



Research article

Does voluntary integrated reporting reduce information asymmetry? Evidence from Europe and Asia



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ABSTRACT

The purpose of this research is to examine the effect of voluntary integrated reporting on information asymmetry in European and Asian firms and investigate size as a moderator variable to this relationship. Using a final sample of 94 firms in Europe and Asia that published integrated reports in 2016, the Ordinary Least Square is then performed to analyze the data on quarterly basis. The quarterly analysis is used to look at the relevance of accounting information decline as the time lag increases. The results show that there is an insignificant relationship between integrated reporting quality and information asymmetry which is captured by spread. In addition, the insignificant effect of size to moderate this relationship is also found. These results are supported by additional analysis. This research contributes to the existing debate about whether integrated reporting affects the market, particularly information asymmetry. To the best of the authors' knowledge, this is the first study to examine the effect of integrated reporting quality on the market on a quarterly basis.

1. Introduction

Integrated reporting (IR) in recent years has received great public attention particularly after the formation of the International Integrated Reporting Council (IIRC) and the issuance of IR guidelines (Adams, 2017; Zhou et al., 2017). Despite the critique arising that IR could be yet the tool for corporate impression (Melloni et al., 2017), the IIRC (2013, p. 3) stated that IR can improve "the quality of information available to providers of financial capital to enable a more efficient and productive allocation of capital." Integrated reporting aims to reduce the clutter of sustainability report by disclosing aspects they consider to be material and useful about the value-creating activities in the short, medium, and long-term into a concise and coherent report (Zhou et al., 2017; IIRC, 2013). Integrated reporting offers a broader picture of the new firm by shifting away from standalone sustainability or social responsibility reports towards an integrated report that delivers a comprehensive picture of long-term performance from various perspectives, business model, and value creation (Burke and Clark, 2016). Hence, the voluntary information disclosure is a way to mitigate the information asymmetry problem and lead to better business transparency (Brammer and Pavelin, 2006).

Nevertheless, empirical evidence on the IR benefit is still sparse (De Villiers et al., 2014). Previous studies conducted by Zhou et al. (2017) and Vitolla et al. (2020) found an inverse relationship between alignment

of integrated reports and information asymmetry, measured by analysts' forecast errors, as well as cost of equity capital. Other studies conducted by Maria et al. (2017), Akker (2017), Martinez (2016a,b), Lee and Yeo (2015) found that IR offers more relevant information. Thus the alignment of corporate reporting with the integrated report is negatively associated with the asymmetric information. Barth et al. (2001) also suggested the evidence that IR quality reduces information asymmetry as captured in a lower bid-ask spread. On the contrary, Stubbs and Higgins (2014) found evidence that IR did not affect a decrease of the level of information asymmetry. They argued that the information provided is not required by the capital providers to make the investment decisions. Accordingly, the limited evidence and inconsistent results found about the market responds to the information available in the integrated reports (Mervelskemper and Streit, 2016).

This paper also considers that the usefulness of the integrated reporting is affected by other factors such as the importance of the firm size. Atiase (1985) suggested that firm size may be more direct to the information asymmetry. The incentive for acquiring private information is an increasing function of firm size. Hence there is more public information for a big firm than a small firm. In addition, since the analyst follows the big firms, information asymmetry is expected to increase before the publication of report and earning announcement, then decrease after the companies provide the disclosure. On the other hand,

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small firm information asymmetry is increased after publishing the disclosure because of difference of ability to process news and different opinions among the stakeholders (Kim and Verrecchia, 1994). Accordingly, there is still a big question whether firm size can moderate the relationship between the integrated reporting and information asymmetry. This research observe whether the firm size act as a moderating variable to the relationship between IR and information asymmetry.

Accordingly, this paper is motivated by the increasing regulatory attention to IR implementation (Barth et al., 2017; Zhou et al., 2017), the emerging assessment that companies might use IR as a tool for impression management (Melloni et al., 2017) and the observed lack of sufficient empirical evidence on the benefits of IR (De Villiers et al., 2014), particularly related with the market responses (Mervelskemper and Streit, 2016), namely information asymmetry. This research aims to examine: firstly, the effect of voluntary integrated reporting quality on the asymmetric information; secondly, the role of firm size as a moderating effect on the relationship between integrated reporting and information asymmetry is examined.

This paper used European and Asian firms as the most significant number of voluntarily IR adopters which number 159 and 116 adopters, respectively. In addition, Meek et al. (1995) found that European companies publish more non-financial information than American multinational companies, therefore European firms capture more disclosure. In a nutshell, using 94 companies that published Integrated Reports in 2016, the results show that there is an insignificant negative relationship between the voluntary integrated reporting quality and information asymmetry. The insignificant result for firm size as a moderating variable is found as well. The consistency of these two results is then confirmed by additional testing (robustness test) using the European firm only.

This paper contributes to the enrichment of the literature related to the impact of integrated reporting to the market, particularly the information asymmetry as suggested by the previous researchers (De Villiers, Rinaldi and Unerman, 2014; Cheng et al., 2014; Akker, 2017). From the research design, this study extends the method to measure the integrated report quality by using content analysis with the current IR framework and continuous scoring, and then examines its effect on a quarterly basis. The quarterly analysis is used to look at the relevance of accounting information decline as the time lag increases (Ohaka and Akani, 2017), hence it will be more beneficial in the first quarter after the publication date. This kind of analysis is not found yet in previous research. Second, there has been a debate on whether IR has benefits or not. By suggesting the empirical evidence, therefore this research aids in moving the debate and gives practical insights for the companies whether to make voluntary IR adoption or not. Finally, IR has become the agenda of regulators around the world. These findings are therefore expected to have valuable regulatory implications for IIRC and the government bodies in each country as well who are concerned with the implementation of integrated reporting.

The remainder of this research is organized as: section 2 briefly discusses a literature review and how the hypotheses are formulated. It is followed by section 3 that reviews the methodology. Section 4 provides the results and discussion for the empirical finding. The article ends in section 5 with conclusions, limitations, and suggestions for future research.

2. Literature review

2.1. Theory

2.1.1. Agency theory

Jensen and Meckling (1976) state that from the agency theory perspective, the demand for disclosure emerges from agency conflict between managers and outsiders. Most of the previous studies found that voluntary disclosure is useful for companies (Welker, 1995). Those companies that voluntarily disclose integrated information provide the higher volume of relevant information to the outsiders, hence it

diminishes information asymmetries (Maria et al., 2017). Information asymmetry exists when one or more investors have private information while uninformed investors only have information from the public access. Therefore the increased availability of information to the various participants in the market can mitigate the agency problem and reduce the information asymmetry (Grossman and Hart, 1980; Verrecchia, 1982). This level of firm-information asymmetry is relevant only to the extent that it increases the information asymmetry among the investors, for instance through insider trading (Brown and Hillegeist, 2007) that will be explained in the adverse selection theory below.

2.1.2. Adverse selection theory

Investor trade is based on a subset of information. Information asymmetry occurs when some parties gain more private information than the others about the firms. It can generate adverse selection problem because the better-informed investors use their private information in their trading activities. Therefore, this different subset of information among the investors yields the difference between the bid and ask price (Stoll, 2000). A proper disclosure policy may alleviate the information asymmetry problem as it is associated with less informed trading (Diamond and Verrecchia, 1991). Thus, uninformed traders tend to invest more in the firms that provide more voluntary disclosures because these disclosures can minimize the level of private information (Bushee and Miller, 2012).

