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► **To cite this version:**

Dimos Andronoudis, Diogenis Baboukardos, Fanis Tsoligkas. How the information content of integrated reporting flows into the stock market. *International Journal of Finance and Economics*, 2024, 29 (1), pp.1057-1078. 10.1002/ijfe.2721 . hal-04389552

HAL Id: hal-04389552

<https://hal.science/hal-04389552>

Submitted on 11 Jan 2024

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How the Information Content of Integrated Reporting Flows into the Stock Market

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October 2022

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Abstract

According to its advocates, Integrated Reporting (IR) aims to enhance firms' information environment by placing financial reporting into a much broader perspective in which interrelated non-financial information of firms' activities are taken into consideration. We examine whether this intended outcome of IR embeds into the stock pricing process using a sample of South African listed firms that mandatorily adopted IR in 2011. Unlike previous studies that explore market valuation implications of IR, we examine the channel through which the IR-related information flows into firm value. Specifically, we quantify the effects of revisions of expectation about future cash flows (prompted by financial reporting information), revisions of expectation about discount rates (prompted by non-financial reporting information) and their interconnectedness. We hypothesize and empirically show that the adoption of an IR approach prompted greater market revisions of expectations about future discount rates and a stronger interconnectedness between market revisions of expectations about future cash flows and discount rates. Thus, the change in the stock pricing process after the adoption of IR is determined by non-financial reporting information and its strong interconnectedness with financial reporting information. We also show that our results are stronger for firms with greater earnings opacity, suggesting that investors find IR more useful when firms' financial reporting is opaque. Results indicate to researchers, practitioners and regulators that IR enhances the firm-level information environment by providing informative non-financial reporting which is also well integrated with financial reporting.

Keywords: Integrated Reporting; Discount Rate News; Pricing Process, South Africa

JEL Classification: M14, M41, M48, G10.

1. Introduction

In recent years, the corporate world has been witnessing a shift of the reporting rationale from a fragmented one, in which the financial and non-financial impacts of firm activities are separately reported, to an integrated one, in which the interrelatedness of financial and non-financial reporting is emphasized. Since 2010, the flagship of this reporting movement has been the International Integrated Reporting Council (IIRC) which introduced to the corporate reporting world the concept of Integrated Reporting (IR). According to the International Integrated Reporting Council (IIRC) Framework (2021) the “primary purpose of an integrated report is to explain to providers of financial capital how an organization creates, preserves or erodes value over time. It therefore contains relevant information, *both financial and other.*” (para. 1.7, emphasis added). IR calls for a single report which integrates in a meaningful manner financial and non-financial reporting¹ by comprehensively describing how a firm uses and maintains access to resources from its external environments (e.g., human, social and natural), and how it maintains or improves its assets [Cho et al., 2013; Eccles & Serafeim 2011; Federation of European Accountants (FEE) 2015]. Recently, IR has gained even more prominence due to the consolidation of the IIRC with the IFRS Foundation. According to the IFRS Foundation (2022a), one of its ultimate goals is to provide firms with guidance over the preparation of integrated reports and align the reporting requirements of the International Accounting Standards Board (IASB) with those of the newly established International Sustainability Standards Board (ISSB).

¹ Throughout the manuscript the terms “financial reporting” and “financial information” are used interchangeably and refer to accounting information as it is published in firms’ financial statements and accompanying notes. In a similar vein, the terms “non-financial reporting” and “non-financial information” are also used interchangeably and refer to any other information provided by firms. This is in line with the IIRC Framework (2021) which states that “...the information in the financial statements [...] [serves] as an anchor or point of reference to which the other information in an integrated report can be related” (para. 3.31).

IR is suggested as a better reporting approach over the traditional one as it is expected to render capital markets participants more efficient in their investment decisions (EY, 2013, 2014; KPMG, 2013). This stance is also supported by some of the largest institutional investors in the world, who claim that IR leads to more effective communication of how firms operate and is, therefore, a valuable tool for their capital allocation decisions (IIRC, 2017). To that end, the accounting profession acknowledges that non-financial information reporting should be interconnected with financial reporting (Accountancy Europe, 2019). Moreover, the previous chairman of the IASB, Hans Hoogervorst, has also recognized the importance of integrating financial and non-financial information within the same report as it "...places more emphasis on interconnectivity among elements of an integrated report" (Hoogervorst 2017, pg. 3). In other words, it can be argued that IR enhances the firm's information environment by providing together three different pieces of information: (1) financial reporting; (2) non-financial reporting; and (3) their interconnectedness.

The above argumentation is corroborated by recent empirical studies. These studies have primarily focused on South Africa as this is the only country in the world so far where its listed firms have been required to release an annual integrated report since 2011 (e.g., Barth et al. 2017; Lee & Yeo 2016; Zhou et al. 2017). In a nutshell, the findings of these studies indicate that the mandatory adoption of an IR approach by listed firms in Johannesburg Stock Exchange (JSE) has led to: a) a substantial improvement in the quality and quantity of disclosures provided by JSE-listed firms (Haji & Anifowose, 2016; Marx & Mohammadali-Haji, 2014; Setia et al., 2015) and, b) market valuation implications (Baboukardos & Rimmel 2016; Barth et al. 2017; Lee and Yeo 2016; Zhou et al. 2017). According to these studies, IR enhances the firm's information environment by placing financial reporting into a much broader perspective in which interrelated non-financial information of the firm's activities are taken into consideration.

Although previous empirical studies provide important insights over the market valuation implications of IR, a question that remains unexplored is the channels through which IR associates with firm value and leads to the improvement of the information environment, documented by prior research. In this study we posit that non-financial information and its interconnectedness with financial reporting enhance the firm's information environment and this enhancement would manifest into the firm value and into how prices are set. That is, IR should enhance the firm's information environment through the provision of more informative non-financial reporting (Hypothesis 1a) and through the integration of financial and non-financial reporting (Hypothesis 1b). Ultimately, the rich information dynamics between financial and non-financial reporting are expected to prompt market reactions, thereby determining the firm's market valuation (i.e., revisions of expectations and, in turn, return news).

Building on these predictions, we subsequently consider whether financial reporting opacity enhances the effect of IR adoption. As earnings become more opaque, assessing a firm's future financial performance turns more challenging for investors. Prior literature shows that non-financial reporting information gains greater relevance when financial reporting is more opaque. For instance, Dhaliwal et al. (2014) show that corporate social responsibility (CSR) reports, which contain non-financial information are substitutes to financial reporting opacity. Thus, we predict that the enhancement of firm's information environment through the provision of more informative non-financial reporting (Hypothesis 2a) and through the integration of financial and non-financial reporting (Hypothesis 2b) is more pronounced for firms with greater earnings opacity.

To empirically examine our predictions, we adopt the accounting-based return decomposition in Vuolteenaho (2002), which has been introduced to accounting research by Callen and Segal (2004) and subsequently employed as a valuation tool, examining the valuation implications of,

amongst others, reporting regulations (Callen et al., 2005, 2006; Clatworthy et al., 2012; Garcia Lara et al., 2010; Shan et al., 2014 for example, and Callen 2009, 2016 for review on the valuation dimension of the methodology). More importantly, this model is relevant to our setting, because it allows us to quantify the embeddedness of (1) financial reporting information, (2) non-financial reporting information and (3) their interconnectedness into the firm's market valuation.

According to Callen (2009), the Vuolteenaho (2002) accounting-based return variance decomposition expresses shocks to returns as a linear function of the shocks to the variables in a VAR system which considers returns, earnings, and book values as state variables. Earnings, i.e., cash flow news, come from the closed-form VAR system by picking up the shocks on expected returns from the financial reporting information (that is earnings and book values), as a first order effect. Further, discount rates news come from the same VAR system by picking up the shocks on expected returns that do not derive from financial reporting information but instead from other non-financial information. Finally, Vuolteenaho (2002) accounting-based return variance decomposition imposes cash flow and discount rate news to covary. The covariance of these two state variables depicts the interconnectedness of financial and non-financial reporting information. Thus, the Vuolteenaho (2002) accounting-based return decomposition allows us to examine whether firm-level return news variability is driven by (1) the variability of cash flow news, prompted by financial reporting information, (2) the variability of discount rate news, prompted by non-financial reporting information and (3) their covariance term, prompted by the interconnectedness of financial and non-financial reporting information.

Following most previous studies (e.g., Baboukardos & Rimmel 2016; Barth et al., 2017; Bernardi & Stark 2018), this study exploits the unique case of South African firms listed on the JSE which, thus far, is the only capital market where IR is mandated. This renders JSE a unique

laboratory setting in which the adoption of IR is not a decision made by the firm but exogenously imposed by the capital market authorities. Our results show that the mandatory adoption of IR is associated with greater market revisions of expectations about future discount rates. We also show that the interconnectedness between market revisions of expectations about future cash flows and discount rates is stronger after the adoption of an IR approach. These patterns corroborate our predictions that IR enhances the firm-level information environment through the provision of more informative non-financial reporting and through the integration of financial and non-financial reporting. In addition, these findings are stronger for firms with greater financial reporting opacity. This finding suggests that IR is found to be more useful when firms' financial reporting is more opaque. Our results are robust to a battery of sensitivity tests.

