigate capital constraints on firms. This will mitigate the underinvestment problem.

Thus, high–quality financial reporting reduces information asymmetry, which can consequently improve investment efficiency. Many studies examine the association between financial reporting quality and investment efficiency. Biddle et al. (2009) examine the impact of financial reporting quality on investment efficiency for US firms. Biddle et al. (2009) focused on two proxy variables for financial reporting quality: accruals quality (AQ) and transparency of financial reporting. AQ is estimated using two methods, one relying on Dechow and Dichev (2002) and the other presented in Wysocki (2008), which is modified from Dechow and Dichev's (2002) model. The transparency of financial reporting is estimated using the approach presented in Li (2008). Defining the average of these three variables as the proxy variable for financial reporting quality, Biddle et al. (2009) found that it improves investment efficiency.

Other studies that have quantified the quality of financial reporting using the methods of Dechow and Dichev (2002) include Chen et al. (2011), Gomariz and Ballesta (2014), and Houcine (2017). Chen et al. (2011) provide evidence similar to that of Biddle et al. (2009) for 21 countries. Gomariz and Ballesta (2014) report that high–quality financial reporting firms are less likely to overinvest in Spanish firms, while underinvestment has no significant effect. Houcine (2017) found that firms with higher quality financial reporting are less likely to underinvest in Tunisian firms. However, no significant effect of financial reporting quality on overinvestment was identified.

Some studies focused on discretionary accruals (DA) as the quality of financial reporting. Firms with more DA are interpreted as having lower quality of financial

reporting. Ota (2017) uses Kasznik's (1999) method to estimate DA and shows that even among Japanese firms, firms with higher quality financial reporting are relatively more efficient in their investments. Linhares et al. (2018) estimate DA based on the model of Dechow et al. (1995) and found that investment efficiency improves with lower DA for Brazilian firms[4]. Lara et al. (2016) focused on accounting conservatism as a proxy variable for financial reporting quality. They estimated the degree of conservatism from the study by Khan and Watts (2009) and found that greater degrees of conservatism are associated with more efficient investments.

2.2.2 Information disclosure other than financial information

Lai et al. (2014) examined the impact of the level of firm disclosure on investment efficiency. The level of firm disclosure is based on the information disclosure and transparency rankings system developed by the Taiwan Securities and Futures Institute (TSFI). Moreover, they reported that investment efficiency improves for firms with higher levels of information disclosure for Taiwanese firms.

Some studies focused on nonfinancial information disclosure rather than financial information. This is because nonfinancial information, in addition to financial information, is also expected to lead to a reduction in information asymmetry. Bryan (1997) reported that information about future operations and capital investment plans is significantly related to short–term performance. This finding suggests that such information can be useful to investors in predicting firms' short–term performance. Schleicher and Walker (1999) provided evidence to suggest that firms that disclose detailed information about their business and financing in the future through annual reports are better able to predict future earnings changes. As these studies highlight, if nonfinancial information is useful in predicting future performance, then information asymmetry between firms and investors is likely to be reduced.

Tan et al. (2015) examine the impact of the level of voluntary disclosure of nonfinancial information about future performance on investment efficiency based on Cheng et al.'s (2012) approach for Chinese firms. The results of their analyses provide evidence suggesting that concerns about the underinvestment problem are mitigated in firms with higher levels of voluntary disclosure of nonfinancial information. In contrast, they also confirm results that are inconsistent with the expectation that voluntary disclosure of nonfinancial information induces overinvestment[5].

Some studies examine the association between information disclosure about risk and investment efficiency. The reason for focusing on information disclosure on risk is that previous studies indicate that it can reduce information asymmetry (e.g., Campbell et al. 2014; Hope et al. 2016). Elmy et al. (1998) and Roulstone (1999) indicate that information disclosure on risk increases the transparency of information. Eng and Mak (2003) show that risk information is useful for predicting future performance. In contrast, Kravet and Mulsu (2013) found that risk information is difficult to quantify;

therefore, increasing risk information will only lead to more uncertainty for investors.

Al–Hadi et al. (2017) examine the impact of the level of risk disclosure on investment efficiency for firms in six Arabic countries. Their analysis showed that firms with higher levels of risk–related information disclosure are more efficient in their investments. Chiu et al. (2019) also provide similar evidence for US firms. Li et al. (2019) found that firms with higher levels of risk disclosure for Chinese firms are less likely to overinvest. However, they found no evidence to support that risk information contributes to the mitigation of the underinvestment problem.

2.2.3 Information disclosure on CSR and ESG

Several studies have indicated that proactive firm CSR reduces information asymmetry (e.g., Dhaliwal et al. 2011; Cho et al. 2013; Krüger, 2015). First, information disclosure on a firm's CSR can enhance the monitoring ability of external stakeholders (e.g., Deng et al. 2013). Second, firms more active in CSR can improve their reputations and consequently mitigate the adverse selection problem (e.g., Cui, et al., 2016; Rim et al., 2016; Dell'Atti et al., 2017; Gavana et al., 2017). El Ghoul et al. (2011) find that equity financing is cheaper for firms more active in CSR.

Several studies examined the relationship between firms' disclosure of CSR information and investment efficiency under the assumption that CSR leads to less information asymmetry. Samet and Jarboui (2017) show that firms more proactive in CSR information disclosure tend to be more efficient in their investments[6]. Zhong and Gao (2018) found that firms that proactively disclose information about CSR are less likely to overinvest. However, the association between CSR and underinvestment is not significant.

Some studies focused on environmental, social, and governance (ESG) information disclosure, while others provided evidence to suggest that information disclosure on ESG, as well as CSR, also leads to less information asymmetry (e.g., Galbreath, 2013; Yu et al., 2018)[7]. Based on this evidence, Hammami and Zadeh (2020) find that firms more proactive in ESG disclosure are more likely to mitigate the underinvestment problem. However, no evidence currently supports that information disclosure on ESG leads to less overinvestment.

2.2.4 Improved comparability through the IFRS adoption

Several previous studies have provided evidence suggesting that the adoption of International Financial Reporting Standards (IFRS) improves the comparability of information (e.g., Li, 2010; DeFond et al. 2011; Barth et al. 2012; Yip and Young 2012; Horton et al. 2013). Comparability has been identified by the conceptual statement of the Financial Accounting Standards Board (FASB) as one of the qualitative characteristics that financial information should have. Therefore, comparability is considered the qualitative characteristic that enables users of financial information to

recognize the similarities and differences between two sets of economic phenomena.

Some studies examine the impact of IFRS adoption on investment efficiency, noting that improved comparability through IFRS adoption can lead to a reduction in information asymmetry. Chen et al. (2013) focus on the year of mandatory IFRS adoption in European countries and provide evidence that investment efficiency improves after mandatory IFRS adoption. Gao and Sidhu (2018) examine the association between mandatory IFRS adoption and investment efficiency for 40 countries around the world and find evidence similar to that of Chen et al. (2013). In contrast, Hou et al. (2016) report that the likelihood of inefficient investment in Chinese firms increases after mandatory IFRS adoption.

3. Quantifying investment efficiency

Studies examining the association between information disclosure and investment efficiency, reviewed in the previous section, quantify investment efficiency based on the difference between expected and actual investment [8]. Overinvestment (underinvestment) is larger (less) than the expected investment. Several previous studies have provided methods for estimating expected investment. The method used in most studies is provided by Biddle et al. (2009). Biddle et al. (2009) attempt to estimate the expected investment of a firm using the following equation[9].

$$I_{t+1} = \alpha_0 + \alpha_1 \mathrm{SalesGrowth}_t + \varepsilon_{t+1} \quad (1)$$

Here, I is firm investment, which typically includes capital investment and R&D investment. The definition of I varies according to previous studies. SalesGrowth is the sales growth. Biddle et al. (2009) use panel data to estimate equation (1) year–by–year and then define the investment efficiency from the residuals (ε) obtained. Thus, the residuals being positive (negative) is equivalent to overinvestment (underinvestment)[10].

Richardson (2006) also provides a model for estimating the expected investment. First, Richardson (2006) distinguishes the total investment (I_{total}) of firms into two categories: investment in new projects (I_{new}) and investment in maintaining facilities ($I_{maintain}$). Next, Richardson (2006) further identifies I_{new} into two types: expected ($I_{expected}$) and unexpected investment ($I_{unexpected}$). The model for estimating this unexpected investment is shown in equation (2) below.

$$I_{new,t} = \beta_0 + \beta_1 \frac{V_{t-1}}{P_{t-1}} + \beta_2 \mathrm{Leverage}_{t-1} + \beta_3 \mathrm{Cash}_{t-1} + \beta_4 \mathrm{Age}_{t-1} + \beta_5 \mathrm{Size}_{t-1} + \beta_6 \mathrm{StockReturn}_{t-1} + \beta_7 I_{new,t-1} + \mathrm{Year\&Industry\ dummies} + \varepsilon_t \quad (2)$$

V/P is the variable for investment opportunities and is the value of the firm (V) divided by its market value of equity (P). The other variables are leverage (Leverage), cash (Cash), firm age (Age), firm size (Size), stock return (StockReturn), and year and industry dummies (Year&Industry dummies). The residual (ε) in equation (2) represents unexpected investment in new investment projects. Similar to Biddle et al. (2009), this residual represents investment efficiency. Thus, if the residual (ε) is positive (negative), it means that the firm implements overinvestment (underinvestment).