Disclosure quality can affect the information asymmetry in two ways (Brown and Hillegeist, 2007). First, disclosure quality changes the behavior of uninformed investors. When higher disclosure quality increases the firm's appearance and reduces the cost of collecting specific information, a higher disclosure quality will encourage more trading by uninformed investors (Merton, 1987). This circumstance then will be associated with relatively less informed trading. Therefore it reduces the information asymmetry (Brown et al., 2004; Diamond, 1985). Second, disclosure quality alters the incentive to look for private information (Brown and Hillegeist, 2007). The amount of costly private information for investors is diminished in the amount that the firms disclose public information (Verrecchia, 1982). For this reason, managers may view corporate information disclosure to diminish information asymmetry and avoid the cost of adverse selection (Maria et al., 2017).

2.2. Hypothesis development

2.2.1. Integrated reporting and information asymmetry

Integrated reporting has rapidly obtained a great attention since the formation of the International Integrated Reporting Council (IIRC) in 2010 (Cheng et al., 2014). Integrated reporting aims to prepare broader elements that connect with each other and portrays the firm's performance than are provided by the traditional reporting or sustainability reporting. One of the main differences between IR and traditional reporting or sustainability reporting is that IR increases the focus on the interest of the financial capital provider and provides the information on how the firms create their value in the short, medium, and long-term (De Villiers, Rinaldi and Unerman, 2014).

Given the recent development of IR, there is still a scarcity of the research in this area (De Villiers, Rinaldi and Unerman, 2014) particularly on the effect of voluntary integrated reporting on the information asymmetry. Information asymmetry exists when some parties obtain private information about the firms. Therefore, it can generate an adverse selection problem because the better-informed investors use their private information in their trading. This different subset of information among the investors yields the difference between the bid and ask price (Stoll, 2000) which is commonly known as the spread.

Several previous researchers used bid-ask spread (Akker, 2017; Zhou et al., 2017) and analysts forecast accuracy (Maria et al., 2017; Lang and Lundholm, 2000) to capture the information asymmetry. Some evidence from the previous literature found that analyst used non-financial information in their forecasting (Nichols and Wieland, 2009; Simpson,

2010; Orens and Lybaert, 2007; Dhaliwal et al., 2012). Some research also suggested that analysts use financial and non-financial information in their earning forecasting (Coram et al., 2011; Simpson, 2010; Ghosh and Wu, 2012; Maines et al., 2002), so it means that both types of information are important for the analyst. Better disclosure quality increases the analyst understanding of the firm's performance and outlook, in which it enhances the forecast accuracy (Lang and Lundholm, 1996).

Some previous studies conducted by Martinez (2016a,b) and Lee and Yeo (2015) found that in the mandatory IR adoption in The Johannesburg Stock Exchange (JSE) in South Africa, IR reduced the information asymmetry because it enhanced the information transparency. In the voluntary context, a number of the researchers also suggested that voluntary integrated reporting is negatively associated with information asymmetry because it is crucial for an efficient capital market (Healy and Palepu, 2001).

Maria et al. (2017) found the existence of a negative association between the integrated reporting and the information asymmetry because those companies that voluntarily disclose the integrated information provide a higher amount of information to the market. The authors used analyst forecast accuracy as the proxy for information asymmetry and used unbalanced panel data for 995 companies in 2011 and 2012. Integrated reporting is then measured by a dummy variable: one means the companies publish the integrated report, and zero is otherwise.

Another study was conducted by Akker (2017). He investigated the IR effect in the 29 North- American listed companies and their 32 control groups in 2010–2015. A dummy variable was also used to measure IR, meanwhile spread and cumulative abnormal return were used to define the information asymmetry. The cumulative abnormal return was calculated by subtracting the total returns of the firm with the return of that day in the market index. He suggested the evidence that IR provides more relevant information. Thus the alignment with the IR is negatively associated with the information asymmetry which is captured by the spread. He did not find the evidence for the cumulative abnormal return. In summary, these two previous research have the same finding that voluntary integrated report can decrease the information asymmetry.

Information produced by companies relating to performance can influence investors' decisions in investing in shares, so there is a need for common information. Measurement of information asymmetry in this study uses spreads on the grounds that, spreads have a high level of sensitivity to new information that is assessed by the company. Spread is more dominant in describing the level of asymmetry of company information.

The author has found a single research only that voluntary IR has an insignificant effect on the asymmetry information. This study was performed by Martinez (2016a,b) in 96 pairs of treated and control firms. He also used spread and a dummy variables for IR and found that IR has an insignificant effect on the information asymmetry. Because voluntary information disclosure is prominent to support an efficient capital market (Healy and Palepu, 2001), it is also considered that integrating all companies' key information into one integrated report enables diverse investors to make a better decision regarding the estimates of future transaction costs and investment decision. Accordingly, integrated information can mitigate information asymmetry and provide additional information to the investors and other market participants. Integrated reporting provides a more extensive disclosure of corporate performance than traditional company statements do (García-Sánchez et al., 2013); for instance, the use of resources and its relations with capital. This information is useful in assessing the organization's long-term business model and strategy, and also for the efficient allocation of scarce resources. Based on these theoretical arguments, the following hypothesis is formulated:

H1. *The quality of voluntary integrated reporting is negatively associated with information asymmetry.*

2.2.2. Firm size, integrated reporting, and information asymmetry

Myers and Majluf (1984) pointed out that information asymmetry is not as severe in large firms. However, the information cost is lower than in the small firms. Hence providing a greater volume of disclosure in large firms will lower the adverse selection and information asymmetry. Atiase (1985) also suggested that firm size may be connected more directly to the information asymmetry. The incentive for acquiring private information is an increasing function of firm size. Hence there is a more public information for a big firm than a small firm. In addition, since the analysts follow the big firms, information asymmetry is expected to increase before the publication of report and earning announcement, and then decrease after the companies provide the disclosure. On the other hand, small firm information asymmetry is increased after publishing the disclosure because of difference in ability to process news and different opinions among the stakeholders (Kim and Verrecchia, 1994). Taking all this into account, the second hypothesis is:

H2. *Firm size moderates the relationship between the quality of voluntary integrated reporting and information asymmetry.*

3. Methodology

3.1. Sample selection

This research used the mixed method. In the data collection stage, this study used a qualitative method by content analysis, particularly to assess the integrated report quality. This data and other financial data are then analyzed with Ordinary Least Square (OLS) by using STATA software. Regression assumption is also tested especially for the data normality and consideration of skewness between +2 and -2, heteroscedasticity, and multicollinearity problem (Akker, 2017; O'Brien, 2007). Therefore, the regression results presented in this paper are already free from those problems.

The initial sample of this study is 300 firms comprising 179 European firms and 121 Asian firms. The selected criteria are the companies which publish integrated reports in 2016 and have no omitted data for all variables. After eliminating non-complying firms, the final sample is 94 firms consisting of 73 European firms and 21 Asian firms. The effect on the information asymmetry is then examined in the subsequent three quarters after the publication of integrated report for 2016. The quarterly analysis is used to look at the relevance of accounting information decline as the time lag increases (Ohaka and Akani, 2017); hence it will be more beneficial in the first quarter after the publication date. Assuming the firm's integrated report publication is on March 2017, the effect of IR is investigated in June 2017 (quarter 1), September 2017 (quarter 2), and December 2017 (quarter 3). After checking the availability of data on March 2018 (quarter 4), most of them are not available; hence this study uses three quarters only after integrated report publication. This study used Integrated Report 2016 because there was an increasing numbers of organizations which used the IR framework globally during 2016. This fact implies that IR has extended its global reach in 2016 and increased acceptance within the business and investor communities.