Taken together, our results have the following implications. The significant increase in the market revisions of expectations about future discount rates suggests that the new IR approach enables market participants to identify or measure more reliably the risks and opportunities arising from the firm's activities which are not reflected in financial reporting, as suggested by the IIRC Framework (IIRC, 2021). Moreover, the significant increase in the covariance between cash flows news and discount rates news demonstrates that IR does serve its role of integrating financial and non-financial reporting in meaningful way for stock market participants.

Our study contributes to recent literature concerning the capital market implications of IR and shows that IR enhances the firm's information environment (Baboukardos & Rimmel 2016; Barth et al., 2017; Lee & Yeo 2016; Zhou et al., 2017). Despite the recent attention, empirical evidence about "...the benefits associated with integrated reporting is [still] sparse" (Barth et al., 2017, pg. 44), whilst Adams et al. (2016) stress that we know little about the usefulness of IR to capital market participants. Our study delves into the valuation process by directly examining how IR's

enhancement of the information environment for investors manifests itself into the firm's stock market valuation. In contrast, prior literature examines the consequences of IR on firm value (Baboukardos & Rimmel 2016; Lee & Yeo 2016), analysts forecast errors and cost of capital (Zhou et al., 2017) or liquidity (Barth et al., 2017). Finally, our results provide useful insights to the debate over the current developments in corporate reporting and, particularly, in relation to the intention of IFRS Foundation to provide firms with guidance over the preparation of integrated reports (IFRS Foundation, 2022a). Our findings not only confirm the well-documented market valuation implications of IR but, more importantly, show the channel through which the IR-related information flows into firm value demonstrating that it is the non-financial reporting and its interconnectedness with financial reporting that make the difference.

The rest of the paper is organized as follows. Section 2 presents the background of the study and develops its hypotheses. Section 3 illustrates the research design. Section 4 discusses the results of both the main and the sensitivity analyses. Finally, Section 5 draws conclusions.

2. Background and hypothesis development

Although the first integrated report dates back to 2002 when the Danish company Novozymes released a report called “integrated report”, the concept of IR has come under the spotlight over the last decade. 2010 is a landmark year for IR since two important events took place. First, the foundation of the IIRC by HM King Charles III Accounting for Sustainability Project and the Global Reporting Initiative. IIRC was a global coalition of regulators, investors, companies, standard setters, the accounting profession, academia and NGOs whose main purpose was to establish IR as mainstream business practice, and to align capital allocation with sustainable

development through IR. In 2022 the IIRC consolidated with the IFRS Foundation as part of the latter's large-scale endeavor to build on previous work on financial and non-financial reporting performed by various organizations (such as the Climate Disclosure Standards Board, the Task Force for Climate-related Disclosures, the Sustainability Accounting Standards Board and others) (Baboukardos et al., 2022). The main goal of this endeavor is the development of a complete set of financial and non-financial reporting standards which will follow an IR approach and provide firms with guidance over the preparation of an integrated report (IFRS Foundation, 2022a). Under the IFRS Foundation, IIRC has now been transitioned into Integrated Reporting and Connectivity Council. (IFRS Foundation, 2022b)

Second, South Africa became the first country whose listed firms were required to release an annual integrated report. The South African King Committee on Corporate Governance released the King III Report in 2009. The King III Report required firms to integrate their financial and non-financial information into a single report (IDSA, 2009). In early 2010 JSE incorporated compliance with the King III Report in its listing requirements and hence, JSE-listed firms were mandated to release an annual integrated report for financial years starting on 01/03/2010 onwards. Consequently, the first integrated reports were released by JSE-listed firms in 2011. Similar to the IIRC Framework (2013), King III acknowledges that capital markets will be benefited by the integration of financial and non-financial reporting as it will lead to more relevant information (IDSA, 2009: Principle 9.1, par.7).

At its core, IR bestows the value creation process of the firm which both has an impact on, and it is affected by its external environmental. This is manifested in the IIRC Framework (2013, 2021) through the concept of six capitals, namely: financial; manufactured; intellectual; human; social; and natural. IIRC (2013, 2021) recognizes these six capitals as essential inputs for every

organization which are transformed through its internal processes into outputs. In other words, IIRC (2013, 2021) stresses that the firm's financial performance cannot be evaluated in isolation of its non-financial performance. According to the IIRC Framework, IR's primary purpose is to "improve the quality of information available to providers of financial capital to enable a more efficient and productive allocation of capital" (IIRC, 2021, pg. 2). Previous studies that examine the quality and quantity of JSE-listed firms' disclosures after the adoption of an IR approach support this argument. Stolowy and Paugam (2018) compared the level of non-financial disclosures of JSE-listed firms between 2006 and 2011 and demonstrate that it has been considerably increased. Setia et al. (2015) show that within the first three years of mandatory IR adoption both the extent and the quality of integrated reports has been improved. Haji and Anifowose (2016) find that after the adoption of an IR approach, JSE-listed firms disclose more unfavorable information about their activities than they did before. Further, Marx and Mohammadali-Haji (2014) show that during the first years after the adoption of an IR approach South African firms discuss more extensively their risks and uncertainties and they growingly improve the quality of their disclosures.

Practitioners corroborate this viewpoint arguing that IR enables capital markets to better understand the firm's strategy, align their valuation models, and make more efficient and forward-looking investment decisions (KPMG, 2013) which is evident by a substantial increase in JSE-listed firms' risk disclosures (EY, 2013, 2014). To this end, the previous chairman of the IASB argues that "...users seek more forward-looking information than the *financial statements currently provide*. These elements are often *included in integrated reporting*" (Hoogervorst 2017, pg. 2, emphasis added).

Based on the above, it can be argued that IR enhances the information environment which, in turn, leads to updated market expectations for the firm's future performance based on the firm's non-financial information and its interrelatedness with financial information. These revisions of expectations push returns away from their expected values (i.e., create return news and return news variance). Previous studies provide empirical evidence which, however, can only indirectly support the notion that non-financial information and the interrelatedness between financial and non-financial information lead to revised expectations about the firm's future performance. For instance, Zhou et al. (2017) construct an index which gauges the alignment of integrated reports of listed firms in JSE with the IIRC Framework (2013) and find that their proxy of IR quality is negatively associated to analysts' forecast errors and to cost of equity capital. Particularly, Zhou et al. (2017) show that the qualitative features of connectivity and newness of an integrated report lead to a lower forecast error which indicates that IR provides new information which is relevant to investment decision-making. Further, they show that the reduction in the cost of equity is more prominent for firms with low analyst coverage, underscoring the IR-related enhancement of these firms' information environment.

Lee and Yeo (2016) also suggest an improvement in the information environment of firms by showing that the quality of the firm's integrated report is associated to its market value. Their findings are stronger for firms with high organizational complexity which further corroborates the argument that high-quality IR enhances firms' information environment. Drawing upon the findings of Lee and Yeo (2016), Barth et al. (2017) investigates whether the positive association between the quality of IR and market value stems from changes in the information environment of the firm (i.e., capital market effect) or from change in the internal decision-making processes of the firm (i.e., real effect). Their findings indicate that IR is associated with both capital market and

real effects. Particularly relevant to our study is their finding that the quality of IR is associated with better firm market liquidity which indicates better informed capital market participants. Further, Baboukardos and Rimmel (2016) compare the market valuation of accounting information before and after the adoption of an IR approach in JSE and observe that investors value differently both the net assets and earnings of JSE-listed firms after the adoption of IR approach. Considering that the accounting information is produced based on the same accounting standards, they conclude that the change in the valuation of accounting numbers stems from the interconnectedness of financial and non-financial reporting under the new reporting approach.

Finally, previous studies provide evidence that the usefulness of non-financial reporting has been enhanced under an IR approach. Bernardi and Stark (2018) examine a sample of JSE-listed firms and show that the volume of non-financial disclosures provided by these firms was not associated to financial analysts' forecast accuracy before the adoption of an IR approach. Nevertheless, after the introduction of IR, non-financial disclosures are found to be positively associated with analyst forecast accuracy. Additionally, Mervelskemper and Streit (2017) show that firms' non-financial performance is more value relevant when reported through an integrated report than through a stand-alone CSR report.