Finally, I present the model of McNichols and Stubben (2008). This model focuses on Tobin's q. As highlighted in the previous section, neoclassical economic theory shows that marginal q is the only driver that influences firm investment (e.g., Yoshikawa, 1980; Hayashi, 1982; Abel, 1983). The model of McNichols and Stubben (2008) is expressed in equation (3) below.

$$I_t = \gamma_0 + \gamma_1 Q_{t-1} + \gamma_2 Q\_Qrt2_{t-1} + \gamma_3 Q\_Qrt3_{t-1} + \gamma_4 Q\_Qrt4_{t-1} + \gamma_5 CF_t + \gamma_6 Growth_{t-1} + \gamma_7 I_{t-1} + \varepsilon_t \quad (3)$$

Q is a proxy for Tobin's q and is calculated by dividing market capitalization by the book value of equity. Q_Qrt2 (Q_Qrt3, Q_Qrt4) is a dummy variable of 1 if Q belongs to the second quartile (third and fourth quartiles) in industry and year and zero otherwise. CF is cash flow, and Growth is firm size. The focus is still on the residuals. As in previous models, investment efficiency can be captured from the residuals.

4. Formulation of research questions and methods for data collection and evaluation

This study performs a meta-analysis of four procedures of the five–step model presented by Cooper (1982): (1) formulation of the research questions, (2) collection of the data, (3) evaluation of the data, and (4) analysis and interpretation[11]. This section describes procedures from steps (1) to (3), and the fourth procedure, "analysis and interpretation" is described in the next section.

4.1 Formulation of the research questions

This study examines the impact of the four factors reviewed in Section 2 (financial reporting quality, nonfinancial disclosure, CSR and ESG disclosures, and the IFRS adoption) on investment efficiency. Thus, the research questions are as follows:

RQ1: Does high–quality financial reporting improve investment efficiency?

RQ2: Does proactive disclosure of nonfinancial information improve investment

efficiency?

RQ3: Does proactive disclosure of CSR and ESG information improve investment efficiency?

RQ4: Does the IFRS adoption improve investment efficiency?

Table 1 Number of primary studies obtained from literature databases

ScienceDirect	JSTOR	Springer Link	Emerald	
236	104	26	34	
Taylor and Francis	Wiley	Proquest	CiNii	Total Amount
105	138	428	16	1,087

The collection of primary studies in the literature databases was conducted by title search. The keywords "investment efficiency" is used for the foreign primary studies and "Toushi no Kouritsusei" is used for Japanese primary studies. Note that this table is my own creation (the following tables are the same).

4.2 Collection of the data

This study includes primary studies from the eight literature databases available to the author. Seven of the eight literature databases (ScienceDirect, JSTOR, Springer Link, Emerald, Taylor and Francis, Wiley, and Proquest) were used to collect foreign primary studies. The other is CiNii, which is used to collect primary studies from Japan[12]. The collection of primary studies was performed by searching for titles in each literature database. The title of the primary foreign (Japanese) studies is "investment efficiency (Toushi no Kouritusei)". Table 1 shows the number of papers collected from each literature database. Table 1 reveals that 1,071 foreign and 16 Japanese primary studies (1,087 in all) were extracted[13].

4.3 Evaluation of the data

There are two requirements for selecting samples of primary studies from the literature database for meta–analysis. First, the association between the four factors (financial reporting quality, nonfinancial disclosure, CSR and ESG disclosures, and the IFRS adoption) and investment efficiency must be quantitatively tested[14]. Second, investment efficiency must be quantified using the three methods (Biddle et al., 2009; Richardson, 2006; McNichols and Stubben, 2008) presented in the previous section[15].

Tables 2–5 list the primary studies used in the meta–analysis. For example, Table 2 lists 29 primary studies that examine the association between financial reporting quality and investment efficiency[16]. The two most common countries for research are the US and China. The method of Biddle et al. (2009) is presently the most commonly used to quantify investment efficiency.

4.4 Effect size

The characteristic of the meta–analysis is that the results of individual primary studies are combined using the effect size. The effect size was defined as the magnitude of impact of the primary studies. The effect size is often based on (1) standardized mean differences, (2) odds ratios, and (3) correlation coefficients[17]. This study focuses on the correlation coefficients between these effect sizes. However, many of the primary studies in this paper do not explicitly indicate the results of the correlation coefficients in their papers. Therefore, in this study, I calculated the correlation coefficient r from the test statistic t and sample size n in the main results (regression analysis) using the following equation:

$$r = \pm\sqrt{\frac{t^2}{t^2 + n - 2}} \tag{4}$$

In this study, I combined the correlation coefficients of each primary study obtained from equation (4) with Fisher's Z–transformation[18]. Note that in combining effect sizes, either the fixed–effects model or the random–effects model is chosen based on the assumptions about the effect size. The fixed–effects model should be used if several studies are assumed to be performed on different samples selected from the same population and using the same procedures. In contrast, the random–effects model should be used if the populations of each study are different and variation in data collection procedures among the studies exists. In this study, I used both fixed– and random–effects models to combine the correlation coefficients[19].

The method of combining the correlation coefficients by the fixed–effects model is based on equation (5) (Haebara, 2014, p. 206):

$$\zeta = \frac{\sum_{i=1}^{k} w_i Z_i}{\sum_{i=1}^{k} w_i} \tag{5}$$

Here, ζ is the Z–transformed value of the combined correlation coefficients of each study, w_i is the variance of Z in study i, and k is the sample size.

The random–effects model is then expressed by equation (6) below (Haebara, 2014, p. 210).

Table 2 Primary studies on the relationship between financial reporting quality and investment efficiency

Number	Title	Countries	Sample size	How to quantify investment efficiency	Factors affecting investment efficiency
1	Chen et al. 2011	21 couniries	1,788	Biddle et al. 2009	Average of three proxy variables(Kothari et al., 2005, McNichols and Stubben, 2008, Dechow and Dichev, 2002)
2	Gomariz and Ballesta 2014	Spain	230	Biddle et al. 2009	Average of three proxy variables(Kasznik, 1999, McNichols and Stubben, 2008, Dechow and Dichev, 2002)
3	Li and Wang 2010	China	1,009	Richardson 2006	Average of four proxy variables(Jones, 1991, Ball and Shivakumar, 2005, Dechow and Dichev, 2002, Francis et al., 2004)
4	Zhong and Gao 2017(1)	China	2,352	Biddle et al. 2009	Accruals quality(Dechow and Dichev, 2002)
5	Zhong and Gao 2017(2)	China	2,352	Biddle et al. 2009	Discretional accruals(Kasznik, 1999)
6	Cheng et al. 2013	US	5,554	Biddle et al. 2009	Accruals quality(Dechow and Dichev, 2002)
7	Lara et al. 2016(1)	US	41,626	Biddle et al. 2009	Accounting Conservatism(Khan and Watts, 2009)
8	Lara et al. 2016(2)	US	41,626	Biddle et al. 2009	Accruals quality(Dechow and Dichev, 2002)
9	Lai and Liu 2018	Taiwan	2,863	Biddle et al. 2009	Discretional accruals(Kothari et al., 2005)
10	Houcine 2017	Tunisia	323	Biddle et al. 2009	Average of four proxy variables(Givoly and Hayn, 2000, Dechow and Dichev, 2002, Francis et al., 2005)
11	Habib and Hasan 2017	US	22,489	Biddle et al. 2009	Discretional accruals(Kothari et al., 2005)
12	Cook et al. 2019	US	19,622	Biddle et al. 2009	Accruals quality(Dechow and Dichev, 2002)
13	Dou et al. 2019	US	6,187	Biddle et al. 2009	Accruals quality(Dechow and Dichev, 2002)
14	Chen et al. 2017	US	31,544	Biddle et al. 2009	Accruals quality(Dechow and Dichev, 2002)
15	Biddle et al. 2009	US	20,443	Biddle et al. 2009	Average of three proxy variables(Wysocki, 2008, Li, 2008, Dechow and Dichev, 2002)
16	Boubaker et al. 2018	France	326	Biddle et al. 2009	Accruals quality(Dechow and Dichev, 2002)
17	Linhares et al. 2018	Brazil	1,855	Biddle et al. 2009	Discretional accruals(Dechow et al., 1995)
18	Shahzad et al. 2018	Pakistan	768	Biddle et al. 2009	Discretional accruals(Kasznik, 1999)
19	Shahzad and Rehman 2019	Pakistan	1,520	Biddle et al. 2009	Discretional accruals(Kasznik, 1999)
20	Bzeouich et al. 2019	France	435	Richardson 2006	Discretional accruals(Kothari et al., 2005)
21	Cherkasova and Rasadi 2017	10 countries	20,110	Biddle et al. 2009	Average of two proxy variables(Kothari et al., 2005, Dechow and Dichev, 2002)
22	Jeon and Oh 2017	Korea	2,399	McNichols and Stubben 2008	Discretional accruals(Jones, 1991)
23	Aulia and Siregar 2018	Indonesia	415	Biddle et al. 2009	Average of three proxy variables(Kasznik, 1999, McNichols and Stubben, 2008, Dechow and Dichev, 2002)
24	Alimoradi 2017	Iran	405	Biddle et al. 2009	Accruals quality(McNichols, 2002)
25	Park et al. 2017(1)	Korea	26,048	Biddle et al. 2009	Discretional accruals(Kothari et al., 2005)
26	Park et al. 2017(2)	Korea	26,048	Biddle et al. 2009	Accruals quality(Dechow and Dichev, 2002)
27	Park et al. 2017(3)	Korea	26,048	Biddle et al. 2009	Accruals quality(McNichols and Stubben, 2008)
28	Oh and Kim 2018	Korea	5,297	McNichols and Stubben 2008	Discretional accruals(Dechow et al., 1995)
29	Ota 2017	Japan	9,480	Biddle et al. 2009	Discretional accruals(Kasznik, 1999)