The integrated report data are retrieved from the IIRC official website, meanwhile, the financial data are retrieved from Thomson Reuters Datastream. The sample excludes the financial institutions because they have a different nature (Chelcele et al., 2012). This paper considered Europe and Asia as a one sample in the main analysis because of the regulations of IR implementation issued by The International Integrated Reporting Council (IIRC). It states that all companies in the world are able to implement an integrated reporting framework without the existence of different institutional backgrounds. Another main reason is that, the sample consists of 73 European firms and 21 Asian firms. It is a relatively small sample, particularly for Asian firms. Therefore both European and Asian firms were analysed as one sample. This paper also

adds a control variable, namely REGION, to solve the institutional background issues.

3.2. Empirical model

This paper proposes model 1 to test the first hypothesis:

$$\text{Spread}_{it} = \beta_0 + \beta_1 \text{IRQ} + \beta_2 \text{Size}_{it} + \beta_3 \text{Leverage}_{it} + \beta_4 \text{Growth}_{it} + \beta_5 \text{Profitability}_{it} + \beta_6 \text{LNPrice}_{it} + \beta_7 \text{Revenue}_{it} + \beta_8 \text{OCF}_{it} + \beta_9 \text{Region} + \beta_{10} \text{Industry} + \epsilon \quad (1)$$

Then, the model 2 below is formulated to examine the second hypothesis:

$$\text{Spread}_{it} = \beta_0 + \beta_1 \text{IRQ} + \beta_2 \text{Size}_{it} + \beta_3 \text{IRQ} * \text{Size} + \beta_4 \text{Leverage}_{it} + \beta_5 \text{Growth}_{it} + \beta_6 \text{Profitability}_{it} + \beta_7 \text{LNPrice}_{it} + \beta_8 \text{Revenue}_{it} + \beta_9 \text{Region} + \beta_{10} \text{Industry} + \epsilon \quad (2)$$

The dependent variable is information asymmetry. This study used spread to measure the information asymmetry following the previous research (Akker, 2017; Martinez, 2016a,b). Spread is calculated by the quarter average of the ratio of the daily closing bid-ask spread to the closing price for firm *i* in quarter *t* in the fiscal year 2017 multiplied by 100. This study computed spread quarterly which is different from the previous research that used annual spread. The investor performs trading based on their information acquired. Due to the existence of different information among the investors, there is the difference between the bid-ask price (Akker, 2017). This difference can be viewed as the transaction cost to execute the order (Araujo et al., 2011). Some studies point out that the existence of spread is due to the adverse selection cost appearing with the asymmetric information among the market participants (Glosten and Milgrom, 1985). Spread is also more sensitive to news releases (Chang et al., 2008). Menyah and Paudyal (2000) found that the component of asymmetric information is dominated by the realized spread. In summary, the previous studies suggested that asymmetric information components behave in the same way as the spread; hence the larger the spread, the larger will be the asymmetry information (Elbadry et al., 2015). Therefore this reason justifies spread as a proxy for information asymmetry. Analyst forecast accuracy is another measure for information asymmetry, and some previous research also used this proxy (Lang & Lundholm, 1996, 2000; Marquardt and Wiedman, 1998; Maria et al., 2017). This study does not use this proxy due to the availability of data.

The quality of IR is an independent variable used in this study. Some of the recent studies used a dummy variable to measure IR (Akker, 2017; Maria et al., 2017). Integrated Reporting quality is captured by the alignment of an integrated report with the IR framework following the previous study (Zhou et al., 2017). The author used total Integrated Reporting Quality's score (IRQ) derived from International Integrated Reporting Framework issued by the IIRC. This research extends the previous research by: first, using IIRC framework 2013 as the most current thinking of IR while the previous research using the Prototype IR framework issued in 2012 (Zhou et al., 2017). Second, before content analysis is performed, the author firstly constructs a coding framework from International IR Framework and then employs an independent review from Integrated Reporting expertise including academic personnel and practitioners from Ernst and Young (EY). The independent reviewer is asked to comment on the appropriateness and completeness of the coding framework. The current International IR framework includes eight content elements and guiding principles (IIRC, 2013). Instead of using a binary variable (1 and 0, 1 meaning the components exist in the firm's integrated report, 0 is otherwise), this study extends the method used by Zhou et al. (2017) by using continuous scoring to deeper analyze and capture more variation in IRQ scores. The author used 0,1,2: 0 means the firms do not mention the IR component in their report, 1 means they already mentioned it but with the limited explanation, and 2 means they clearly mentioned and supported IR with an extensive explanation (Aktas

et al., 2016). The finalized coding framework has 30 components and one guiding principle (refer to Appendix 1) thus the maximum total score of integrated report quality (IRQ) is 67. The higher the total score of IR implies that the companies report is more aligned with the IR framework. Thus it will increase the information transparency and reduce the information asymmetry. Thus, IRQ is expected to be a negative coefficient. However, there is also a possibility of subjective nature for the coding process and therefore the content analysis should be carefully undertaken.

This study used some control variables as they are considered important. In accordance with Maria et al. (2017), Akker (2017), Ferrero et al. (2016), this study used size, leverage, growth, profitability, LNPrice, revenue, Operating Cash Flow (OCF) and the country as the control variables. Size is measured by the natural logarithm of total assets (Ferrero et al., 2016; Maury, 2006; Akker, 2017). Leverage is calculated by dividing total liabilities by total assets (Lang and Lundholm, 1996). Growth is defined by the market to book ratio (Akker, 2017; Ferrero et al., 2016). Profitability is computed by dividing net income before taxes by book value of shareholder equity (Akker, 2017). LNPrice is the natural logarithm of the adjusted price. Revenue is measured by net revenue divided by total assets and OCF is also defined as the net operating cash flow divided by total assets. Country is dummy variable, 1 meaning European firms, 0 is Asian firms. Industry is categorized by 1: manufacturing industry, 2: mining, 3: utilities and services, 4: construction/real estate, 5: other.

4. Results and discussion

4.1. Results

4.1.1. Descriptive statistics

The analysis is conducted on 94 firms in 2017. It is performed quarterly (quarter 1,2,3 after 2016 annual report's publication), hence there are 309 observations in this study. Before examining the hypotheses, inspection of data by descriptive statistics are performed. Table 1 depicts the descriptive statistics for quarter 1 in June 2017 (assuming the publication of annual report 2016 in March 2017). The other quarters have the similar results.

In summary, Table 1 shows that there is no great difference for spread, size, leverage, growth, profitability, LNPrice, revenue, and Operating Cash Flow (OCF) as indicated by a low standard deviation. Meanwhile, the high variation of Integrated Reporting Quality (IRQ) is obtained. The mean of IRQ is 44, 1521 with the minimum value of 22 and the maximum value of 61,5. This considerable variation of IRQ can be due to the IR framework adopting a principle-based to strike a proper balance between the prescription and flexibility for firms, while allowing for comparison across the organizations to provide the information (Lee and Yeo, 2015). Hence, this variation of IR disclosure implies that each firms have discretion and latitude for IR disclosures based on their organizational circumstances. The IR framework, therefore recognizes a high variation in different organizational circumstances as captured by descriptive statistics above.