Based on the review of extant literature above, we argue that although previous empirical studies show that the adoption of an IR approach by listed firms in JSE has led to capital market consequences, these studies do not provide evidence over the channel through which the IR-related information flows into firm value. We employ the accounting-based return decomposition in Vuolteenaho (2002) which allows us to examine whether changes "in returns is driven either by the volatility of earnings news or by the volatility of discount rate news or both" (Callen, 2016). Following prior literature (Callen & Segal 2004; Callen et al., 2005, 2006; Clatworthy et al., 2012;

Cohen et al., 2002; Garcia Lara et al., 2010; Shan et al., 2014; Vuolteenaho, 2002), we assert that return news variance is driven by: (1) variability in revisions of expectations about future cash flows (or, cash flow news), prompted by financial reporting; (2) variability in revisions of expectations about future discount rates (or, discount rate news), prompted by non-financial reporting information and; (3) their interconnectedness (i.e., the covariance between cash flow and discount rate news).

IR does not aim to change financial reporting regulation but to provide a framework for the better interconnectedness of financial reporting with non-financial reporting information. Indeed, the mandatory adoption of IR by JSE did not affect financial reporting regulation which remained unchanged. On the contrary, as discussed above, previous studies (e.g., Haji & Anifowose, 2016; EY, 2013, 2014; Stolowy & Paugam, 2018, Setia et al., 2015; Marx & Mohammadali-Haji, 2014) document a substantial improvement of the quality and quantity of non-financial reporting provided by JSE-listed firms after the mandatory introduction of IR. Drawing on this and the accounting-based return decomposition in Vuolteenaho (2002), we posit that the evidence in prior literature that an IR approach is associated with firms' market valuations (e.g., Barth et al. 2017; Lee and Yeo 2016; Zhou et al. 2017), stems from changes triggered by non-financial reporting information and the interconnectedness between financial and non-financial reporting information. We therefore hypothesize:

H1a: The adoption of an IR approach prompts market revisions of expectations about future discount rates.

H1b: The interconnectedness between market revisions of expectations about future cash flows and discount rates is stronger after the adoption of an IR approach.

We also examine whether IR is more useful for firms with low financial reporting quality as it is capture by financial reporting opacity. Opacity is the extent to which earnings “...fails to provide information about the distribution of the true, but unobservable, economic earnings of firm” (Bhattacharya et al., 2003, p. 642). Thus, earnings opacity causes information asymmetry (Bhattacharya et al., 2003), and firms with greater opacity have greater amount of hidden information (Jin and Myers, 2006). Consistent with opacity causing higher information asymmetry, Maffett (2012) shows that firms with opaque financial reporting information experience more privately informed trading by institutional investors. Thus, assessing the future financial performance of firms with greater earnings opacity is more challenging and can have significant adverse effect on equity markets. For instance, Bhattacharya et al. (2003) find that earnings opacity has an adverse effect on the cost of equity and trading in the stock market. Their findings are consistent with opaque earnings leading to increased information risk. Similarly, Jin and Myers (2006) show that opaqueness is associated with stock price crash risk. Further, Cahan et al. (2009) show that information opacity has a significant adverse effect on the return-earnings relation. Along these lines, Lang and Maffett (2011) find that transparency, the opposite of opaqueness, is negatively associated with liquidity volatility.

Prior literature indicates that non-financial reporting plays a complementary role to financial reporting. Specifically, non-financial reporting provides incrementally useful information to investors. For instance, Nichols and Wieland (2009) show that press releases, which are primarily non-financial information, help analysts in their valuation process. Specifically, they show that forecasts improve in quantity and in accuracy. Similarly, Dhaliwal et al. (2012) document that CSR reports (a typical example of non-financial reporting) assist analysts in better predicting

future earnings. Further, they show that such non-financial information gains more relevance in the presence of opaque financial information, thereby concluding that such information complements financial disclosure. Building upon these findings, Dhaliwal et al. (2014) further show that such non-financial reporting complements financial reporting in reducing the cost of equity. These findings indicate that non-financial reporting is more useful for investors when evaluating firms with greater financial reporting opacity. Equally, in our context we expect that investors may rely more on non-financial reporting information conveyed by IR when financial reporting is more opaque. If this is the case, then the hypothesized effects in H1a and H1b will be stronger for firms exhibiting higher financial reporting opacity. Thus, we hypothesize that:

H2a: The adoption of an IR approach prompts stronger market revisions of expectations about future discount rates for firms with higher earnings opacity.

H2b: The interconnectedness between market revisions of expectations about future cash flows and discount rates is stronger after the adoption of an IR approach for firms with higher earnings opacity.

3. Methodology and data

3.1 Sample Selection and Composition

Table 1 summarizes the sample selection process. Our sample selection starts in 2005 and ends in 2016. IR was adopted for financial reporting periods starting on 01/03/2010 onwards. That is, South African firms had to release their first integrated reports in 2011. Hence, our sample covers a balanced period of six years around the mandatory adoption of IR (i.e., pre-IR period is between 2005-2010 and post-IR period is between 2011-2016). We retrieve all firms included in Datastream's research lists of active and inactive firms that have been listed in JSE. From these

lists we only retain instruments classified as equity. Further, we delete firms classified as members of the financial industry, and firms with missing industry membership. This yields an initial sample of 2,344 firm-year observations. Subsequently, we eliminated 88 firm-year observations with missing data required in our analysis. Relatedly, we removed 24 firm-year observations with missing observations when we logarithmically transform the variables used in our analysis. This yields a sample of 2,234 firm-year observations used for Vuolteenaho (2002) accounting-based return decomposition. Subsequently, we eliminated 80 firm-year observations with missing data required for the multivariate analysis.

[Insert Table 1 here.]

Table 2 presents the sample distribution by year. Overall, the sample is well distributed across years and the sub-periods before and after the mandatory introduction of IR.

[Insert Table 2 here.]

3.2 *Multivariate Analyses*

This section discusses the multivariate regression analyses we used to empirically test our hypotheses with respect to the effect of the mandatory adoption of IR on the market revisions of expectations about future discount rates and the covariance between market revisions of expectations about future cash flows and discount rates.

To test H1, examining the effect of IR on the market's revisions of expectations about future discount rates, we estimate the following model:

$$\text{var}(\text{DRN})_{i,t} = \alpha_0 + \beta_1 * \text{IR}_{i,t} + \varepsilon_{i,t} \quad \text{Model 1a}$$

where $\text{var}(\text{DRN})_{i,t}$ is our measure of the market's revisions of expectations about future discount rates and $\text{IR}_{i,t}$ is an indicator variable that equals to one for the period after the mandatory adoption of IR in South Africa, and zero otherwise. Section 3.3 discusses in detail the empirical estimation of our dependent variable.

To test H2, examining the effect of IR on the covariance between the revisions of expectations about future cash flows and discount rates we estimate the following model:

$$\text{covar}_{i,t} = \alpha_0 + \beta_1 * \text{IR}_{i,t} + \varepsilon_{i,t} \quad \text{Model 1b}$$

where $\text{covar}_{i,t}$ is our measure of the covariance between the market revisions of expectations about cash flow news and discount rates and $\text{IR}_{i,t}$ as previously defined. Section 3.3 discusses in detail the empirical estimation of our dependent variable.

Subsequently, we extend Model 1a and Model 1b by adding firm-level control variables to isolate inferences about the effect of adopting IR. Given the limited prior literature using the market revisions of expectations about future discount rate news and the interconnectedness between market revisions of expectations about future cash flows and discount rates as dependent variables, we rely on relevant literature identifying risk factors and examining the determinants of returns. Specifically, we control for risk factors and variables that have been shown to affect stock

returns in prior literature (Dargenidou et al., 2017; Jiang et al., 2016; Soares & Stark, 2015). Thus, we include the following risk factors which associate with market returns: leverage measured as the ratio of total debt to book value of equity, as a measure of financial health (*LEV*); book to market ratio (*BM*) as a measure of risk and growth; the natural logarithm of total assets (*SIZE*) as measure of a firm’s size; stock market beta (*BETA*) as a proxy for risk; dividend yield measured as the ratio of total dividends divided by the market value of the firm (*DY*) and; earnings opacity (*OPAC*) which affects the return shareholders demand. Following Bhattacharya et al. (2003) and Dhaliwal et al. (2014), earnings opacity is measured as the absolute value of scaled accruals scaled by lag total assets.^{2,3} The details of all variables defined across the methodology section and beyond are presented in the Appendix. Further, we include year fixed effects to alleviate concerns about time varying effects and firm fixed effects to reduce concerns over omitted variables (Maso et al., 2020; Nikolaev & Van Lent, 2005), as follows:

$$\text{var}(\text{DRN})_{i,t} = \alpha_0 + \beta_1 * \text{IR}_{i,t} + \sum_{j=1}^6 \text{Controls} + \text{Year Fixed Effect} + \text{Firm Fixed Effects} + \varepsilon_{i,t}$$

Model 2a

$$\text{covar}_{i,t} = \alpha_0 + \beta_1 * \text{IR}_{i,t} + \sum_{j=1}^6 \text{Controls} + \text{Year Fixed Effect} + \text{Firm Fixed Effects} + \varepsilon_{i,t}$$

Model 2b

² DeFond and Hung (2003) argue that total accruals triggers investors’ suspicions towards earnings as opposed to its components such as discretionary accruals.