Table 3 Primary studies on the relationship between nonfinancial information disclosure and investment efficiency

Number	Title	Countries	Sample size	How to quantify investment efficiency	Factors affecting investment efficiency
1	Chiu et al. 2019(1)	US	1,829	Biddle et al. 2009	Text number
2	Chiu et al. 2019(2)	US	1,829	Biddle et al. 2009	Number of words about risk
3	Chiu et al. 2019(3)	US	1,829	Biddle et al. 2009	Number of words about the future
4	Lai et al. 2014	Taiwan	6,017	Biddle et al. 2009	The level of disclosure
5	Al-Hadi et al. 2017	6 countries	108	Biddle et al. 2009	The level of disclosure about risk information
6	Li et al. 2019	China	4,192	Richardson 2006	The level of disclosure about risk information
7	Tan et al. 2015	China	2,329	Richardson 2006	A variable on non-financial disclosure
8	Tan and Liu 2017(1)	China	806	Richardson 2006	A variable on non-financial disclosure
9	Tan and Liu 2017(2)	China	806	Richardson 2006	Quality rating of information disclosre

Table 4 Primary studies on the relationship between disclosure of CSR and ESG information and investment efficiency

Number	Title	Countries	Sample size	How to quantify investment efficiency	Factors affecting investment efficiency
1	Benlemlih and Bitar 2018	US	8,125	Biddle et al. 2009	CSR
2	Zhong and Gao 2017	China	2,352	Biddle et al. 2009	CSR
3	Hammami and Zadeh 2020	Canada	548	Biddle et al. 2009	ESG
4	Cook et al. 2019	US	19,622	Biddle et al. 2009	CSR
5	Shahzad et al. 2018	Pakistan	1,900	Biddle et al. 2009	CSR
6	Samet and Jarboui 2017	17 countries	888	Biddle et al. 2009	CSR

Table 5 Primary studies on the relationship between the IFRS adoption and investment efficiency

Number	Title	Countries	Sample size	How to quantify investment efficiency	Factors affecting investment efficiency
1	Chen et al. 2013	17 countries	4,435	Biddle et al. 2009	The level of information disclosure after mandatory adoption of IFRS
2	Zhong and Gao 2017	40 countries	82,724	Biddle et al. 2009	Mandatory adption of IFRS
3	Linhares et al. 2018	Brazil	1,855	Biddle et al. 2009	Adoption of IFRS
4	Hou et al. 2016	China	3,392	Biddle et al. 2009	Mandatory adption of IFRS

Table 6 t-values, correlation coefficients, and 95% confidence intervals for the primary studies in Table 2

Number	Title	t-values (overinvestment)	CC	95% CI (lower)	95% CI (upper)	t-values (underinvestment)	CC	95% CI (lower)	95% CI (upper)
1	Chen et al. 2011	-4.12	-0.09	-0.1358	-0.0438	-8.50	-0.12	-0.1486	-0.0912
2	Gomariz and Ballesta 2014	-5.79	-0.35	-0.4586	-0.2311	0.19	0.01	-0.1095	0.1292
3	Li and Wang 2010	-1.70	-0.05	-0.1114	0.0118	-1.63	-0.04	-0.0940	0.0142
4	Zhong and Gao 2017(1)	-2.43	-0.05	-0.0902	-0.0096	-5.13	-0.07	-0.1001	-0.0398
5	Zhong and Gao 2017(2)	-3.54	-0.07	-0.1101	-0.0297	-5.15	-0.07	-0.1001	-0.0398
6	Cheng et al. 2013	-2.54	-0.03	-0.0563	-0.0037	-3.40	-0.04	-0.0662	-0.0137
7	Lara et al. 2016(1)	-4.46	-0.02	-0.0296	-0.0104	-6.05	-0.02	-0.0296	-0.0104
8	Lara et al. 2016(2)	-1.65	-0.01	-0.0196	-0.0004	-3.13	-0.01	-0.0196	-0.0004
9	Lai and Liu 2018	-2.28	-0.04	-0.0765	-0.0034	-2.28	-0.04	-0.0765	-0.0034
10	Houcine 2017	0.55	0.03	-0.0794	0.1387	1.75	0.09	-0.0193	0.1972
11	Habib and Hasan 2017	-26.54	-0.17	-0.1827	-0.1573	-13.46	-0.05	-0.0584	-0.0416
12	Cook et al. 2019	-2.93	-0.02	-0.0340	-0.0060	-0.97	-0.01	-0.0240	0.0040
13	Dou et al. 2019	-0.54	-0.01	-0.0349	0.0149	0.21	0.00	-0.0249	0.0249
14	Chen et al. 2017	-2.08	-0.01	-0.0210	0.0010	-2.08	-0.01	-0.0210	0.0010
15	Biddle et al. 2009	-5.91	-0.04	-0.0537	-0.0263	-3.38	-0.02	-0.0337	-0.0063
16	Boubaker et al. 2018	-2.59	-0.14	-0.2449	-0.0319	-2.33	-0.08	-0.1546	-0.0045
17	Linhares et al. 2018	-2.34	-0.05	-0.0953	-0.0045	-4.21	-0.09	-0.1350	-0.0447
18	Shahzad et al. 2018	-1.66	-0.05	-0.1203	0.0208	-1.66	-0.05	-0.1203	0.0208
19	Shahzad and Rehman 2019	-3.90	-0.09	-0.1396	-0.0399	-3.90	-0.09	-0.1396	-0.0399
20	Bzeouich et al. 2019	-15.30	-0.59	-0.6481	-0.5251	-15.30	-0.59	-0.6481	-0.5251
21	Cherkasova and Rasadi 2017	-4.14	-0.02	-0.0338	-0.0062	-4.64	-0.13	-0.1877	-0.0714
22	Jeon and Oh 2017	-3.50	-0.07	-0.1097	-0.0301	-0.71	-0.01	-0.0394	0.0195
23	Aulia and Siregar 2018	-1.60	-0.07	-0.1652	0.0264	-2.67	-0.16	-0.2752	-0.0403
24	Alimoradi 2017	-6.80	-0.32	-0.4048	-0.2297	-6.80	-0.32	-0.4048	-0.2297
25	Park et al. 2017(1)	-16.25	-0.10	-0.1120	-0.0880	-11.76	-0.05	-0.0588	-0.0412
26	Park et al. 2017(2)	-23.23	-0.14	-0.1519	-0.1281	-14.75	-0.06	-0.0688	-0.0512
27	Park et al. 2017(3)	-5.43	-0.03	-0.0421	-0.0179	2.45	0.01	0.0012	0.0188
28	Oh and Kim 2018	-2.20	-0.03	-0.0569	-0.0031	-0.09	-0.01	-0.0369	0.0169
29	Ota 2017	-3.29	-0.03	-0.0501	-0.0099	-3.29	-0.03	-0.0501	-0.0099

Table 7　t–values, correlation coefficients, and 95% confidence intervals for the primary studies in Table 3