4.1.2. Integrated reporting quality (IRQ)

Figure 1 presents the average IRQ scores for European and Asian firms in 2016. Overall, this figure shows that the European companies have a higher score than the Asian firms. One of the reasons is they have a more extended page in their annual report which is more than 100 pages, therefore European firms provide more disclosures for Integrated Reporting aspects. However, Asian, firms which are mostly from Japanese firms having a concise Integrated Report, most firms have less than 100 pages. Besides that, the considerable difference in IRQ can be due to the firms having discretion and latitude for IR disclosures that they consider essential to portray their business and provide useful information for the market.

Table 1. Descriptive statistic.

| Variable | Obs | Mean | Std. Dev | Min | Max |
|---------------|-----|---------|----------|---------|---------|
| Spread | 94 | 0,1329 | 0.1890 | -0.4497 | 1.0009 |
| IRQ | 94 | 44,1521 | 7.3106 | 22.000 | 61.5000 |
| Size | 94 | 7,6599 | 0.9815 | 6.0474 | 10.0864 |
| Leverage | 94 | 0,5700 | 0.1955 | 0.0505 | 1.4007 |
| Growth | 94 | 2.6526 | 2.3737 | -0.3700 | 14.3900 |
| Profitability | 94 | 0.0594 | 0.0589 | -0.1515 | 0.3251 |
| LNPrice | 94 | 5.1973 | 2.3789 | -2.9004 | 9.6274 |
| Revenue | 94 | 0.7422 | 0.5091 | 0.0236 | 3.1156 |
| OCF | 94 | 0.0902 | 0.0747 | -0.0878 | 0.4849 |
| Industry | 94 | 2.6276 | 1.4140 | 1.0000 | 5.0000 |
| Region | 94 | 0.7765 | 0.4187 | 0.0000 | 1.0000 |

Spread is computed by a quarter average of the ratio of daily closing bid-ask spread to the closing price for firm *i* in the quarter *t* in the year 2017 multiplied by 100. IRQ is assessed by content analysis. Size is the logarithm of total asset. Growth is the market to book ratio. Profitability is measured by Return on Asset (ROA). LNPrice is logarithm of the adjusted price. Revenue is the net revenue divided by total assets. Industry: 1:OCF is the net operating cash flow divided by total assets. Industry, 1: manufacturing industry, 2: mining, 3: utilities and services, 4: construction/real estate, 5: other. Region is dummy variable: 1 = European firms, 0 = Asian firms.



Figure 1. IRQ score in 2016.

A detailed comparison is depicted in Figure 2. In general, this figure clearly presents that European firms outweigh the Asian firms in most of IRQ's component disclosure, except for part 1 only which is related to the organizational overview and external environment. The substantial difference is witnessed in part 3 (where the difference is 1.4) and part 8 with the difference of 1.5. Apparently European firms provide more extensive disclosures in part 3 presenting their business

model. However, it is limited for Japanese firms, even some companies do not disclose anything about their business models. This condition also occurs for part 8. In some aspects, this figure also provides the similarities between these two continents. Both of the European and Asian firms pay similar attention to provide the disclosure for part 4 which is related with critical risks and opportunities and part 7 that portrays the business outlook as indicated by the smallest difference in disclosure score (0.4) among the other parts.

4.1.3. Empirical results

This section presents the performed regression to examine the Hypothesis 1. The result of the first regression found an insignificant relationship between the Integrated Reporting Quality (IRQ) and the information asymmetry in 3 quarters (Coefficient of IRQ in quarter 1: -0,008, $p > 0,01$; quarter 2: 0,002, $p > 0,01$, and quarter 3: 0,000, $p > 0,01$). Therefore, the Hypothesis 1 is rejected. There is a significant result for some control variables, for instance in quarter 1,2, and 3 some control variables namely size (quarter 1: -0.109, $p < 0,01$; quarter 2: -0.184, $p < 0,01$; quarter 3: -0.123, $p < 0,05$), Growth (quarter 1: -0.018, $p < 0,05$; quarter 2: -0.027, $p < 0,1$; quarter 3: -0.067, $p < 0,05$), LNPrice (quarter 1: -0.022, $p < 0,01$; quarter 2: -0.029, $p < 0,1$; quarter 3: -0.047, $p < 0,1$), and Revenue (quarter 1: -0.020, $p < 0,01$) are negatively associated with information asymmetry.

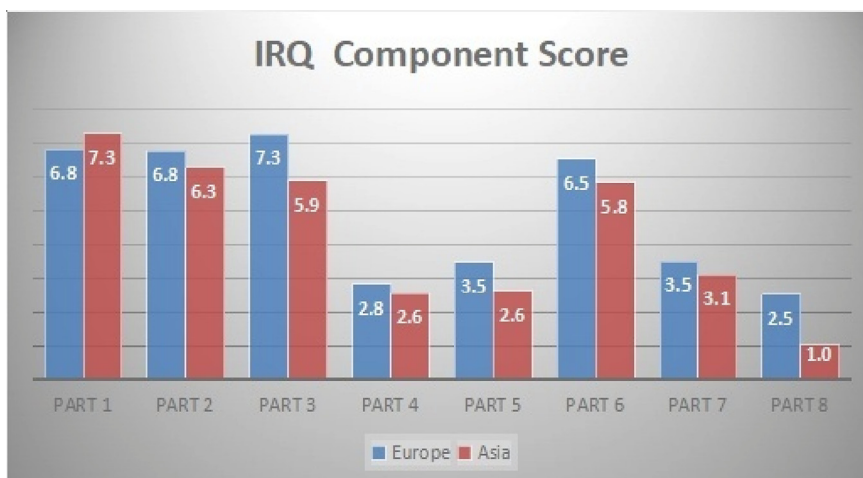


Figure 2. IRQ Component Score in 2016. Note Part 1: Organizational overview and external environment; Part 2: Governance; Part 3: Business model; Part 4: Risk and opportunities; Part 5: Strategy and resource allocation; Part 6: Performance; Part 7: Outlook; Part 8: Basis of preparation and presentation.

This section also describes the findings of Hypothesis 2 testing whether size moderates the relationship between the firm's Integrated Reporting Quality and information asymmetry. The regression result is presented in Table 2 using model 2. The existence of a moderating effect is depicted in the significant coefficient of IRQ*Size in model 2 and the significant coefficient of IRQ in model 1. In general, it shows that there is an insignificant coefficient as well for IRQ*Size in quarter 1 (0,04, p < 0,1), quarter 2 (0,02, p > 0,01), and quarter 3 (0,012, p > 0,01). Therefore, it means that the firm size does not moderate the effect of voluntary integrated reporting on the information asymmetry. Thus, Hypothesis 2 is rejected (see Table 2). Some of variable controls are significant, for instance, size in quarter 1 (-0.324, p < 0,05), Growth in quarter 1 (-0,020, p < 0,05), quarter 2 (-0,028, 0 < 0,1), quarter 3 (-0,068, p < 0,05), and LN Price in quarter 1 (-0,020, p < 0,05) and quarter 2 (-0,028, p < 0,1).

Large firms have more stable growth and less variability in earnings (Hodgkinson, 2001; Chung and Kim, 1994). Firm size is related to information environment and the level of information disclosure is important for analyst forecasting (Lang and Lundholm, 1996). Greater information will lower adverse selection, thus the firm size is negatively associated with information asymmetry. Companies with higher growth, revenue, and operating cash flow are also expected to present a greater volume of information disclosure. Thus, they are negatively associated with information asymmetry as well (see Table 3).