³ Note that for convenience in interpreting the effect of opacity, we define it as the negative of Bhattacharya et al. (2003) and Dhaliwal et al. (2014)’s measure whereby a more positive (negative) value indicates greater (lower) earnings opacity.

In line with hypothesis H1a, we expect the coefficients of IR to be positive and significant in Model 1a and Model 2a. That is the adoption of IR prompts the market to revise expectations prompted by non-financial reporting, quantified by $var(DRN)$. Consistent with H1b we expect the coefficients of IR to be positive and significant in Model 1b and Model 2b. That is the interconnectedness between market revisions of expectations about future cash flows and discount rates is stronger after the adoption of an IR approach.

In order to test H2a and H2b we extend Model 2a and Model 2b by including an interaction term between the indicator variable IR , which captures the effect of the mandatory IR adoption and our measure of earnings opacity, $OPAC$, as follows:

$$var(DRN)_{i,t} = \alpha_0 + \beta_1 * IR_{i,t} + \beta_2 * OPAC_{i,t} + \beta_3 * OPAC_{i,t} * IR_{i,t} + \sum_{j=1}^6 Controls + Year\ Fixed\ Effect + Firm\ Fixed\ Effects + \varepsilon_{i,t} \quad \text{Model 2a}$$

$$covar_{i,t} = \alpha_0 + \beta_1 * IR_{i,t} + \beta_2 * OPAC_{i,t} + \beta_3 * OPAC_{i,t} * IR_{i,t} + \sum_{j=1}^6 Controls + Year\ Fixed\ Effect + Firm\ Fixed\ Effects + \varepsilon_{i,t} \quad \text{Model 2b}$$

In line with the hypothesis development, we expect the coefficient of interaction between opacity ($OPAC$) and the indicator variable IR to be positive and significant indicating that the adoption of IR prompts stronger market revisions of expectations about future discount rates and it results in stronger interconnectedness between market revisions of expectations about future cash flows and discount rates for firms with higher earnings opacity.

3.3 Estimating revisions of expectations about future discount rates and cash flows

We employ the *accounting-based return decomposition* in Vuolteenaho (2002) which allows us to examine whether changes “in returns is driven either by the volatility of earnings news or by the volatility of discount rate news or both” (Callen, 2016). Vuolteenaho (2002) decomposes a firm’s stock return into changes in cash flow expectations (cash flows news) and changes in discount rates (discount rate news). This approach is effectively based on a log-linearized Discounted Cash Flows model (DCF) equating return news to changes/revisions in the present-value of expected cash flows (numerator channel) and discount rates (denominator channel).

Vuolteenaho (2002)’s methodology traces back to the Campbell and Shiller (1988a,b) and Campbell (1991) definition of unexpected stock excess returns as a log-linear function of: (a) changes in expectations about (present-value) future dividend growth; (b) changes in expectations about (present-value) future discount rates. Returns are pushed away from their expected values (non-zero unexpected returns), when the market revises its expectations about future cash flows (the numerator DCF channel) and/or future discount rates (the denominator DCF channel). Vuolteenaho (2002) transfers the concept to the firm-level analysis by assuming cross-sectional stationarity in the (log) BM ratio and the accounting clean-surplus equation. He uses earnings over book value of equity (return on equity: ROE) as the cash flow proxy and adopts the constant log-linear present-value factor, rho, from Campbell and Shiller (1988a,b) and Campbell (1991). Return on equity is included as the main driver of financial reporting information, while the book to market controls for firm growth and interactions between firm growth and earnings and expected returns persistence (Henry, 2018). The result is:

$$r_{i,t} - E_{t-1}(r_{i,t}) = (E_t - E_{t-1}) \sum_{j=0}^{\infty} \rho^j roe_{i,t+j} + k_{i,t} - (E_t - E_{t-1}) \sum_{j=1}^{\infty} \rho^j r_{i,t+j}$$

$$Ret_{i,t} = +CFN_{i,t} - DRN_{i,t} \quad (\text{Model 3})$$

The left-hand-side is the (log) stock return news $[r_{i,t} - E_{t-1}(r_{i,t})]$; $CFN_{i,t}$ is the (log) cash flow news $[(E_t - E_{t-1}) \sum_{j=0}^{\infty} \rho^j roe_{i,t+j} + k_{i,t}]$; $DRN_{i,t}$ is the (log) discount rate news $[(E_t - E_{t-1}) \sum_{j=1}^{\infty} \rho^j r_{i,t+j}]$.^{4,5} Model (3) reflects that an upward (downward) revision in ROE is good (bad) news about the firm prospects, triggering a positive (negative) shock to stock returns. In turn, an upward (downward) revision in the discount rate triggers a negative (positive) shock to stock returns. Finally, taking variances of Model (3) yields Vuolteenaho (2002)'s variance decomposition of unexpected stock returns, as follows:

$$\begin{aligned} var[r_{i,t} - E_{t-1}(r_{i,t})] &= +var(CFN_{i,t}) + var(DRN_{i,t}) - 2*covar(CFN_{i,t}, DRN_{i,t}) \\ Var(Ret_{i,t}) &= +var(CFN_{i,t}) + var(DRN_{i,t}) - 2*covar_{i,t} \end{aligned} \quad \text{(Model 4)}$$

The left-hand-side is the variance of stock return news $\{var[r_{i,t} - E_{t-1}(r_{i,t})], \text{ i.e., } var(Ret_{i,t})\}$. $var(CFN_{i,t})$ is the variance contribution of cash flow news to return news. $var(DRN_{i,t})$ is the variance contribution of discount rate news to return news. Lastly, $covar(CFN_{i,t}, DRN_{i,t})$ (i.e., $covar_{i,t}$) is the covariance between cash flow and discount rate news. Model 4 reflects that the variability in return news is attributed to: (1) the variability in the revisions of expectations about future cash flows; (2) the variability in the revisions of expectations about future discount rates

⁴ Cash flow news is revisions in the discounted expected earnings over the lifetime of the firm which could be viewed as expectations of cash flows.

⁵ The approximation error, $k_{i,t}$ can be empirically assigned to cash flow or discount rate news. We assign it to cash flow news following the related literature but, additionally, we assess the sensitivity of our results to that choice. The results of this sensitivity analysis, which are available upon request, indicate that including or excluding the approximation error in cash flow news does not alter the tenor of our results.

and; (3) the covariance between revisions of expectations about future cash flows and discount rates.⁶

From the above, cash flow news come from the closed-form VAR system by picking up the shocks from financial reporting information, that is earnings and book values. In other words, as a result of the VAR system, cash flow news would reflect shocks from financial reporting information, earnings and book values, as a first order effect. Further, discount rates news come from the same VAR system by picking up the shocks on expected returns from information other than financial reporting information (that is non-financial reporting). Finally, the covariance of these two state variables depicts the interconnectedness of cash flows news prompted by financial reporting information and discount rate news prompted from non-financial reporting information.

4. Results

4.1 Univariate Analyses

Table 3 reports the descriptive statistics of the control variables included in our multivariate analysis. The average firm has leverage ratio (LEV) of 0.542, book value of equity to market value of equity (BM) of 0.877, (log) value of total assets (SIZE) of 14.528 million R (ZAR), stock market beta (BETA) of 0.548 and dividend yield (DY) of 0.028. Finally, the average earnings opacity (OPAC) in the sample is 0.026, indicating that firms in JSE do not exhibit high levels of earnings opacity.

[Insert Table 3 here.]

⁶ The empirical estimation of Model (4)'s variance and covariance proxies is detailed in the Supplementary Material.

[Insert Table 4 here.]

Table 4, Panel A, presents the descriptive statistics of the variables derived from the *accounting-based return decomposition* in Vuolteenaho (2002). We present these descriptive statistics for the pre-IR sub-sample and post-IR sub-samples, separately. Our results show that the revision of expectations about cash flow news, $var(CFN)$, is always larger than the revision of expectations about discount rate news, $var(DRN)$, consistent with the results of related US-sampled studies (see Callen 2009, 2016, and references therein). Specifically, the revision of expectations about, $var(CFN)$, is always a statistically significant (at 1% level) driver of return news variance with a variance contribution of 0.189 in the pre-IR period and 0.199 in the post-IR period. The revision of expectations about discount rate news, $var(DRN)$, is also always statistically significant (at 1% level) driver of return news variance with a variance contribution of 0.005 in the pre-IR period and 0.016 in the post-IR period. The covariance between the news, $covar$, is always statistically significant (at 1% level) and is 0.024 in the pre-IR period and 0.042 in the post-IR period. Taken together, the revision of expectations about cash flow news is six times the revision of expectations about discount rate news pre-IR and this figure drops to four times in the post-IR period. By contrast, the covariance between cash flow and discount rate almost doubles from the pre-IR to the post-IR years. In sum, the main driver of firm-level JSE stock returns is revisions in expectations prompted by financial reporting (revision of expectations of cash flow). The importance of revisions in expectations prompted by non-financial reporting information (revision of expectations of discount rates) increases in the post-IR period. Relatedly, the covariance between the two types of expectation revisions is significantly stronger in the post-IR period relative to the pre-IR period.