Number	Title	t-values (overinvestment)	CC	95% CI (lower)	95% CI (upper)	t-values (underinvestment)	CC	95% CI (lower)	95% CI (upper)
1	Chiu et al. 2019(1)	-2.05	-0.04	-0.0857	0.0058	-2.32	-0.05	-0.0956	-0.0042
2	Chiu et al. 2019(2)	-1.88	-0.04	-0.0857	0.0058	-3.29	-0.07	-0.1155	-0.0242
3	Chiu et al. 2019(3)	-2.32	-0.05	-0.0956	-0.0042	-2.57	-0.06	-0.1055	-0.0142
4	Lai et al. 2014	-4.47	-0.05	-0.0752	-0.0248	-2.71	-0.03	-0.0552	-0.0047
5	Al-Hadi et al. 2017	-2.17	-0.20	-0.3748	-0.0115	-2.03	-0.22	-0.4207	0.0012
6	Li et al. 2019	-2.65	-0.04	-0.0702	-0.0097	0.87	0.01	-0.0132	0.0332
7	Tan et al. 2015	4.02	0.08	0.0395	0.1202	-4.05	-0.06	-0.0903	-0.0296
8	Tan and Liu 2017(1)	2.08	0.07	0.0009	0.1384	-3.66	-0.09	-0.1383	-0.0413
9	Tan and Liu 2017(2)	-5.23	-0.18	-0.2460	-0.1123	-5.02	-0.12	-0.1679	-0.0716

Table 8　t–values, correlation coefficients, and 95% confidence intervals for the primary studies in Table 4

Number	Title	t-values (overinvestment)	CC	95% CI (lower)	95% CI (upper)	t-values (underinvestment)	CC	95% CI (lower)	95% CI (upper)
1	Benlemlih and Bitar 2018	-0.62	-0.01	-0.0317	0.0117	-3.00	-0.02	-0.0373	-0.0027
2	Zhong and Gao 2017	-2.93	-0.06	-0.1002	-0.0196	-0.64	-0.01	-0.0403	0.0203
3	Hammami and Zadeh 2020	-1.09	-0.04	-0.1233	0.0439	-2.69	-0.10	-0.1790	-0.0197
4	Cook et al. 2019	-1.65	-0.01	-0.0240	0.0040	-2.76	-0.02	-0.0340	-0.0060
5	Shahzad et al. 2018	-1.99	-0.04	-0.0848	0.0050	-1.99	-0.04	-0.0848	0.0050
6	Samet and Jarboui 2017	-5.48	-0.18	-0.2429	-0.1156	-3.42	-0.08	-0.1302	-0.0294

Table 9　t–values, correlation coefficients, and 95% confidence intervals for the primary studies in Table 5

Number	Title	t-values (overinvestment)	CC	95% CI (lower)	95% CI (upper)	t-values (underinvestment)	CC	95% CI (lower)	95% CI (upper)
1	Chen et al. 2013	-1.91	-0.02	-0.0494	0.0094	-1.85	-0.02	-0.0494	0.0095
2	Zhong and Gao 2017	-2.23	-0.01	-0.0168	-0.0032	-7.68	-0.02	-0.0268	-0.0132
3	Linhares et al. 2018	-2.02	-0.04	-0.0854	0.0055	1.70	0.03	-0.0155	0.0754
4	Hou et al. 2016	2.48	0.04	0.0064	0.0736	3.99	0.05	0.0236	0.0763

Tables 2–5 list the primary studies used in the meta–analysis. On firms' information disclosure, I focus on (1) financial reporting quality (Table 2), (2) disclosure of nonfinancial information (Table 3), (3) disclosure of CSR and ESG information (Table 4), and (4) the IFRS adoption (Table 5). These tables specify the title of each primary study, the countries wherein the study is conducted, sample size, the method of quantifying investment efficiency, and proxy variables for factors affecting investment efficiency. Tables 6–9 show the t–values provided in the primary studies, the correlation coefficients (CC) calculated using equation (4), and the 95% confidence intervals (95% CI) of the correlation coefficients. If p– and z–values are reported in each study, they are all converted to t–values by the author. In tables 6–9, I clearly distinguish between the results for overinvestment and underinvestment.

Table 10 Results of the meta–analysis

Panel A	overinvestment	underinvestment	Panel B	overinvestment	underinvestment
ζ (fixed-effects model)	-0.0511	-0.0308	ζ (fixed-effects model)	-0.0320	-0.0401
95% CI(upper)	-0.0476	-0.0277	95% CI(upper)	-0.0180	-0.0279
95% CI(lower)	-0.0545	-0.0338	95% CI(lower)	-0.0459	-0.0522
ζ^*(random-effects model)	-0.0810	-0.0560	ζ^*(random-effects model)	-0.0368	-0.0584
95% CI(upper)	-0.0575	-0.0407	95% CI(upper)	0.0058	-0.0285
95% CI(lower)	-0.1045	-0.0713	95% CI(lower)	-0.0793	-0.0882
Nunber of fail-safes	8,275.64	5,174.24	Nunber of fail-safes	214.42	176.25

Panel C	overinvestment	underinvestment	Panel D	overinvestment	underinvestment
ζ (fixed-effects model)	-0.0203	-0.0233	ζ (fixed-effects model)	-0.0092	-0.0149
95% CI(upper)	-0.0095	-0.0136	95% CI(upper)	-0.0028	-0.0086
95% CI(lower)	-0.0310	-0.0330	95% CI(lower)	-0.0157	-0.0213
ζ^*(random-effects model)	-0.0482	-0.0288	ζ^*(random-effects model)	-0.0063	0.0080
95% CI(upper)	-0.0139	-0.0118	95% CI(upper)	0.0158	0.0439
95% CI(lower)	-0.0824	-0.0457	95% CI(lower)	-0.0285	-0.0279
Nunber of fail-safes	42.73	28.50	Nunber of fail-safes	16.60	71.28

Table 10 shows the results of the meta–analysis by combining the correlation coefficients. ζ (ζ^*) is the combined correlation coefficient of the primary studies using the fixed–effects model (the random–effects model). In addition, the 95% confidence intervals in each combined correlation coefficient are clearly indicated here.

In addition, Table 10 shows the number of fail–safes. The number of fail–safes (N) is calculated by the following equation: $N = \frac{\left(\sum_{i=1}^{k} z_i\right)^2}{2.706} - k$ (z is the z–transformed t–values for each study i, and k is the sample size). Panel A presents the combined results of the correlation coefficients in the primary studies listed in Table 6; Panel B, C, and D, which correspond to the primary studies listed in Table 7, 8, and 9, respectively.

$$\zeta^* = \frac{\sum_{i=1}^{k} w_i^* Z_i}{\sum_{i=1}^{k} w_i^*} \tag{6}$$

w_i^* is calculated using the following equation (7).

$$w_i^* = \frac{1}{\upsilon_i^*} \tag{7}$$

υ_i^* is defined as the sum of the variance τ^2, which reflects the differences between studies, and the variance υ_i, which reflects the sample variation of individual studies[20]. Note that τ^2 is expressed by equation (8) below (Haebara, 2014, p. 209).

$$\tau^2 = \frac{\sum_{i=1}^{k} w_i (Z_i - \varsigma)^2 - (k-1)}{\sum_{i=1}^{k} w_i - \frac{\left(\sum_{i=1}^{k} w_i^2\right)}{\left(\sum_{i=1}^{k} w_i\right)}} \tag{8}$$

5. Results of the meta-analysis

5.1 Test statistic t and the correlation coefficients in the primary studies

Tables 6–9 show the correlation coefficients calculated from equation (4) using the test statistic t and sample size in the primary studies[21]. Moreover, the upper and lower limits of the 95% confidence intervals of the correlation coefficients are also explicitly shown together. Here, the confidence interval is an indication of how reliable the sample effect size is as an estimate. Because the effect size obtained from the sample is an estimate of the population effect size and must include the sample error, simply reporting the sample effect size value as a result does not reveal the sample error. Confidence intervals of 95% are the intervals estimated to include the population with that probability.

Table 6 shows that many studies have negative correlation coefficients. This result suggests that high–quality financial reporting discourages the implementation of both overinvestment and underinvestment. However, the results for 95% confidence intervals show that, in several studies, the upper limits of the confidence intervals are above zero. For example, six of the 29 primary studies on overinvestment (numbers 3, 10, 13, 14, 18, and 23) correspond to this. This indicates that the correlation coefficients of the studies are not significant in a two–tailed test at the 5% level. Studies on underinvestment show that the upper limits of 95% confidence intervals are above zero

in ten of the 29% primary studies. Thus, the results of the primary studies examining the relationship between financial reporting quality and investment efficiency alone do not necessarily imply that they are negatively associated.