4.2. Discussion

This result of Hypothesis 1 is in line with the previous researcher, Martinez (2016a,b) who suggested that there is an insignificant effect of voluntary IR adoption on the information asymmetry. His research was applied in 96 paired non-JSE listed firms during the period of 2011 and 2014. However, these findings contradict the previous results performed by Maria et al. (2017) and Akker (2017) who concluded that voluntary integrated reporting significantly reduce the information asymmetry.

Although this finding is not significant, the results should be interpreted carefully due to some possible reasons for this discrepancy. It could be: first, three main differences in this research design could clarify this discrepancy. The 3 previous studies (Maria et al., 2017; Akker 2017; Martinez, 2016a,b) use dummy variable to capture the Integrated Reporting IR, meanwhile content analysis is performed in this research for assessing IR quality. There is also the difference for spread measurement. Akker (2017) used the annual spread, but this study used the quarter spread. This study also uses cross-section data in 2017 for 94 firms, but examines the IR effect in the subsequent three quarters in 2017 after 2016 integrated report publication (assuming the publication of 2016 report is in March 2017). These three different research designs might yield the different effect and also some companies have a missing value in their daily bid-ask price. Although the author has tried to solve it by using winsorization, these values could potentially affect the results as well.

Second, the IR concept is still relatively new in the capital reporting trend. The IIRC published its final IR framework in December 2013; hence it still needs a long journey. Moreover, it is still voluntary adoption in the European and Asian context, hence the market might not pay considerable attention to this reporting trend.

Third, most of the sample are multinational firms that already had a high information environment before the adoption of Integrated Reporting, hence it becomes difficult to capture the IR effect. This circumstance is different with some of JSE firms in South Africa, particularly the firms with a low information environment before the IR adoption, therefore IR significantly affect the market (Zhou et al., 2017; Lee and Yeo, 2015).

These results are not in line with the theoretical perspective as well. From an agency theory perspective, Jensen and Meckling (1976) stated that the demand for disclosure emerges from agency conflict between managers and the investors. Hence the higher volume of voluntary information disclosure can diminish information asymmetry (Grossman and Hart. 1980; Verrecchia, 1982). From the adverse selection theory, this insignificant result also could not deliver the evidence that managers

Table 2. Regression result for Hypothesis 2.

| Hypothesis 2 | Quarter 1 | | | | Quarter 2 | | | | Quarter 3 | | | |
|---------------|-----------|----------|--------|-------|-----------|----------|--------|-------|-----------|----------|--------|-------|
| | Coef | Std. Err | T | P> t | Coef | Std. Err | t | P> t | Coef | Std. Err | t | P> t |
| IRQ | -0.037* | 0.0263 | -1.400 | 0.082 | -0.021 | 0.058 | -0.350 | 0.362 | -0.097 | 0.0890 | -1.100 | 0.138 |
| Size | -0.324** | 0.1580 | -2.050 | 0.021 | -0.319 | 0.350 | -0.910 | 0.182 | -0.743 | 0.5649 | -1.320 | 0.096 |
| IRQ*size | 0.004* | 0.0039 | 1.380 | 0.086 | 0.002 | 0.007 | 0.390 | 0.347 | 0.012 | 0.0114 | 1.100 | 0.136 |
| Leverage | 0.181* | 0.1126 | 1.610 | 0.055 | 0.376* | 0.250 | 1.500 | 0.068 | 0.718* | 0.4435 | 1.620 | 0.054 |
| Growth | -0.020** | 0.0097 | -2.050 | 0.021 | -0.028* | 0.020 | -1.350 | 0.09 | -0.068** | 0.0363 | -1.890 | 0.031 |
| Profitability | 0.897*** | 0.3298 | 2.720 | 0.004 | 1.816*** | 0.736 | 2.470 | 0.008 | 4.028*** | 1.3693 | 2.940 | 0.002 |
| LNPrice | -0.020** | 0.0093 | -2.180 | 0.016 | -0.028* | 0.020 | -1.360 | 0.088 | -0.039 | 0.0365 | -1.080 | 0.141 |
| Revenue | -0.019 | 0.0383 | -0.510 | 0.306 | -0.065 | 0.085 | -0.770 | 0.223 | -0.028 | 0.1496 | -0.190 | 0.424 |
| OCF | -0.018 | 0.2852 | -0.070 | 0.474 | -0.098 | 0.629 | -0.160 | 0.437 | -0.289 | 1.1228 | 0.260 | 0.398 |
| Region | -0.252*** | 0.0633 | -3.990 | 0.000 | -0.428*** | 0.140 | -3.040 | 0.001 | -0.513** | 0.2366 | -2.170 | 0.016 |
| Industry | -0.027** | 0.0133 | -2.080 | 0.020 | -0.025 | 0.295 | -0.860 | 0.196 | -0.005 | 0.0516 | -0.110 | 0.456 |
| Cons. | 2.967*** | 1.2456 | 2.380 | 0.010 | 2.847 | 2.761 | 1.030 | 0.153 | 6.064 | 4.5058 | 1.350 | 0.091 |
| Number of obs | 94 | | | | 94 | | | | 94 | | | |
| F Statistic | 4.200*** | | | | 2.320** | | | | 2.320** | | | |
| R-Squared | 0.360 | | | | 0.237 | | | | 0.237 | | | |
| Prob > F | 0.000 | | | | 0.0157 | | | | 0.0157 | | | |

Notes: ***, **, * indicates significance at the 0.01, 0.05 and 0.10 level (1-tailed test), respectively. Cell statistics are unstandardized coefficients and standard error.

The regression model is:

Spread_{it} = β₀ + β₁IRQ + β₂Size_{it} + β₃IRQ*Size + β₄Leverage_{it} + β₅Growth_{it} + β₆Profitability_{it} + β₇LNPrice_{it} + β₈Revenue_{it} + β₉OCF_{it} + β₁₀Region + β₁₁Industry + ε

Spread is computed by a quarter average of the ratio of daily closing bid-ask spread to the closing price for firm i in the quarter t in the year 2017 multiplied by 100. IRQ is assessed by content analysis. Size is the log of total asset. Growth is the market to book ratio. Profitability is measured by Return on Asset (ROA). LNPrice is a log of the adjusted price. Revenue is the net revenue divided by total assets. Industry: 1:OCF is the net operating cash flow divided by total assets. Industry, 1: manufacturing industry, 2: mining, 3: utilities and services, 4: construction/real estate, 5: other.Region is dummy variable: 1 = European firms, 0 = Asian firms.