Table 4, Panel B, presents the differences between the pre-IR and post-IR sub-sample and shows whether they are statistically significant. The revision of expectations about discount rate news to return news increases by 0.011 in the post-IR period (statistically significant at the 1% level). Further, the covariance between revision of expectations of cash flow news and discount rates also increases significantly in the period after the adoption of IR compared to the pre-IR period (0.018, significant at 1% level). Finally, the revision of expectations of cash flow news do not differ significantly between the pre and post IR period.

Overall, in line with H1a, our results show that the importance of non-financial reporting information in affecting return news variance increases after the mandatory adoption of an IR approach in JSE relative to the years before the adoption. That is, the market incorporates more revisions in expectations prompted by non-financial reporting whilst setting prices in the post-IR period than it did so in the pre-IR period,. Additionally, consistent with H1b, we find that the market revisions in expectations prompted by the interrelatedness of financial and non-financial reporting information are significantly stronger in the post-IR period than in the pre-IR period. Collectively, our results indicate that the stock pricing process in the post-IR period reflects a larger intake of non-financial information which is also more interconnected with financial reporting information. These findings are consistent with IIRC (2021) Framework which does not aim to change financial reporting regulation but instead to serve “as an anchor or point of reference to which the other information in an integrated report can be related” (para. 3.31).

4.2 *Multivariate Analyses*

Table 5 shows the results of the multivariate analysis examining the association between the market revisions of expectations about future discount rates ($var(DRN)$ in Table 4) and the

adoption of IR. Model 1a shows that the coefficient of *IR* is positive and significant (coefficient 0.011; significant at 1%). As expected, the coefficient of *IR* observed in Model 1a is the same as the difference in the variance of discount rate news, $var(DRN)$, between the pre-IR and post-IR period in Table 4, Panel B. Model 2a presents the results when we add firm-level control variables, year fixed effects and firm fixed effects. The coefficient of *IR* remains positive and significant (coefficients: 0.024, significant at 1%). This suggests that the mandatory adoption of IR indeed increases the market revisions of expectations about future discount rates, in line with H1a. Thus, we confirm that the mandatory adoption of IR results to enhanced firms' information environment through the provision of more informative non-financial reporting. With respect to the control variables, we document that firms with fewer growth opportunities, proxied by the book-to-market ratio (*BM*), exhibit larger market revisions of expectations about future discount rates (coefficient 0.010, significant at 5%). Additionally, we find that larger firms (*SIZE*) exhibit less market revisions of expectations about future discount rates (coefficients 0.011, significant at 1%).

[Insert Table 5 here.]

Table 6 shows the results of the multivariate analysis which examines the association between the covariance of cash flow and discount rate news (*covar* in Table 4) and the adoption of IR. As expected, the coefficient of *IR* observed in Model 1b is the same as the difference of the covariance of discount rate news and cash flow news, *covar*, between the post-IR and pre-IR periods in Table 4 Panel B. Model 2b presents the results when we add firm-level control variables, year fixed and firm fixed effects. The coefficient of *IR* remains positive and significant (coefficient: 0.052, significant at 1%). This result suggests that IR enhances firms' information environment through

the interconnectedness of financial and non-financial reporting, consistent with H1b. Regarding the control variables, we document that the interconnectedness between market revisions of expectations about future cash flows and discount rates is negatively related to firm size (coefficient: -0.025, significant at 1%). This finding indicates that larger (smaller) firms exhibit lower (higher) market revisions in expectations prompted by the interrelatedness of financial and non-financial reporting. Albeit at a first glance this association may be counter-intuitive, larger firms have richer information environment than smaller firms and, thus, revision of expectations would occur less frequently.

[Insert Table 6 here.]

Table 7 presents results the of the multivariate analysis examining whether IR is more useful when firms' financial reporting is opaque. The first column shows the results when the dependent variable is the market revisions of expectations about future discount rates. The results show that firms with greater earnings opacity exhibit greater revisions of expectations about future discount rates following the adoption of IR. The coefficient of interaction between earnings opacity *OPAC* and *IR* is positive and significant (coefficients: 0.067, significant at 5%), while the coefficient of *IR* remains positive and significant (coefficients: 0.021, significant at 1%). The second column of Table 7 shows the results when the dependent variable is the interconnectedness between market revisions of expectations about future cash flows and discount rates. We find that the coefficient of interaction between earnings opacity *OPAC* and *IR* is also positive and significant (coefficients: 0.192, significant at 5%), while the coefficient *IR* remains positive and significant (coefficients: 0.043, significant at 1%). Taken together, the results presented in Table 7 suggest that the benefits

of IR are more pronounced in firms with greater financial reporting opacity, supporting both H2a and H2b.

[Insert Table 7 here.]

4.3 *Sensitivity analysis*

To ensure the robustness of our results we conduct a battery of sensitivity tests which are discussed in this section. First, the results presented in Tables 5, 6 and 7 employ all firms with available data from 2005 to 2016. Such an approach, however, may lead to findings driven by the inclusion of different firms in the pre-IR and post-IR periods. To alleviate such concerns, we follow Baboukardos and Rimmel (2016), Bernardi and Stark (2016) and Pope and McLeay (2011) and retain only those firms that appear in both periods. The results, presented in the first four columns of Table 8, are qualitatively similar to those of our main results.

[Insert Table 8 here.]

Second, we examine whether the documented effects of IR adoption on the revisions of expectations about future discount rate and the news' covariance are temporary transition effects. To address potential transition effects, we eliminate from our sample the last year before the adoption of IR (i.e., 2010) and the first year following the adoption of IR (i.e., 2011). We present these results columns 5 to 8 in Table 8. Again, our conclusions remain unchanged and therefore our results are unlikely to be driven by potential transition effects.

Third, to alleviate potential issues that our results are driven by market-wide effects that influence the stock market, we follow Baker and Wurgler (2007) and control for investor sentiment as proxied by market trading volume (*MarketTradingVolume*). This is measured as the annual market trading volume by value of the Datastream's Global index for South Africa divided by this index's market capitalization. Additionally, we control for macroeconomic indicators that are known to affect the market (Tsalavoutas & Tsoligkas, 2021; Wisniewski & Jackson, 2021) namely: *MarketDev* which is the market capitalization of listed companies as a % of GDP and *Inflation* which is measured by the consumer price index. Table 9 presents the results which are unchanged. Hence, we conclude that our results are not driven by market-wide factors.

[Insert Table 9 here.]

Fourth, in our tests we rely on annual returns consistent with most prior literature (e.g., Callen et al., 2005; Callen et al., 2010; Callen et al., 2016; Chue, 2015). However, annual returns could potentially be affected by other events occurring during the year. To circumvent this potential issue, we used the earnings announcement date (Datastream code: WC05905) as a proxy to the file date of the integrated report and calculated the returns around the earnings announcement (t-1 to t+4).⁷ We present the results when using short-term returns, as opposed to annual returns, in Table 10.

[Insert Table 10 here.]

⁷ While for certain settings, such as the US, retrieving the file date (10K for the US) can be accomplished from various databases (e.g., EDGAR), this is more challenging for international markets and even more so for a longitudinal study.

Our main conclusion that the adoption of IR approach prompts greater market revisions of expectations about future discount rates and a stronger interconnectedness between market revisions of expectations about future cash flows and discount rates remains (coefficients of IR positive and significant) remain unchanged. The magnitude of those coefficients is small, as expected, given the short period of cumulative returns used. Further, we note that the coefficients of interaction between earnings opacity, OPAC, and IR is insignificant across all specifications. This is not surprising considering that we use short term returns around the earnings announcement and that prior literature documents a delayed response to earnings signals characterised with higher uncertainty. More specifically, Francis et al. (2007) show that firms with greater earnings uncertainty exhibit lower earnings response coefficients and larger subsequent, long-term, abnormal returns as investors resolve the uncertainty associated with the earnings signal. Thus, in such settings, investors gradually respond to the earnings signal as uncertainty is resolved over time where more information become available (Dargenidou et al., 2017; Francis et al., 2007).