Table 7 clearly shows that many primary studies have negative correlation coefficients, but there are a few studies with the upper limits of their confidence intervals above zero. Some studies have significantly positive correlation coefficients with respect to overinvestment (numbers 7 and 8). In light of the results of previous studies, it is unclear whether disclosure of nonfinancial information reduces overinvestment. All the correlation coefficients of the primary studies on overinvestment in Table 8 are negative, but more than half are not significant at the 5% level. This result suggests that CSR and ESG information disclosure does not necessarily lead to less overinvestment. Table 9 shows that there is only one primary study with a significantly negative correlation coefficient (number 2). This result suggests that mandatory IFRS adoption is unlikely to lead to improved investment efficiency.

5.2 Results of the meta-analysis by combining the correlation coefficients

Table 10 reports the results of the meta–analysis by combining the correlation coefficients of the primary studies provided in Tables 6–9. The combination of the correlation coefficients uses the fixed–effects model (equation (5)) and the random–effects model (equation (6)). Panel A provides the results combining the correlation coefficients of the primary studies examining the association between financial reporting quality and investment efficiency. In Panel A, the combined correlation coefficients were significantly negative for both the fixed– and random–effects models. This result indicates that firms with higher quality financial reporting are less likely to make inefficient investments. High–quality financial reporting is expected to improve investment efficiency by reducing information asymmetry.

In addition, Table 10 showed the results for the number of fail–safes. Here, the fail–safe number indicates how many more studies with no effect would prevent the null hypothesis, which has zero effect size, from being rejected. The smaller the fail–safe number, the more likely the existence of fewer studies will change the results of the meta–analysis, which raises the suspicion of publication bias (Rosenthal, 1979)[22]. Currently, there are approximately 8,275 (5,174) fail–safes in primary studies examining the association between financial reporting quality and overinvestment (underinvestment) as in Panel A. This means that if there are 8,275 (5,174) more studies that show that financial reporting quality does not affect overinvestment (underinvestment), the results of the aforementioned meta–analysis would change. Given these findings, publication bias is not a significant concern with respect to financial reporting quality and investment efficiency.

Panel B provides the results of the meta–analysis on primary studies examining the

association between nonfinancial disclosure and investment efficiency. The combined correlation coefficients are significantly negative for both overinvestment and underinvestment in the fixed–effects model. However, the results of the random–effects model show that the upper limit of the confidence interval is above zero when focusing on overinvestment, and the combined correlation coefficient is not significant at the 5% level. The moral hazard problem can contribute to overinvestment by managers, but increased monitoring to managers is important to mitigate this problem. Proactive disclosure of nonfinancial information as well as financial information may lead to improved monitoring by stakeholders. However, this expectation is not necessarily supported, at least in light of the findings of the meta–analysis in this study.

In Panel C, the combined correlation coefficients are significantly negative for both the fixed– and random–effects models. This result indicates that disclosure of CSR and ESG information improves investment efficiency by reducing information asymmetry. However, it is important to note that the number of fail–safes in Panel C is relatively lower than that in Panels A and B. Both CSR and ESG have been attracting a lot of attention in recent years, and the importance of information disclosure is widely recognized. Under such circumstances, even if CSR– and ESG–related information disclosure does not result in improved investment efficiency, the results may not be made public. More evidence on this subject would be required in future research.

Panel D provides combined correlation coefficients of the primary studies examining the association between IFRS adoption and investment efficiency and reveals that the correlation coefficients combined in the fixed–effects model are significantly negative, while those combined in the random–effects model are not significant. Furthermore, the number of fail–safes related to the primary studies examining the association between IFRS adoption and overinvestment was found to be about 16, which is the lowest number listed in Table 10. Given these results, it can be argued that IFRS adoption does not necessarily lead to improved investment efficiency.

6. Conclusion

The study aimed to provide an integrated interpretation of evidence from studies examining the impact of firms' information disclosure on investment efficiency using a meta–analysis approach. This study focused on (1) financial reporting quality, (2) disclosure of nonfinancial information, (3) disclosure of CSR and ESG information, and (4) the IFRS adoption as the factors affecting investment efficiency. The meta–analysis of 1,087 primary studies obtained from eight literature databases, using the correlation coefficients (calculated using the test statistic t and sample size) of studies examining the relationship between investment efficiency and the four factors that influence it as effect sizes, revealed the following.

First, firms with high–quality financial reporting are demonstrated to be more

efficient with their investments. High–quality financial reporting may contribute to improved investment efficiency through the mitigation of moral hazard and adverse selection problems caused by information asymmetry. The concern of publication bias on the subject is also found to be relatively small.

Second, disclosure of nonfinancial information clearly led to the mitigation of the underinvestment problem. In contrast, the result that disclosure of nonfinancial information reduces overinvestment is observed when using the fixed–effects model but not when using the random–effects model. Recently, disclosure of nonfinancial information and financial information has become more important, but carefully discussing whether this will lead to an enhanced monitoring function is necessary to mitigate the moral hazard problem that can cause overinvestment.

Third, information disclosure on CSR and ESG was shown to improve investment efficiency. In addition to high–quality financial reporting, proactive disclosure of CSR and ESG information is likely to lead to a reduction in information asymmetry, suggesting that it improves investment efficiency. However, there is a strong concern about publication bias on this subject. Thus, developing future studies to gather evidence on the association between CSR and ESG information disclosure and investment efficiency is important.

Finally, although the results confirmed that IFRS adoption improves investment efficiency, it is not robust. Moreover, a strong concern about publication bias on this subject exists. Since few studies have focused on the relationship between IFRS adoption and investment efficiency, future research must conduct a detailed analysis highlighting this association.

The findings of the meta–analysis in this study can be useful to investors interested in firms' future performance because inefficient investments are likely to cause poor future performance. However, studies examining the association between firm information disclosure and investment efficiency are numerous, and the evidence from them is inconsistent. Therefore, investors are likely to be interested in integrated evidence based on the meta–analysis approach rather than the findings of individual studies.

If investors strongly request integrated evidence, researchers should anticipate that their studies may be used for future meta–analyses and ensure that the information necessary for conducting the meta–analysis is in their papers. In particular, the results of correlation coefficients should be made explicit in addition to descriptive statistics such as mean and standard deviation. Given that many of the studies used in this study's meta–analysis do not include the results of the correlation coefficients, this point deserves future consideration.

Finally, I would like to discuss some future research issues. First, since only a few studies on the relationship between information disclosure and investment efficiency for Japanese firms exist, conducting replication studies on this subject is necessary. To

the best of my knowledge, no study on the relationship between disclosure of nonfinancial information exists, disclosure of CSR and ESG information, and the IFRS adoption and investment efficiency for Japanese firms. New evidence will hopefully help clarify the impact of firms' information disclosure on investment efficiency.

Second, the findings of the meta–analysis in this study depend on the accuracy of measures to quantify investment efficiency. Although many previous studies have used the methods discussed in Section 3 of this paper, no studies have confirmed the accuracy of the estimates. More sophisticated methods may be presented in the future, which may negate the evidence to date. Finally, a wide range of factors affect investment efficiency. While this study focused on firms' information disclosure, many other factors have been examined on investment efficiency[23]. Specifically, studies indicate that good corporate governance improves investment efficiency, focusing on the impact of corporate governance on managers' monitoring function[24]. Thus, one challenge for future research would be to conduct a meta–analysis on this subject.

Appendix

This paper is part of the 2020 Shizuoka Sangyo University Special Research Project "Valuation of the stock market for the adoption of hostile takeover defenses: An integrated interpretation of previous studies by the method of meta–analysis" and the Grant–in–Aid for Scientific Research (Young Scientist Research Project No. 18K12906) for FY 2018–2021. We would like to thank Editage (www.editage.com) for English language editing. Any possible errors in this paper are my own.

Notes

1 Shareholders, investors and creditors are classified as "external suppliers of capital".

2 See Titman et al. (2004) and Ota (2018) for more on this point.

3 Following Tobin (1969), the increase in firm value at the time of a one–unit increase in capital relative to the reacquisition price of capital is termed marginal q.

4 DA is also used in these studies. Chen et al. (2011) estimate DA from the method of Kothari et al. (2005). Gomariz and Ballesta (2014) as well as Ota (2017) estimate DA using Kasznik's (1999) approach.

5 Tan and Liu (2017) also reported similar results.

6 Shahzad et al. (2018) and Cook et al. (2019) provide similar evidence.

7 Sharfman and Fernando (2008) show that improved environmental risk management is associated with a lower cost of capital.

8 Detailed comprehensive review on quantifying investment efficiency is provided in Gao and Yu (2020).

9 Chen et al. (2011) modified the model of Biddle et al. (2009) by adding a dummy variable to equation (1) that represents one if sales growth is negative and zero if otherwise.

10 Biddle et al. (2009) define the top (bottom) quartile of the absolute value of the residuals as firms that overinvest (underinvest). In addition to using equation (1), Biddle et al. (2009) also used a method to identify over– and underinvested firms from the leverage and cash balance (Myers, 1977; Jensen, 1986) in their analysis.