Table 3. Regression result for Hypothesis 1.

| Hypothesis 1 | Quarter 1 | | | | Quarter 2 | | | | Quarter 3 | | | |
|---------------|-----------|----------|--------|-------|-----------|----------|--------|-------|-----------|----------|--------|-------|
| | Coef | Std. Err | T | P> t | Coef | Std. Err | T | P> t | Coef | Std. Err | t | P> t |
| IRQ | -0.008 | 0.002 | -0.320 | 0.374 | 0.002 | 0.005 | 0.390 | 0.346 | 0.000 | 0.010 | 0.000 | 0.498 |
| size | -0.109*** | 0.027 | -0.440 | 0.000 | -0.184*** | 0.060 | -3.030 | 0.001 | -0.123** | 0.063 | -1.960 | 0.027 |
| Leverage | 0.183* | 0.113 | 1.620 | 0.054 | 0.378* | 0.249 | 1.520 | 0.066 | 0.740** | 0.443 | 1.670 | 0.049 |
| Growth | -0.018** | 0.009 | -1.940 | 0.028 | -0.027* | 0.020 | -1.330 | 0.093 | -0.067** | 0.036 | -1.850 | 0.033 |
| Profitability | 0.892** | 0.331 | 2.690 | 0.004 | 1.814*** | 0.732 | 2.480 | 0.007 | 4.006*** | 1.371 | 2.920 | 0.002 |
| LNPrice | -0.022*** | 0.009 | -2.400 | 0.009 | -0.029* | 0.020 | -1.450 | 0.076 | -0.047* | 0.035 | -1.330 | 0.093 |
| Revenue | -0.020*** | 0.385 | -0.540 | 0.295 | -0.066 | 0.085 | -0.780 | 0.219 | -0.007 | 0.148 | -0.050 | 0.478 |
| OCF | -0.042 | 0.286 | -0.150 | 0.441 | -0.112 | 0.625 | -0.180 | 0.429 | 0.280 | 1.124 | 0.250 | 0.401 |
| industry | -0.027** | 0.133 | -2.030 | 0.022 | -0.025 | 0.029 | -0.850 | 0.198 | 0.000 | 0.514 | 0.010 | 0.494 |
| region | -0.233*** | 0.062 | -3.750 | 0.000 | -0.416*** | 0.136 | -3.050 | 0.001 | -0.406** | 0.215 | -1.880 | 0.031 |
| Cons. | 1.292*** | 0.279 | 4.630 | 0.000 | 1.790*** | 0.614 | 2.910 | 0.002 | 1.154* | 0.726 | 1.590 | 0.058 |
| Number of obs | 94 | | | | 94 | | | | 94 | | | |
| F Statistic | 4.39*** | | | | 2.56*** | | | | 2.02** | | | |
| R-Squared | 0.3458 | | | | 0.2356 | | | | 0.195 | | | |
| Prob > F | 0.0001 | | | | 0.0096 | | | | 0.0413 | | | |

Notes: ***, **, * indicates significance at the 0.01, 0.05 and 0.10 level (1-tailed test), respectively. Cell statistics are unstandardized coefficients and standard error.

Model 1:

$$\text{Spread}_{it} = \beta_0 + \beta_1 \text{IRQ} + \beta_2 \text{Size}_{it} + \beta_3 \text{Leverage}_{it} + \beta_4 \text{Growth}_{it} + \beta_5 \text{Profitability}_{it} + \beta_6 \text{LNPrice}_{it} + \beta_7 \text{Revenue}_{it} + \beta_8 \text{OCF}_{it} + \beta_9 \text{Region} + \beta_{10} \text{Industry} + \epsilon$$

Spread is computed by a quarter average of the ratio of daily closing bid-ask spread to the closing price for firm *i* in the quarter *t* in the year 2017 multiplied by 100. IRQ is assessed by content analysis. Size is the log of total asset. Growth is the market to book ratio. Profitability is measured by Return on Asset (ROA). LNPrice is a log of the adjusted price. Revenue is the net revenue divided by total assets. Industry: 1:OCF is the net operating cash flow divided by total assets. Industry, 1: manufacturing industry, 2: mining, 3: utilities and services, 4: construction/real estate, 5: other. Region is dummy variable: 1 = European firms, 0 = Asian firms.

view the corporate information to reduce information asymmetry and avoid the cost of adverse selection (Maria et al., 2017).

To the best of the author's knowledge, since this is the first research that examines the effect of size as a moderating variable to the relationship between the integrated reporting quality and information asymmetry, hence the author cannot compare this result with the previous findings. For this insignificant result in this study, the reason might be similar to the previous result in testing the Hypotheses 1.

4.3. Additional analyses

To deepen the analysis of the IRQ's effect on the information asymmetry, European firms and Asian firms are considered as different samples to examine Hypothesis 1 because Europe and Asia have a different institutional background. The results are presented below in Table 4 for European firms only. This paper did not present the Asian firms due to the small sample (less than 30 firms) which could probably lead to a wrong

Table 4. Regression result for European firm (Hypothesis 1).

| Hypothesis 1 | Quarter 1 | | | | Quarter 2 | | | | Quarter 3 | | | |
|---------------|-----------|----------|--------|-------|-----------|----------|-------|-------|-----------|----------|--------|-------|
| | Coef | Std. Err | t | P> t | Coef | Std. Err | T | P> t | Coef | Std. Err | t | P> t |
| IRQ | -0,830 | 0,001 | 1,053 | 0,148 | -0,002 | 0,008 | 0,008 | 0,791 | 0,002 | 0,014 | 0,138 | 0,445 |
| Size | 0,002*** | 0,017 | 4,083 | 0,000 | 0,219** | 0,077 | 0,077 | 0,006 | 0,331** | 0,141 | 2,341 | 0,011 |
| Leverage | 0,073 | 0,075 | -0,535 | 0,297 | -0,342 | 0,322 | 0,322 | 0,291 | -0,512 | 0,589 | -0,869 | 0,194 |
| Growth | -0,040 | 0,006 | 0,453 | 0,325 | 0,032 | 0,024 | 0,024 | 0,191 | 0,067* | 0,045 | 1,477 | 0,072 |
| Profitability | 0,002** | 0,191 | -2,027 | 0,023 | -2,063** | 0,823 | 0,823 | 0,014 | -3,538** | 1,590 | -2,225 | 0,014 |
| LNPrice | -0,387*** | 0,006 | 2,497 | 0,007 | 0,039 | 0,027 | 0,027 | 0,158 | 0,050 | 0,051 | 0,979 | 0,165 |
| Revenue | 0,016 | 0,024 | 0,672 | 0,251 | 0,083 | 0,107 | 0,107 | 0,437 | 0,101 | 0,193 | 0,522 | 0,301 |
| OCF | 0,176 | 0,178 | 0,990 | 0,163 | 0,162 | 0,759 | 0,759 | 0,831 | -0,327 | 1,413 | -0,231 | 0,408 |
| Industry | 0,011 | 0,009 | 1,174 | 0,122 | 0,021 | 0,040 | 0,040 | 0,604 | 0,0203 | 0,075 | 0,270 | 0,393 |
| Number of obs | 73 | | | | 73 | | | | 73 | | | |
| F Statistic | 4,526*** | | | | 2,575** | | | | 1,735* | | | |
| R-Squared | 0,392 | | | | 0,268 | | | | 0,197 | | | |
| Prob > F | 0,000 | | | | 0,010 | | | | 0,090 | | | |

Notes: ***, **, * indicates significance at the 0.01, 0.05 and 0.10 level (1-tailed test), respectively. Cell statistics are unstandardized coefficients and standard error.

Model:

$$\text{Spread}_{it} = \beta_0 + \beta_1 \text{IRQ} + \beta_2 \text{Size}_{it} + \beta_3 \text{Leverage}_{it} + \beta_4 \text{Growth}_{it} + \beta_5 \text{Profitability}_{it} + \beta_6 \text{LNPrice}_{it} + \beta_7 \text{Revenue}_{it} + \beta_8 \text{OCF}_{it} + \beta_9 \text{Industry} + \epsilon$$

Spread is computed by a quarter average of the ratio of daily closing bid-ask spread to the closing price for firm *i* in the quarter *t* in the year 2017 multiplied by 100. IRQ is assessed by content analysis. Size is the log of total asset. Growth is the market to book ratio. Profitability is measured by Return on Asset (ROA). LNPrice is a log of the adjusted price. Revenue is the net revenue divided by total assets. Industry: 1:OCF is the net operating cash flow divided by total assets. Industry, 1: manufacturing industry, 2: mining, 3: utilities and services, 4: construction/real estate, 5: other.