Fifth, if our results are not affected by confounding events and are indeed associated with the IR adoption, we should not observe any significant changes in the revisions of expectations about discount rate news or the covariance between cash flow and discount rate news in any year prior to the adoption of IR. To this end, we re-estimate our main models for the pre-IR period by artificially shifting the IR adoption year in periods when no change has actually occurred. Specifically, we set as "pseudo" IR adoption year each year of our pre-IR sample period (but the first year). The results of this analysis are presented in Table 11. In all specifications and for each of the five "pseudo" IR adoption years, the coefficient of IR and the coefficient of interaction between IR and opacity remain insignificant. Hence, we can conclude that it is indeed the adoption

of IR which led to revisions of expectations about discount rate news or the covariance between cash flow and discount rate news.

[Insert Table 11 here.]

Finally, in our main tests we include year and firm fixed effects. The former minimizes concerns on time varying effects and the latter minimises concerns over omitted variables (Maso et al., 2020; Nikolaev & Van Lent, 2005). In this last set of tests, we explore the sensitivity of our results when we control for the panel structure of the dataset by clustering standard errors at the firm and year level and include industry fixed effects. Table 12 presents the results of this analysis. Our findings remain unchanged indicating that our inferences are unlikely to be affected by our approach.

[Insert Table 12 here.]

5. Conclusions

Contributing to a growing stream of literature that examines the effects of IR on firms' information environment, we examine the channel through which the IR-related information flows into firm value. To address this, we adopt the Vuolteenaho (2002) return news variance decomposition approach which allows us to quantify the embeddedness of (1) financial reporting information, (2) non-financial reporting information and (3) their interconnectedness into the firm's market

valuation. Specifically, Vuolteenaho (2002) valuation model attributes firm-level return news variability to the variability of cash flow news (prompted by financial reporting), the variability of discount rate news (prompted by non-financial reporting) and their covariance (prompted by the interconnectedness of financial and non-financial reporting information). This methodology enables us to test the IR's aim to enhance the overall information environment for investors by enriching financial reporting information with the provision of useful non-financial information which are also more interconnected with financial information.

We demonstrate that the adoption of an IR approach prompts greater market revisions of expectations about future discount rates and a stronger interconnectedness between market revisions of expectations about future cash flows and discount rates. That is, the stock pricing process after the introduction of IR is driven more strongly by non-financial reporting information and its interconnectedness with financial reporting information than it was before the adoption. Collectively, these findings corroborate our predictions: The mandatory adoption of an IR approach enhances the information environment of the firm through the provision of more informative non-financial reporting and through the better integration of financial and non-financial reporting. In addition, these associations are stronger for firms with greater earnings opacity indicating that IR is more useful when firms' financial reporting is opaque and that investors may rely more on the non-financial reporting information conveyed by IR in such cases. Our findings are robust to a series of sensitivity tests.

These findings have the following implications. Our study corroborates previous studies showing that IR has market valuation implications (Baboukardos and Rimmel 2016; Barth et al. 2017; Zhou et al. 2017). We contribute to this stream of literature by indicating the channel through which IR's enhanced information environment embeds into the stock pricing process and firm

valuation. We demonstrate that it embeds through both the increased variance contribution of cash flow news to return news, indicating the enhanced usefulness of non- financial reporting, and the increased news's covariance term, indicating the enhanced interrelatedness of financial and non-financial reporting. Also, our study is relevant for standard setters and accounting bodies which recently acknowledge the necessity the accounting profession to consider non-financial aspects of firms' activities as a response to the urgent climate change crisis, and they identify IR as an appropriate way forward (Accounting for Sustainability Network - Press Release 2016). In particular, our findings are relevant to the recent developments within the IFRS Foundation with the creation of the ISSB and the aim to develop standards which are built upon the principles and concepts of IR (IFRS Foundation, 2022a). Finally, our study offers important valuation insights to capital market participant interested in the financial implications of non-financial information activities (for example, Principles of Responsible Investment - Press Release 2019).

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Tables

Table 1: Sample selection process

Initial sample of firm-year observations	2,346
Missing assets, sales, year-end market value of equity, annual returns, ROE, BE/ME and one-year-ago annual return, ROE and BE/ME.	(88)
Missing log-transformed annual return, ROE, BE/ME and one-year-ago annual return, ROE and BE/ME.	(24)
Sample of firm-year observations used in variance return decomposition	2,234
Of which:	
Pre-IR	1,085 - 49%
Post-IR	1,149 -51%
Missing firm level control variables used in multivariate analysis	80
Sample of firm-year observations used in multivariate analysis	2,154
Of which:	
Pre-IR	1,039 – 48%
Post-IR	1,115 – 52%

Notes: Table 1 shows the process through which our South African sample of firm-year observations is collected. At the top, the table reports the initial sample of firm-year observations obtained from Datastream for the 2005 to 2016 period. The table proceeds by reporting the number of firm-year observations deleted with each filtering step. At the bottom, the table reports the final number of firm-year observations (all filters in-place) which are then used in our empirical analyses. The table also reports the number and proportion of pre-IR and post-IR firm-year observations in our sample.

Table 2: Composition of sample by year

Period	Year	Firm-year observations	Sub-totals
<u>Pre-IR</u>	2005	167	Total = 1,085
	2006	158	
	2007	162	
	2008	184	
	2009	207	
	2010	207	
Post-IR	2011	198	Total = 1,149
	2012	197	
	2013	193	
	2014	188	
	2015	185	
	2016	188	
	Total	2,234	

Notes: Table 2 shows the year composition of our final sample of firm-year observations. The table is organized by year vertically. The last column accumulates the firm-year observations by pre-IR and post-IR periods, and the last row accumulates the total number of firm-year observations in our sample from 2005 to 2016.

Table 3: Full-sample descriptive statistics for firm-level variables

Variable	N	Mean	St. Dev	Min	25%-pct	Median	75%-pct	Max
LEV	2,154	0.542	1.161	-2.573	0.081	0.281	0.585	18.105
BM	2,154	0.877	0.907	-0.587	0.353	0.609	1.040	6.233
SIZE	2,154	14.528	2.203	7.228	12.970	14.571	16.140	20.669
BETA	2,154	0.548	0.978	-3.050	0.032	0.550	1.080	4.090
DY	2,154	0.028	0.035	0.000	0.000	0.022	0.041	0.257
OPAC	2,154	0.026	0.109	-0.595	-0.017	0.030	0.073	0.592

Notes: Table 3 shows pooled descriptive statistics for firm-level variables. The statistics have been estimated for our sample of South African firms from 2005 to 2016, consisting of 2,154 firm-year observations. All variables are defined in the Appendix.

Table 4: Return news variance decomposition analysis

	var(Ret)	var(CFN)	var(DRN)	covar
Panel A: Sub-sample analysis				
Pre-IR	0.147*** (18.83)	0.189*** (18.63)	0.005*** (11.25)	0.024*** (14.82)
Post-IR	0.132*** (15.84)	0.199*** (14.78)	0.016*** (11.83)	0.042*** (11.39)
Panel B: Pair-wise sub-sample comparison				
Post-IR minus Pre-IR	-0.015 (-1.31)	0.010 (0.58)	0.011*** (7.24)	0.018*** (4.37)

Notes: Table 4 shows the return news variance decompositions. Panel A shows the return news variance decompositions for firm-year observations belonging in the pre-IR period (2005-2010) and firms year-observations belonging in the post-IR period (2011-2016). Panel B shows the differences in the return news variance decompositions between: firm-year observations belong and in the post-IR period minus those belonging in the pre-IR period. The columns show: the total return news variance (var(Ret)); the variance contribution of cash flow news to return news (var(CFN)); the variance contribution of discount rate news to return news (var(DRN)) and; the covariance between cash flow and discount rate news (covar). These have been estimated with the Vuolteenaho (2002) methodology and equate as: $\text{var(Ret)} = \text{var(CFN)} + \text{var(DRN)} - 2*\text{covar}$. The table reports t-statistics in brackets, examining the null hypothesis. *, ** and *** indicate significance levels of 10%, 5% and 1%, respectively. The pre-IR estimations use the 2005 to 2010 sample, consisting of 1,085 firm-year observations. The post-IR estimations use the 2011 to 2016 sample, consisting of 1,149 firm-year observations. All variables are defined in the Appendix.

Table 5: Regression analyses for the IR effect on discount rate news variance

VARIABLES	Discount rate news variance	
	Model 1a	Model 2a
IR	0.011*** (7.240)	0.024*** (3.574)
OPAC		0.022** (1.984)
LEV		0.005** (2.024)
BM		0.010** (2.324)
SIZE		-0.011*** (-3.603)
BETA		0.000 (0.197)
DY		-0.016 (-0.829)
Intercept	0.005*** (5.108)	0.151*** (3.543)
Fixed Effects		
Year	YES	YES
Firm	YES	YES
Observations	2,234	2,154
Adj. R ²	0.0225	0.261

Notes: Table 5 shows the regression analyses for the determinants of the changes in the variance contribution of discount rate news to return news (Table 4's var(DRN)) between post-IR and pre-IR firm-year observations. *, ** and *** denote significance levels of 10%, 5% and 1%, respectively; and the t-statistic, in parentheses. All variables are defined in the Appendix.