[11] The other procedure is the publication of the results.

[12] The last day of access to the respective literature databases is July 31, 2020.

[13] When performing the meta–analysis, whether the working paper should be included as data in the analysis is not clear. In this study, given the criticism (e.g., apples and oranges problem and garbage in, garbage out problem (Eysenck, 1978)) of the inclusion of non–peer–reviewed papers in the data, I have decided not to include working papers in the data for the analysis.

[14] Therefore, analytical studies are not included in the sample (e.g., Nan and Wen, 2014).

[15] Following this requirement, studies focusing on "labor investment efficiency" cannot be included in this paper's sample (e.g., Jung et al., 2014; Ha and Feng, 2018; Yun and Mo, 2020).

[16] If there are multiple proxy variables for factors affecting investment efficiency used in the same study, I treat them as a distinct sample. However, I prioritize the proxy variable for financial reporting quality that is averaged across multiple methods.

[17] Some studies perform the meta–analysis by combining p–value, although not effect sizes (e.g., Asano, 2018; Ota, 2019).

[18] This is called the Pearson's product–moment correlation coefficient.

[19] The influence of the degree of accuracy of the measurement of variables used in primary studies on the effect size is called the artifact. There are studies that modify the artifact in combining effect sizes. In this paper, however, I do not modify the artifact. This is an issue for future research.

[20] This is the variance in the fixed–effects model.

[21] The test statistic t in the primary studies is taken from the results of the main regression analysis in the papers. The sign of the test statistic t in all primary studies is set as negative if it indicates that firms with high–quality financial reporting (i.e., those that actively disclose nonfinancial information, those that are more active in disclosing information about CSR and ESG, and those that adopt IFRS) are less likely to over– or underinvest.

[22] If the sample for the meta–analysis is only the studies that have been published, the likelihood of estimating a higher effect increases. This is because studies that did not show an effect are often not published. The fail–safe numbers have been used in many studies to counter publication bias. However, the assumption that the average effect size of unpublished studies is zero has been criticized as arbitrary, and the trim–and–fill method is generally used (Duval and Tweedie, 2000).

[23] For example, the impact of the tax avoidance (Bailing and Rui, 2018; Khurana et al., 2018), corporate culture (Zhang et al., 2016), investor sentiment (Huang et al., 2016; Zhu et al. 2016), supply network position (Jinyan et al., 2020), corporate philanthropy (Chen et al., 2018),cross–listing (Abdallah and Abdallah, 2019), green financial development (He et al., 2019), audit quality (Chen et al. 2011; Bae et al., 2017), and analysts (Chen et al., 2017) on investment efficiency has been examined.

[24] Previous studies have focused on shares held by major shareholders (Xie and Li, 2018), corporate groups (Lee et al., 2017; Tan et al., 2018; Lei and Chen, 2019; Lin and Yeh, 2020), characteristics of top management (Lai and Liu, 2018; Lina, 2019), institutional investor monitoring (Ward et al., 2020), outside directors (Felix, 2018), female directors (Shin et al., 2020), and family ownership (Gao et al., 2017; Shahzad et al., 2018) as factors related to corporate governance.

References

Abdallah, A. A. N. and W. Abdallah. 2019. Does cross–listing in the US improve investment efficiency? Evidence from UK firms. *The Quarterly Review of Economics and Finance* 72: pp. 215–231.

Abel, A. B. 1983. Optimal investment under uncertainty. *American Economic Review* 73(1): pp. 228–233.

Al–Hadi, A., M. M. Hasan, G. Taylor, M. Hossain and G. Richardson. 2017. Market risk disclosures and investment efficiency: International evidence from the gulf cooperation council financial firms. *Journal of International Financial Management and Accounting* 28 (3): pp. 349–393.

Alimoradi, A. 2017. Scrutinizing the relation between financial reporting quality and investment efficiency: Evidence from Tehran Stock Exchange. *Journal of Economic and Management Perspectives* 11 (4): pp. 785–791.

Asano, N. 2018. The relationship between audit committee expertise and financial quality: A meta–analytic review. *Kaikei* 194 (3): pp. 294–305.

Aulia, D. and S. V. Siregar. 2018. Financial reporting quality, debt maturity, and chief executive officer career concerns on investment efficiency. *Brazilian Administration Review* 15 (2): pp. 1–16.

Bae, G. S., S. U. Choi, D. S. Dhaliwal and P. T. Lamoreaux. 2017. Auditors and client investment efficiency. *The Accounting Review* 92 (2): pp. 19–40.

Bailing, J. and J. Rui. 2018. The impact of tax avoidance on enterprise investment efficiency. *Journal of Discrete Mathematical Sciences and Cryptography* 21 (6): pp. 1293–1298.

Ball, R. and L. Shivakumar. 2005. Earnings quality in UK private firms: Comparative loss recognition timeliness. *Journal of Accounting and Economics* 39 (1): pp. 83–128.

Barth, M. E., W. R. Landsman, M. Lang and C. Williams. 2012. Are IFRS–based and US GAAP–based accounting amounts comparable? *Journal of Accounting and Economics* 54 (1): pp. 68–93.

Biddle, G. C., G. Hilary and R. S. Verdi. 2009. How does financial reporting quality relate to investment efficiency? *Journal of Accounting and Economics* 48 (2–3): pp. 112–131.

Benlemlih, M. and M. Bitar. 2018. Corporate social responsibility and investment efficiency. *Journal of Business Ethics* 148: pp. 647–671.

Boubaker, S., A. Houcine, Z. Ftiti and H. Masri. 2018. Does audit quality affect firms' investment efficiency? *Journal of the Operational Research Society* 69 (10): pp. 1688–1699.

Bryan, S. H. 1997. Incremental information content of required disclosures contained in management discussion and analysis. *The Accounting Review* 72 (2): pp. 285–301.

Bushman, R. M. and A. J. Smith. 2001. Financial accounting information and corporate governance. *Journal of Accounting and Economics* 31 (1–3): pp. 237–333.

Bzeouich, B., F. Lakhal and N. Dammak. 2019. Earnings management and corporate investment efficiency: Does the board of directors matter? *Journal of Financial Reporting and Accounting* 17 (4): pp. 650–670.

Campbell, J. L., H. Chen, D. S. Dhaliwal, H. M. Lu and L. B. Steele. 2014. The information content of mandatory risk factor disclosures in corporate filings. *Review of Accounting Studies* 19: pp. 396–455.

Chang, X., S. Dasgupta and G. Hilary. 2009. The effect of auditor quality on financing decisions. *The Accounting Review* 84 (4): pp. 1085–1117.

Chen, C., D. Young and Z. Zhuang. 2013. Externalities of mandatory IFRS adoption: Evidence from cross–border spillover effects of financial information on investment efficiency. *The Accounting Review* 88 (3): pp. 881–914.

Chen, F., O. K. Hope, Q. Li and X. Wang. 2011. Financial reporting quality and investment efficiency of

private firms in emerging markets. *The Accounting Review* 86 (4): pp. 1255–1288.

Chen, J., W. Dong, J. Y. Tong and F. F. Zhang. 2018. Corporate philanthropy and investment efficiency: Empirical evidence from China. *Pacific–Basin Finance Journal* 51: pp. 392–409.

Chen, T., L. Xie and Y. Zhang. 2017. How does analysts' forecast quality relate to corporate investment efficiency? *Journal of Corporate Finance* 43: pp. 217–240.

Cheng, M., D. Dhaliwal and Y. Zhang. 2013. Does investment efficiency improve after the disclosure of material weaknesses in internal control over financial reporting? *Journal of Accounting and Economics* 56 (1): pp. 1–18.

Cheng, X., T. Youchao and L. Jianmei. 2012. The non–financial information, the external financing, and the investment efficiency: A study based on the constraint of external systems. *Management World* 28 (7): pp. 137–150.

Cherkasova, V. and D. Rasadi. 2017. Earnings quality and investment efficiency: Evidence from Eastern Europe. *Review of Economic Perspectives* 17 (4): pp. 441–468.

Chiu, T. T., J. B. Kim and Z. Wang. 2019. Customers' risk factor disclosures and suppliers' investment efficiency. *Contemporary Accounting Research* 36 (2): pp. 773–804.

Cho, S. Y., C. Lee, and R. J. Pfeiffer Jr. 2013. Corporate social responsibility performance and information asymmetry. *Journal of Accounting and Public Policy* 32(1): pp. 71–83.

Cook, K. A., A. M. Romi, D. Sánchez and J. M. Sánchez. 2019. The influence of corporate social responsibility on investment efficiency and innovation. *Journal of Business Finance and Accounting* 46 (3–4): pp. 494–537.