Table 5. Regression result (above median) for Hypothesis 2.

| Hypothesis 2 | Quarter 1 | | | | Quarter 2 | | | | Quarter 3 | | | |
|---------------|-----------|----------|--------|-------|-----------|----------|--------|-------|-----------|----------|--------|-------|
| | Coef | Std. Err | t | P> t | Coef | Std. Err | t | P> t | Coef | Std. Err | t | P> t |
| IRQ | 0,037 | 0,034 | 1,078 | 0,143 | -0,001 | 0,002 | -0,426 | 0,336 | -0,000 | 0,001 | -0,310 | 0,378 |
| Size | -0,000 | 0,002 | -0,091 | 0,463 | 0,038 | 0,034 | 1,112 | 0,136 | 0,049** | 0,023 | 2,103 | 0,021 |
| Leverage | -0,068 | 0,140 | -0,485 | 0,315 | -0,053 | 0,140 | -0,378 | 0,353 | -0,007 | 0,096 | -0,080 | 0,468 |
| Growth | -0,011 | 0,013 | -0,819 | 0,208 | -0,016 | 0,014 | -1,156 | 0,127 | -0,013* | 0,009 | -1,501 | 0,071 |
| Profitability | 0,273 | 0,411 | 0,663 | 0,255 | 0,263 | 0,423 | 0,622 | 0,268 | 0,254 | 0,293 | 0,866 | 0,196 |
| LN Price | 0,011 | 0,009 | 1,228 | 0,113 | 0,017 | 0,009 | 1,748 | 0,044 | 0,014** | 0,006 | 2,178 | 0,018 |
| Revenue | 0,041 | 0,047 | 0,884 | 0,191 | 0,046 | 0,047 | 0,985 | 0,165 | 0,031 | 0,033 | 0,930 | 0,179 |
| OCF | 0,135 | 0,223 | 0,608 | 0,273 | 0,233 | 0,226 | 1,030 | 0,154 | 0,241* | 0,154 | 1,558 | 0,063 |
| Industry | 0,022* | 0,014 | 1,584 | 0,060 | 0,025** | 0,014 | 1,770 | 0,042 | 0,018** | 0,009 | 1,909 | 0,032 |
| Region | -0,141*** | 0,052 | -2,710 | 0,005 | -0,146*** | 0,052 | 2,771 | 0,004 | -0,155*** | 0,0362 | -4,285 | 0,000 |
| Number of obs | 47 | | | | 47 | | | | 47 | | | |
| F Statistic | 1,449 | | | | 1,781* | | | | 3,334*** | | | |
| R-Squared | 0,287 | | | | 0,331 | | | | 0,481 | | | |
| Prob > F | 0,190 | | | | 0,100 | | | | 0,000 | | | |

Notes: ***, **, * indicates significance at the 0.01, 0.05 and 0.10 level (1-tailed test), respectively. Cell statistics are unstandardized coefficients and standard error.

Model:

$$\text{Spread}_{it} = \beta_0 + \beta_1 \text{IRQ} + \beta_2 \text{Size}_{it} + \beta_3 \text{Leverage}_{it} + \beta_4 \text{Growth}_{it} + \beta_5 \text{Profitability}_{it} + \beta_6 \text{LNPrice}_{it} + \beta_7 \text{Revenue}_{it} + \beta_8 \text{OCF}_{it} + \beta_9 \text{Industry} + \beta_{10} \text{Region} + \epsilon$$

Spread is computed by a quarter average of the ratio of daily closing bid-ask spread to the closing price for firm *i* in the quarter *t* in the year 2017 multiplied by 100. IRQ is assessed by content analysis. Size is the log of total asset. Growth is the market to book ratio. Profitability is measured by Return on Asset (ROA). LNPrice is a log of the adjusted price. Revenue is the net revenue divided by total assets. Industry: 1:OCF is the net operating cash flow divided by total assets. Industry, 1: manufacturing industry, 2: mining, 3: utilities and services, 4: construction/real estate, 5: other.

result. The results show that no relationship exists between voluntary IR adoption and information asymmetry as implied by insignificance of IRQ in quarter 1 (-0,830, $p > 0,01$), quarter 2 (-0,002, $0 > 0,01$), and quarter 3 (0,002, $p > 0,01$). Hence, the main results are supported to reject Hypothesis 1.

Additional analysis or robustness test is also used to examine Hypothesis 2. Ravsely and Aleksander (2018) identified different groups of SME (Small and Medium Enterprise) and categorized them by size, turnover, and age. This paper follows similar paper, written by Embong et al. (2012) to examine the role of size as a moderating variable. The sample is divided into two categories based on their median: large and

small firms. Those above median are classified as large firms and below the median are small firms. The results in the additional analysis are presented in Tables 5 and 6. They show that the coefficient of IRQ is not significant in three quarters. The results of IRQ in above median group are not significant in quarter 1 (0,037, $p > 0,01$), quarter 2 (-0,001, $p > 0,01$), and quarter 3 (-0,000, $p > 0,01$). The results of IRQ coefficient in below median group is not significant as well in quarter 1 (0,004, $p > 0,01$), quarter 2 (0,004, $p > 0,01$), and quarter 3 (0,010, $p > 0,01$). Accordingly, the main results are also supported that no moderating effect of size exists in the relationship between voluntary IR adoption and information asymmetry.

Table 6. Regression result (below median) for Hypothesis 2.

| Hypothesis 2 | Quarter 1 | | | | Quarter 2 | | | | Quarter 3 | | | |
|---------------|-----------|----------|--------|-------|-----------|----------|--------|-------|-----------|----------|--------|-------|
| | Coef | Std. Err | t | P> t | Coef | Std. Err | t | P> t | Coef | Std. Err | t | P> t |
| IRQ | 0,004 | 0,004 | 1,095 | 0,140 | 0,004 | 0,004 | 1,095 | 0,140 | 0,010 | 0,025 | 0,390 | 0,349 |
| Size | 0,237*** | 0,066 | 3,559 | 0,000 | -0,106 | 0,175 | -0,607 | 0,273 | 1,232*** | 0,380 | 3,235 | 0,001 |
| Leverage | -0,106 | 0,175 | -0,607 | 0,273 | 0,237*** | 0,066 | 3,559 | 0,000 | -0,710 | 0,986 | -0,720 | 0,238 |
| Growth | 0,026** | 0,014 | 1,876 | 0,034 | 0,026** | 0,014 | 1,876 | 0,034 | 0,102* | 0,075 | 1,349 | 0,092 |
| Profitability | -0,773** | 0,439 | -1,759 | 0,043 | -0,773** | 0,439 | -1,759 | 0,043 | -2,927 | 2,546 | -1,149 | 0,128 |
| LN Price | 0,028** | 0,014 | 1,938 | 0,030 | 0,028** | 0,014 | 1,938 | 0,030 | 0,057 | 0,084 | 0,681 | 0,249 |
| Revenue | 0,039 | 0,055 | 0,713 | 0,240 | 0,039 | 0,055 | 0,713 | 0,240 | 0,303 | 0,311 | 0,975 | 0,167 |
| OCF | -0,281 | 0,648 | -0,434 | 0,333 | -0,281 | 0,648 | -0,434 | 0,333 | -3,260 | 3,703 | -0,880 | 0,192 |
| Industry | 0,026 | 0,020 | 1,291 | 0,102 | 0,026 | 0,020 | 1,291 | 0,102 | -0,017 | 0,117 | -0,144 | 0,443 |
| Number of obs | 47 | | | | 47 | | | | 47 | | | |
| F Statistic | 3,840*** | | | | 3,840*** | | | | 1,920* | | | |
| R-Squared | 0,483 | | | | 0,483 | | | | 0,318 | | | |
| Prob > F | 0,000 | | | | 0,000 | | | | 0,080 | | | |

Notes: ***, **, * indicates significance at the 0.01, 0.05 and 0.10 level (1-tailed test), respectively. Cell statistics are unstandardized coefficients and standard error.