Table 6: Regression analyses for the IR effect on the covariance between cash flow and discount rate news

VARIABLES	Covariance between news	
	Model 1b	Model 2b
IR	0.018*** (4.374)	0.052*** (2.944)
OPAC		0.063** (2.097)
LEV		0.011 (1.567)
BM		0.015 (1.346)
SIZE		-0.025*** (-3.011)
BETA		0.002 (0.421)
DY		-0.054 (-1.091)
Intercept	0.024*** (8.153)	0.347*** (3.084)
Fixed Effects		
Year	YES	YES
Firm	YES	YES
Observations	2,234	2,154
Adj. R ²	0.00806	0.134

Notes: Table 6 shows the regression analyses for the determinants of the changes in the covariance between cash flow and discount rate news (Table 4's var(covar)) between post-IR and pre-IR firm-year observations. *, ** and *** denote significance levels of 10%, 5% and 1%, respectively; and the t-statistic, in parentheses. All variables are defined in the Appendix.

Table 7: Regression analyses for the effect of opacity

VARIABLES	Discount rate news variance	Covariance between news
	Model 3a	Model 3b
IR	0.021*** (3.608)	0.043*** (2.751)
OPAC	-0.002 (-0.297)	-0.005 (-0.282)
OPAC*IR	0.067** (2.035)	0.192** (2.369)
LEV	0.005** (2.060)	0.011 (1.599)
BM	0.010** (2.375)	0.015 (1.385)
SIZE	-0.010*** (-3.748)	-0.022*** (-2.997)
BETA	0.000 (0.251)	0.002 (0.475)
DY	-0.016 (-0.823)	-0.054 (-1.080)
Intercept	0.140*** (3.687)	0.315*** (3.085)
Fixed Effects		
Year	YES	YES
Firm	YES	YES
Observations	2,154	2,154
Adj. R ²	0.272	0.146

Notes: Table 7 shows the regression analyses for the determinants of the changes variance contribution of discount rate news to return news (Table 4's var(DRN)) and in the covariance between cash flow and discount rate news (Table 4's var(covar)) between post-IR and pre-IR firm-year observations and the effect of earnings opacity. *, ** and *** denote significance levels of 10%, 5% and 1%, respectively; and the t-statistic, in parentheses. All variables are defined in the Appendix.

Table 8: Sensitivity analysis: Adjusting the sample

VARIABLES	Balanced Sample				Excluding transition years			
	Discount rate news variance		Covariance between news		Discount rate news variance		Covariance between news	
	Model 2a	Model 3a	Model 2b	Model 3b	Model 2a	Model 3a	Model 2b	Model 3b
IR	0.024*** (3.574)	0.021*** (3.608)	0.052*** (2.944)	0.043*** (2.751)	0.023*** (2.887)	0.019*** (2.914)	0.051** (2.502)	0.039** (2.318)
OPAC	0.022** (1.984)	-0.002 (-0.297)	0.063** (2.097)	-0.005 (-0.282)	0.027** (2.162)	-0.001 (-0.097)	0.074** (2.170)	-0.001 (-0.067)
OPAC*IR		0.067** (2.035)		0.192** (2.369)		0.083** (2.067)		0.227** (2.265)
LEV	0.005** (2.024)	0.005** (2.060)	0.011 (1.567)	0.011 (1.599)	0.006** (2.041)	0.005** (2.040)	0.012* (1.661)	0.011* (1.653)
BM	0.010** (2.324)	0.010** (2.375)	0.015 (1.346)	0.015 (1.385)	0.011** (2.137)	0.011** (2.169)	0.018 (1.338)	0.018 (1.356)
SIZE	-0.011*** (-3.603)	-0.010*** (-3.748)	-0.025*** (-3.011)	-0.022*** (-2.997)	-0.011*** (-3.019)	-0.010*** (-3.203)	-0.026*** (-2.671)	-0.023*** (-2.667)
BETA	0.000 (0.197)	0.000 (0.251)	0.002 (0.421)	0.002 (0.475)	0.001 (0.585)	0.001 (0.705)	0.006 (1.077)	0.006 (1.199)
DY	-0.016 (-0.829)	-0.016 (-0.823)	-0.054 (-1.091)	-0.054 (-1.080)	-0.025 (-1.107)	-0.023 (-1.029)	-0.065 (-1.129)	-0.061 (-1.031)
Intercept	0.151*** (3.543)	0.140*** (3.687)	0.347*** (3.084)	0.315*** (3.085)	0.152*** (2.910)	0.133*** (3.083)	0.369*** (2.678)	0.318*** (2.691)
Fixed Effects								
Year	YES	YES	YES	YES	YES	YES	YES	YES
Firm	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,154	2,154	2,154	2,154	1,760	1,760	1,760	1,760
Adj. R ²	0.261	0.272	0.134	0.146	0.253	0.268	0.124	0.139

Notes: Table 8 shows the regression analyses for the determinants of the changes variance contribution of discount rate news to return news (Table 4's var(DRN)) and in the covariance between cash flow and discount rate news (Table 4's var(covar)) between post-IR and pre-IR firm-year observations and the effect of earnings opacity. *, ** and *** denote significance levels of 10%, 5% and 1%, respectively; and the t-statistic, in parentheses. All variables are defined in the Appendix.

Table 9: Sensitivity analysis: Including country controls

VARIABLES	Discount rate news variance		Covariance between news	
	Model 2a	Model 3a	Model 2b	Model 3b
IR	0.015*** (4.600)	0.012*** (5.172)	0.028*** (3.508)	0.021*** (3.438)
OPAC	0.021* (1.914)	-0.004 (-0.527)	0.060** (2.022)	-0.010 (-0.484)
OPAC*IR		0.069** (2.140)		0.195** (2.467)
LEV	0.005** (2.008)	0.005** (2.045)	0.010 (1.536)	0.011 (1.568)
BM	0.010** (2.401)	0.010** (2.441)	0.015 (1.357)	0.015 (1.384)
SIZE	-0.010*** (-3.726)	-0.009*** (-3.875)	-0.022*** (-3.178)	-0.020*** (-3.167)
BETA	0.000 (0.206)	0.000 (0.274)	0.002 (0.452)	0.002 (0.517)
DY	-0.018 (-0.962)	-0.018 (-0.957)	-0.065 (-1.343)	-0.066 (-1.326)
MarketDev	0.001** (2.234)	0.001** (2.265)	0.001** (2.199)	0.001** (2.230)
Inflation	0.000 (0.507)	0.000 (0.372)	0.000 (0.334)	0.000 (0.193)
MarketTradingVolume	0.000 (0.800)	0.000 (0.648)	0.000 (0.451)	0.000 (0.297)
Intercept	0.119*** (3.555)	0.110*** (3.699)	0.284*** (3.100)	0.260*** (3.090)
Fixed Effects				
Firm	YES	YES	YES	YES
Observations	2,154	2,154	2,154	2,154
Adj. R ²	0.256	0.268	0.132	0.144

Notes: Table 9 shows the regression analyses for the determinants of the changes variance contribution of discount rate news to return news (Table 4's var(DRN)) and in the covariance between cash flow and discount rate news (Table 4's var(covar)) between post-IR and pre-IR firm-year observations and the effect of earnings opacity. *, ** and *** denote significance levels of 10%, 5% and 1%, respectively; and the t-statistic, in parentheses. All variables are defined in the Appendix.

Table 10: Sensitivity analysis: Using daily returns

VARIABLES	Discount rate news variance		Covariance between news	
	Model 2a	Model 3a	Model 2b	Model 3b
IR	0.000086* (1.881)	0.000080* (1.734)	0.000519** (1.974)	0.000521* (1.945)
OPAC	0.000006 (0.086)	-0.000040 (-0.459)	0.000263 (0.530)	0.000280 (0.485)
OPAC*IR		0.000131 (0.930)		-0.000047 (-0.058)
LEV	0.000023*** (2.735)	0.000023*** (2.747)	0.000061 (1.505)	0.000061 (1.505)
BM	0.000200*** (17.123)	0.000200*** (17.136)	0.000161 (1.326)	0.000161 (1.324)
SIZE	-0.000065*** (-3.544)	-0.000063*** (-3.437)	-0.000297** (-2.529)	-0.000297** (-2.497)
BETA	-0.000017** (-2.032)	-0.000017** (-2.019)	-0.000102 (-1.637)	-0.000102 (-1.636)
DY	0.000427* (1.759)	0.000427* (1.757)	0.000934 (0.483)	0.000934 (0.483)
Intercept	0.000842*** (3.319)	0.000820*** (3.219)	0.004201** (2.567)	0.004209** (2.536)
Fixed Effects				
Year	YES	YES	YES	YES
Firm	YES	YES	YES	YES
Observations	2,154	2,154	2,154	2,154
Adj. R ²	0.304	0.304	0.0934	0.0929

Notes: Table 10 shows the regression analyses for the determinants of the changes variance contribution of discount rate news to return news and in the covariance between cash flow and discount rate news estimated using daily returns between post-IR and pre-IR firm-year observations and the effect of earnings opacity. *, ** and *** denote significance levels of 10%, 5% and 1%, respectively; and the t-statistic, in parentheses. All variables are defined in the Appendix.