Cooper, H. 1982. Scientific guidelines for conducting integrative research reviews. *Review of Educational Research* 52 (2): pp. 191–302.

Cui, J., H. Jo and H. Na. 2016. Does corporate social responsibility affect information asymmetry? *Journal of Business Ethics* 148: pp. 549–572.

Dechow, P. M. and I. D. Dichev. 2002. The quality of accruals and earnings: The role of accrual estimation errors. *The Accounting Review* 77 (Supplement): pp. 35–59.

Dechow, P. M., R. G. Sloan and A. P. Sweeney. 1995. Detecting earnings management. *The Accounting Review* 70 (2): pp. 193–225.

DeFond, M., X. Hu, M. Hung and S. Li. 2011. The impact of mandatory IFRS adoption on foreign mutual fund ownership: The role of comparability. *Journal of Accounting and Economics* 51 (3): pp. 240–258.

Dell'Atti, S., A. Trotta, A. P. Iannuzzi and F. Demaria. 2017. Corporate social responsibility engagement as a determinant of bank reputation: An empirical analysis. *Corporate Social Responsibility and Environmental Management* 24 (6): pp. 589–605.

Deng, X., J. K. Kang and B. S. Low. 2013. Corporate social responsibility and stakeholder value maximization: Evidence from mergers. *Journal of Financial Economics* 110 (1): pp. 87–109.

Dhaliwal, D. S., O. Z. Li, A. Tsang and Y. G. Yang. 2011. Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting. *The Accounting Review* 86 (1): pp. 59–100.

Dou, Y., M. H. F. Wong. and B. Xin. 2019. The effect of financial reporting quality on corporate investment efficiency: Evidence from the adoption of SFAS No. 123R. *Management Science* 65 (5): pp. 1949–2443.

Duval, S. and R. Tweedie, 2000. A nonparametric "trim and fill" method of accounting for publication bias in meta-analysis. *Journal of the American Statistical Association* 95: pp. 89–98.

El Ghoul, S., O. Guedhami, C. C. Y. Kwok and D. R. Mishra. 2011. Does corporate social responsibility

affect the cost of capital? *Journal of Banking and Finance* 35 (9): pp. 2388–2406.

Elmy, F. J., L. P. LeGuyader and T. J. Linsmeier. 1998. A review of initial filings under the SEC's new market risk disclosure rules. *Corporate Accounting and Finance* 9 (4): pp. 33–45.

Eng, L. L. and Y. T. Mak. 2003. Corporate governance and voluntary disclosure. *Journal of Accounting and Public Policy* 22 (4): pp. 325–345.

Eysenck, H. J. 1978. An exercise in mega-silliness. *American Psychologist* 33 (5): p. 517.

Felix, R. 2018. The effect of informed outside directors on investment efficiency. *Advances in Management Accounting* 30: pp. 99–127.

Francis, J., R. LaFond, P. M. Olsson and K. Schipper. 2004. Costs of equity and earnings attributes. *The Accounting Review* 79 (4): pp. 967–1010.

Francis, J., R. LaFond, P. M. Olsson and K. Schipper. 2005. The market pricing of accruals quality. *Journal of Accounting and Economics* 39 (2): pp. 295–327.

Galbreath, J. 2013. ESG in focus: The Australian evidence. *Journal of Business Ethics* 118 (3): pp. 529–541.

Gao, R. and B. K. Sidhu. 2018. The impact of mandatory international financial reporting standards adoption on investment efficiency: Standards, enforcement, and reporting incentives. *ABACUS* 54 (3): pp. 277–318.

Gao, R. and X. Yu. 2020. How to measure capital investment efficiency: A literature synthesis. *Accounting and Finance* 60 (1): pp. 299–334.

Gao, W., W. Li and Z. Huang. 2017. Do family CEOs benefit investment efficiency when they face uncertainty? Evidence from Chinese family firms. *Chinese Management Studies* 11 (2): pp. 248–269.

Gavana, G., P. Gottardo and A. M. Moisello. 2017. Sustainability reporting in family firms: A panel data analysis. *Sustainability* 9 (1): p. 38.

Givoly, D. and C. Hayn. 2000. The changing time–series properties of earnings, cash flows and accruals: Has financial reporting become more conservative? *Journal of Accounting and Economics* 29 (3): pp. 287–320.

Gomariz, M. F. C. and J. P. S. Ballesta. 2014. Financial reporting quality, debt maturity and investment efficiency. *Journal of Banking and Finance* 40: pp. 494–506.

Ha, J. and M. Feng. 2018. Conditional conservatism and labor investment efficiency. *Journal of Contemporary Accounting and Economics* 14 (2): pp. 143–163.

Habib, A. and M. M. Hasan. 2017. Managerial ability, investment efficiency and stock price crash risk. *Research in International Business and Finance* 42: pp. 262–274.

Haebara, T. 2014. *Further foundations of statistics for psychological research* ARMA.

Hammami, A. and M. H. Zadeh. 2020. Audit quality, media coverage, environmental, social, and governance disclosure and firm investment efficiency: Evidence from Canada. *International Journal of Accounting and Information Management* 28 (1): pp. 45–72.

Hayashi, F. 1982. Tobin's marginal q and average q: A neoclassical interpretation. *Econometrica* 50 (1): pp. 213–224.

He, L., R. Liu, Z. Zhong, D. Wang and Y. Xia. 2019. Can green financial development promote renewable energy investment efficiency? A consideration of bank credit. *Renewable Energy* 143: pp. 974–984.

Hope, O. K., D. Hu and H. Lu. 2016. The benefits of specific risk–factor disclosures. *Review of Accounting Studies* 21: pp. 1005–1045.

Horton, J., G. Serafeim and I. Serafeim. 2013. Does mandatory IFRS adoption improve the information

environment? *Contemporary Accounting Research* 30 (1): pp. 388–423.

Hou, Q., Q. Jin, L. Wang and G. Zhang. 2016. Mandatory IFRS adoption, accounting quality, and investment efficiency: Evidence from China. *China Journal of Accounting Studies* 4: pp. 236–262.

Houcine, A. 2017. The effect of financial reporting quality on corporate investment efficiency: Evidence from the Tunisian stock market. *Research in International Business and Finance* 42: pp. 321–337.

Huang, H., G. Jin and J. Chen. 2016. Investor sentiment, property nature and corporate investment efficiency: Based on the mediation mechanism in credit financing. *China Finance Review International* 6 (1): pp. 56–76.

Jensen, M. C. 1986. Agency costs of free cash flow, corporate finance, and takeovers. *American Economic Review* 76 (2): pp. 323–329.

Jensen, M. C. and W. H. Meckling. 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3 (4): pp. 305–360.

Jeon, H. J. and H. M. Oh. 2017. Debt maturity and investment efficiency evidence from Korea. *Journal of Applied Business Research* 33 (6) pp. 1081–1094.

Jinyan, S., J. Yang and Y. Li. 2020. Does supply network location affect corporate investment efficiency? *Research in International Business and Finance* 51 Forthcoming.

Jung, B., W. J. Lee and D. P. Weber. 2014. Financial reporting quality and labor investment efficiency. *Contemporary Accounting Research* 31 (4): pp. 1047–1076.

Jones, J. J. 1991. Earnings management during import relief investigations. *Journal of Accounting Research* 29 (2): pp. 193–228.

Kasznik, R. 1999. On the association between voluntary disclosure and earnings management. *Journal of Accounting Research* 37 (1): pp. 57–81.

Khan, M. and R. L. Watts. 2009. Estimation and empirical properties of a firm–year measure of accounting conservatism. *Journal of Accounting and Economics* 48 (2–3): pp. 132–150.

Khurana, I. K., W. J. Moser and K. K. Raman. 2018. Tax avoidance, managerial ability, and investment efficiency. *ABACUS* 54 (4): pp. 547–575.

Kothari, S. P., A. J. Leone and C. E. Wasley. 2005. Performance matched discretionary accrual measures. *Journal of Accounting and Economics* 39 (1): pp. 163–197.

Kravet, T. and V. Muslu. 2013. Textual risk disclosures and investors' risk perceptions. *Review of Accounting Studies* 18: pp. 1088–1122.

Krüger, P. 2015. Corporate goodness and shareholder wealth. *Journal of Financial Economics* 115 (2): pp. 304–329.

Lai, S. M. and C. L. Liu. 2018. Management characteristics and corporate investment efficiency. *Asia-Pacific Journal of Accounting and Economics* 25 (3–4): pp. 295–312.

Lai, S. M., C. L. Liu and T. Wang. 2014. Increased disclosure and investment efficiency. *Asia–Pacific Journal of Accounting and Economics* 21 (3): pp. 308–327.

Lambert, R. 2001. Contracting theory and accounting. *Journal of Accounting and Economics* 32 (1–3): pp. 3–87.