Model:

$$\text{Spread}_{it} = \beta_0 + \beta_1 \text{IRQ} + \beta_2 \text{Size}_{it} + \beta_3 \text{Leverage}_{it} + \beta_4 \text{Growth}_{it} + \beta_5 \text{Profitability}_{it} + \beta_6 \text{LNPrice}_{it} + \beta_7 \text{Revenue}_{it} + \beta_8 \text{OCF}_{it} + \beta_9 \text{Industry} + \epsilon$$

Spread is computed by a quarter average of the ratio of daily closing bid-ask spread to the closing price for firm *i* in the quarter *t* in the year 2017 multiplied by 100. IRQ is assessed by content analysis. Size is the log of total asset. Growth is the market to book ratio. Profitability is measured by Return on Asset (ROA). LNPrice is a log of the adjusted price. Revenue is the net revenue divided by total assets. Industry: 1:OCF is the net operating cash flow divided by total assets. Industry, 1: manufacturing industry, 2: mining, 3: utilities and services, 4: construction/real estate, 5: other. Region is not used because all samples consisting from the same region (European Firm).

5. Conclusions

This research examined the existence of a negative relationship between voluntary integrated reporting and information asymmetry for 94 firms in Europe and Asia in 2017 with publishing an integrated report in 2016. The results show that there is an insignificant relationship between the integrated reporting quality and information asymmetry which is captured by the spread. There is no significant effect as well for size effect to moderate the relationship between the integrated reporting quality and information asymmetry. Those results are also supported by additional analyses.

These findings could be relevant for some aspects of the literature especially in the research design where this study used a continuous variable based on detailed content analysis instead of a dummy variable to measure the integrated reporting quality. Other innovations of this study are that it investigated the IR effect on a quarterly instead of an annual basis. From a practical perspective, as the significant effects are not yet observed, this result can provide the companies with insight on whether to implement the integrated reporting immediately or not. Investors who are interested in the integrated reporting also can consider this finding in their decision making. Finally, the IIRC as the regulator body can conduct some improvements to see how the integrated reporting is proceeding, particularly in the voluntary context. As the IR concept is relatively a new area for corporate reporting in the world, the governments are given the consideration and insight as well whether to encourage the companies in their countries to adopt this trend immediately or not.

The results of this paper should be seen in the light of its limitation. First, it used a relatively small sample, 94 firms in three quarters in the period of 2017 only because of the availability of data. The generalization aspect should be treated carefully since the sample is relatively small. Second, there is the potential for subjective assessment in the content analysis performed for the integrated reporting quality. To partially deal with these limitations, further research can expand the database using Asian, European, or other settings and for a longer period. In addition, since this research used the 0,1,2 category to assess the

integrated reporting quality through the content analysis, future research can improve this measurement by using 1–5 or 1–7 rating, therefore it can more deeply analyze the quality of the integrated reporting. Even, if it is possible, a second analyst can be used to deal with the subjective assessment. Another proxy for information asymmetry, for instance, analyst forecast accuracy and cumulative abnormal return (CAR) can also be used to capture the information asymmetry in the market. Finally, IRQ's component testing is also an interesting area to be examined in the future. Further research can also investigate which part of the integrated reporting significantly affects the information asymmetry, hence it can more thoroughly provide evidence of how the integrated reporting as a whole and as a part is being undertaken and affecting the market, particularly information asymmetry.

Declarations

Author contribution statement

D. Sriani: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

D. Agustia: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

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The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

Appendix 1. The <IR> Coding Framework

Panel A. Content Elements

| Dimensions | Components | Scoring schemes | |
|--|----------------------------------|-----------------|---------|
| | | Minimum | Maximum |
| 1. Organizational overview and operating context | 1.1 Reporting boundary | 0 | 2 |
| | 1.2 Mission and value | 0 | 2 |
| | 1.3 Business overview | 0 | 2 |
| | 1.4 Operation context | 0 | 2 |
| | 1.5 Summary statistics | 0 | 2 |
| 2. Governance | 2.1 Governance structure | 0 | 2 |
| | 2.2 Governance strategy | 0 | 2 |
| | 2.3 Organization culture & ethic | 0 | 2 |
| | 2.4 Remuneration & performance | 0 | 2 |
| 3. Business model | 3.1 Business model description | 0 | 2 |
| | 3.2 Business model input | 0 | 2 |
| | 3.3 Business model activities | 0 | 2 |
| | 3.4 Business model output | 0 | 2 |
| | 3.5 Business model outcome | 0 | 2 |
| | 3.6 Stakeholder dependencies | 0 | 2 |
| 4. Risk and opportunities | 4.1 Key risks | 0 | 2 |
| | 4.2 Key opportunities | 0 | 2 |

(continued on next column)

(continued)

| Dimensions | Components | Scoring schemes | |
|--|--|-----------------|---------|
| | | Minimum | Maximum |
| 5. Strategy and resource allocation | 5.1 Link between strategy and resource allocation | 0 | 2 |
| | 5.2 The competitive advantage | 0 | 2 |
| | 5.3 Stakeholder engagement to formulate a strategy | 0 | 2 |
| 6. Performance | 6.1 Quantitative indicator of targets, risk, & opportunities | 0 | 2 |
| | 6.2 Linkage between past & current performance | 0 | 2 |
| | 6.3 Organization effect on capital | 0 | 2 |
| | 6.4 Stakeholder relationship | 0 | 2 |
| | 6.5 Explanation of KPI | 0 | 2 |
| 7. Outlook | 7.1 Explanation of anticipated changes | 0 | 2 |
| | 7.2 Discussion of potential implications | 0 | 2 |
| | 7.3 Forecast/projection & related assumptions | 0 | 2 |
| 8. Basis of preparation and presentation | 8.1 Organization's materiality determination process | 0 | 2 |
| | 8.2 Method to quantify material matters | 0 | 2 |

Panel B. Guiding Principle for Impression Score

| | |
|---------|--|
| 0 | No sustainability performance or other suggested content elements, such as strategy and risks, at all. |
| 1 - 2,5 | Combined report, that is sustainability information is presented in silo, with no connections with other sections in the report. Depending on the quality of sustainability information on its own, for example, the level of quantification of performance indicators assign a score from 1-2,5 |
| 2,5 - 4 | The sustainability information and other suggested content elements, such as strategy and risk, are of reasonable quality, and with limited integration among those elements, for example, the sustainability performance is presented together with financial performance. |
| 4 - 5,5 | For a moderate level of integration between suggested elements, for example, the strategy is linked to the performance. |
| 5,5 - 7 | For a high level of integration, for example, the sustainability performance indicators are disclosed at similar quality to financial performance indicators; clear links between strategy, performance, and risk; easy reading and navigation |

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