Lara, J. M. G., B. G. Osma and F. Penalva. 2016. Accounting conservatism and firm investment efficiency. *Journal of Accounting and Economics* 61 (1): pp. 221–238.

Lee, M., Y. Choi and S. Moon. 2017. The effect of internal capital market of Korean large business groups on investment efficiency. *Journal of Applied Business Research* 33 (5): pp. 903–918.

Lei, Q. and H. Chen. 2019. Corporate governance boundary, debt constraint, and investment efficiency.

Emerging Markets Finance and Trade 55 (5): pp. 1091–1108.

Leuz, C. and R. E. Verrecchia. 2000. The economic consequences of increased disclosure. *Journal of Accounting Research* 38 (Supplement): pp. 91–124.

Li, F. 2008. Annual report readability, current earnings, and earnings persistence. *Journal of Accounting and Economics* 45 (2–3): pp. 221–247.

Li, S. 2010. Does mandatory adoption of international financial reporting standards in the European Union reduce the cost of equity capital? *The Accounting Review* 85 (2): pp. 607–636.

Li, Y., J. He and M. Xiao. 2019. Risk disclosure in annual reports and corporate investment efficiency. *International Review of Economics and Finance* 63: pp. 138–151.

Li, Q. and T. Wang. 2010. Financial reporting quality and corporate investment efficiency: Chinese experience. *Nankai Business Review International* 1 (2): pp. 197–213.

Lin, J. J. and Y. H. Yeh. 2020. Internal capital markets, ownership structure, and investment efficiency: Evidence from Taiwanese business groups. *Pacific–Basin Finance Journal* 60: Forthcoming.

Lina, S. 2019. Analysis of factors affecting investment efficiency based on analytic hierarchy process and support vector machine (SVM) model. *Cluster Computing* 22: pp. 4367–4374.

Linhares, F. S., F. M. Costa and A. X. Beiruth. 2018. Earnings management and investment efficiency. *Revista Brasileira de Gestao de Negocios* 20 (2): pp. 295–310.

McNichols, M. F. 2002. Discussion of the quality of accruals and earnings: The role of accrual estimation errors. *The Accounting Review* 77 (Supplement): pp. 61–69.

McNichols, M. F. and S. R. Stubben. 2008. Does earnings management affect firms' investment decisions? *The Accounting Review* 83 (6): pp. 1571–1603.

Myers, S. C. 1977. Determinants of corporate borrowing. *Journal of Financial Economics* 5 (2): pp. 147–175.

Myers, S. C. and N. S. Majluf. 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics* 13 (2): pp. 187–221.

Nan, L. and X. Wen. 2014. Financing and investment efficiency, information quality, and accounting biases. *Management Science* 60 (9): pp. 2308–2323.

Oh, H. M. and W. Y. Kim. 2018. The effect of analyst coverage on the relationship between seasoned equity offerings and investment efficiency from Korea. *Sustainability* 10 (8): pp. 1–21.

Ota, Y. 2017. The empirical relationship between financial reporting quality and investment efficiency in Japanese firms. *Kankyou to Keiei* (Shizuoka Sangyo University) 23 (2): pp. 121–132.

Ota, Y. 2018. The relationship between capital investment and future performance: Focus on the implied expected growth rate. *Shizuoka Sangyo University School of Information Studies* 20: pp. 65–85.

Ota, Y. 2019. Valuation of stock market for information disclosure of capital investment: Integrative interpretation of evidence of prior research by meta–analysis method. *Securities Analysts Journal* 57 (8): pp. 35–45.

Park, S., I. Kim and W. Kim. 2017. Investment efficiency between listed and unlisted firms, and big 4 audit firms' effect: Evidence from Korea. *Journal of Applied Business Research* 33 (6): pp. 1095–1112.

Richardson, S. 2006. Over–investment of free cash flow. *Review of Accounting Studies* 11: pp. 159–189.

Rim, H., S. U. Yang and J. Lee. 2016. Strategic partnerships with nonprofits in corporate social responsibility (CSR): The mediating role of perceived altruism and organizational identification. *Journal of Business Research* 69 (9): pp. 3213–3219.

Rosenthal, R. 1979. The file drawer problem and tolerance for null results. *Psychological Bulletin* 86 (3):

pp. 638–641.

Roulstone, D. T. 1999. Effect of SEC financial reporting release No. 48 on derivative and market risk disclosures. *Accounting Horizons* 13 (4): pp. 343–363.

Samet, M. and A. Jarboui. 2017. How does corporate social responsibility contribute to investment efficiency? *Journal of Multinational Financial Management* 40: pp. 33–46.

Schleicher, T. and M. Walker. 1999. Share price anticipation of earnings and management's discussion of operations and financing. *Accounting and Business Research* 29 (4): pp. 321–335.

Shahzad, F., I. U. Rehman, S. Colombage and F. Nawaz. 2019. Financial reporting quality, family ownership, and investment efficiency: An empirical investigation. *Managerial Finance* 45 (4): pp. 513–535.

Shahzad, F., I. U. Rehman, F. Nawaz and N. Nawab. 2018. Does family control explain why corporate social responsibility affects investment efficiency? *Corporate Social Responsibility and Environmental Management* 25 (5): pp. 880–888.

Sharfman, M. and C. S. Fernando. 2008. Environmental risk management and the cost of capital. *Strategic Management Journal* 29 (6): pp. 569–592.

Shin, Y. Z., J. Y. Chang, K. Jeon and H. Kim. 2020. Female directors on the board and investment efficiency: Evidence from Korea. *Asian Business and Management* 19: pp. 438–479.

Stiglitz, J. E. and A. Weiss. 1981. Credit rationing in markets with imperfect information. *American Economic Review* 71 (4): pp. 393–410.

Suda, K. 2000. *Zaimu Kaikei no Kinou* [Function of financial accounting] Hakuto Syobou.

Tan, W., S. Yu and Zhenpeng Ma. 2018. The impact of business groups on investment efficiency: Does capital allocation matter? *Emerging Markets Finance and Trade* 54 (15): pp. 3539–3551.

Tan, Y. and Y. Liu. 2017. How do investors view information disclosure quality rating? The effect of FNFI on corporate investment efficiency. *Nankai Business Review International* 8 (2): pp. 210–230.

Tan, Y., N. Xu, X. Liu, C. Zeng. 2015. Does forward–looking non–financial information consistently affect investment efficiency? *Nankai Business Review International* 6 (1): pp. 2–19.

Titman, S. K. C., J. Wei and F. Xie. 2004. Capital investments and stock returns. *Journal of Financial and Quantitative Analysis* 39 (4): pp. 677–700.

Tobin, J. 1969. A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking* 1 (1): pp. 15–29.

Verrecchia, R. E. 2001. Essays on disclosure. *Journal of Accounting and Economics* 32 (1–3): pp. 97–180.

Xie, C. and L. Li. 2018. The empirical test on investment efficiency and influence of equity incentive in supply-side structural reform: Based on the two-tier stochastic frontier approach. *Applied Stochastic Models, Statistics and Their Applications* 34 (5): pp. 730–745.

Yamada, T. and S. Inoue. 2012. *Meta Bunseki Nyuumon* [Introduction to meta-analysis] Tokyodaigaku Syuppankai.

Yip, R. W. Y. and D. Young. 2012. Does mandatory IFRS adoption improve information comparability? *The Accounting Review* 87 (5): pp. 1767–1789.

Yoshikawa, H. 1980. On the "q" theory of investment. *American Economic Review* 70 (4): pp. 739–743.

Yu, E. P. Y., C. Q. Guo and B. V. Luu. 2018. Environmental, social and governance transparency and firm value. *Business Strategy and the Environment* 27 (7): pp. 987–1004.

Yun, K. and L. K. Mo. 2020. Do analysts improve labor investment efficiency? *Journal of Contemporary Accounting and Economics* 16 (3) Forthcoming.

Ward, C., C. Yin and Y. Zeng. 2020. Motivated monitoring by institutional investors and firm investment efficiency. *European Financial Management* 26 (2): pp. 348–385.

Wysocki, P. D. 2008. Assessing earnings and accruals quality: U.S. and international evidence. *Working Paper* MIT.

Zhang, M., W. Zhang and S. Zhang. 2016. National culture and firm investment efficiency: International evidence. *Asia-Pacific Journal of Accounting and Economics* 23 (1): pp. 1–21.

Zhong, M. and L. Gao. 2017. Does corporate social responsibility disclosure improve firm investment efficiency? Evidence from China. *Review of Accounting and Finance* 16 (3): pp. 348–365.

Zhu, H. Z., Z. C. Zhao and H. T. Bao. 2016. The catering of controlling shareholders, investor sentiment and corporate investment efficiency. *Journal of Discrete Mathematical Sciences and Cryptography* 19 (3): pp. 549–568.