Table 11: Sensitivity tests: Placebo test with Pseudo IR adoption years

VARIABLES	2006				2007				2008				2009				2010			
	Discount rate news variance		Covariance between news		Discount rate news variance		Covariance between news		Discount rate news variance		Covariance between news		Discount rate news variance		Covariance between news		Discount rate news variance		Covariance between news	
	Model 2a	Model 3a	Model 2b	Model 3b	Model 2a	Model 3a	Model 2b	Model 3b	Model 2a	Model 3a	Model 2b	Model 3b	Model 2a	Model 3a	Model 2b	Model 3b	Model 2a	Model 3a	Model 2b	Model 3b
IR	0.002 (0.501)	0.002 (0.752)	0.013 (1.089)	0.015 (1.290)	0.002 (0.501)	0.002 (0.540)	0.013 (1.089)	0.015 (1.271)	0.002 (0.501)	0.002 (0.487)	0.013 (1.089)	0.014 (1.214)	0.002 (0.501)	0.002 (0.682)	0.013 (1.089)	0.016 (1.336)	0.002 (0.501)	0.001 (0.450)	0.013 (1.089)	0.014 (1.127)
OPAC	0.001 (0.145)	0.021 (1.206)	0.002 (0.098)	0.068 (1.321)	0.001 (0.145)	0.002 (0.173)	0.002 (0.098)	0.034 (1.023)	0.001 (0.145)	0.000 (0.014)	0.002 (0.098)	0.016 (0.598)	0.001 (0.145)	0.004 (0.514)	0.002 (0.098)	0.020 (0.870)	0.001 (0.145)	0.001 (0.105)	0.002 (0.098)	0.003 (0.164)
OPAC*IR		-0.023 (-1.273)		-0.078 (-1.405)		-0.002 (-0.151)		-0.051 (-1.234)		0.002 (0.143)		-0.029 (-0.804)		-0.013 (-1.254)		-0.074* (-1.777)		0.002 (0.136)		-0.018 (-0.294)
LEV	0.002 (1.465)	0.002 (1.475)	0.004 (1.568)	0.004 (1.563)	0.002 (1.465)	0.001 (1.467)	0.004 (1.568)	0.004 (1.558)	0.002 (1.465)	0.001 (1.461)	0.004 (1.568)	0.004 (1.585)	0.002 (1.465)	0.002 (1.489)	0.004 (1.568)	0.005 (1.625)	0.002 (1.465)	0.001 (1.458)	0.004 (1.568)	0.004 (1.567)
BM	0.000 (0.158)	0.000 (0.100)	-0.001 (-0.110)	-0.001 (-0.149)	0.000 (0.158)	0.000 (0.153)	-0.001 (-0.110)	-0.001 (-0.138)	0.000 (0.158)	0.000 (0.163)	-0.001 (-0.110)	-0.001 (-0.125)	0.000 (0.158)	0.000 (0.101)	-0.001 (-0.110)	-0.002 (-0.177)	0.000 (0.158)	0.000 (0.157)	-0.001 (-0.110)	-0.001 (-0.110)
SIZE	-0.005** (-2.024)	-0.005** (-2.087)	-0.026** (-2.309)	-0.026** (-2.359)	-0.005** (-2.024)	-0.005** (-2.032)	-0.026** (-2.309)	-0.026** (-2.375)	-0.005** (-2.024)	-0.005** (-2.012)	-0.026** (-2.309)	-0.026** (-2.353)	-0.005** (-2.024)	-0.005** (-2.092)	-0.026** (-2.309)	-0.026** (-2.405)	-0.005** (-2.024)	-0.005** (-1.997)	-0.026** (-2.309)	-0.026** (-2.306)
BETA	-0.001* (-1.733)	-0.001* (-1.671)	-0.005 (-1.368)	-0.004 (-1.306)	-0.001* (-1.733)	-0.001* (-1.728)	-0.005 (-1.368)	-0.005 (-1.333)	-0.001* (-1.733)	-0.001* (-1.735)	-0.005 (-1.368)	-0.005 (-1.359)	-0.001* (-1.733)	-0.002* (-1.784)	-0.005 (-1.368)	-0.005 (-1.438)	-0.001* (-1.733)	-0.001* (-1.733)	-0.005 (-1.368)	-0.005 (-1.380)
DY	0.002 (0.155)	0.000 (0.036)	0.084 (1.580)	0.080 (1.496)	0.002 (0.155)	0.002 (0.141)	0.084 (1.580)	0.081 (1.517)	0.002 (0.155)	0.002 (0.163)	0.084 (1.580)	0.083 (1.548)	0.002 (0.155)	0.001 (0.074)	0.084 (1.580)	0.079 (1.481)	0.002 (0.155)	0.002 (0.168)	0.084 (1.580)	0.083 (1.548)
Intercept	0.078** (2.137)	0.079** (2.188)	0.376** (2.412)	0.378** (2.456)	0.078** (2.137)	0.078** (2.145)	0.376** (2.412)	0.382** (2.473)	0.078** (2.137)	0.078** (2.126)	0.376** (2.412)	0.381** (2.453)	0.078** (2.137)	0.080** (2.203)	0.376** (2.412)	0.387** (2.506)	0.078** (2.137)	0.078** (2.111)	0.376** (2.412)	0.380** (2.409)
Fixed Effects																				
Year	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039	1,039
Adj. R ²	0.225	0.229	0.150	0.154	0.225	0.224	0.150	0.153	0.225	0.224	0.150	0.150	0.225	0.226	0.150	0.155	0.225	0.224	0.150	0.149

Notes: Table 11 shows the regression analyses for the determinants of the changes variance contribution of discount rate news to return news (Table 4's var(DRN)) and in the covariance between cash flow and discount rate news (Table 4's var(covar)) between post-IR and pre-IR firm-year observations and the effect of earnings opacity. *, ** and *** denote significance levels of 10%, 5% and 1%, respectively; and the t-statistic, in parentheses. All variables are defined in the Appendix.

Table 12: Sensitivity analysis: Clustering standard errors at the firm and year level

VARIABLES	Discount rate news variance		Covariance between news	
	Model 2a	Model 3a	Model 2b	Model 3b
IR	0.010*** (5.530)	0.008*** (4.737)	0.017*** (3.665)	0.013*** (2.581)
OPAC	0.028 (1.621)	0.003 (0.733)	0.073 (1.515)	0.005 (0.347)
OPAC*IR		0.065* (1.828)		0.177* (1.770)
LEV	0.004* (1.787)	0.004* (1.785)	0.008 (1.493)	0.008 (1.485)
BM	0.008** (1.964)	0.008** (1.962)	0.012 (1.444)	0.012 (1.440)
SIZE	-0.001* (-1.867)	-0.002* (-1.801)	-0.004** (-2.345)	-0.004** (-2.231)
BETA	0.001 (0.511)	0.001 (0.496)	0.004 (0.729)	0.004 (0.712)
DY	-0.058** (-2.282)	-0.059** (-2.270)	-0.207*** (-2.625)	-0.212*** (-2.599)
Intercept	0.031*** (2.884)	0.030*** (2.733)	0.087*** (3.139)	0.086*** (2.987)
Fixed Effects				
Industry	YES	YES	YES	YES
Observations	2,154	2,154	2,154	2,154
Adj. R ²	0.134	0.144	0.0725	0.0829

Notes: Table 12 shows the regression analyses for the determinants of the changes variance contribution of discount rate news to return news (Table 4's var(DRN)) and in the covariance between cash flow and discount rate news (Table 4's var(covar)) between post-IR and pre-IR firm-year observations and the effect of earnings opacity. *, ** and *** denoting significance levels of 10%, 5% and 1%, respectively; and the t-statistic, in parentheses. All variables are defined in the Appendix.

Appendix. Variable definitions

Variable	Definitions- Details
Panel A: Variance decomposition variables	
CFN	Cash flow news estimated with the Vuolteenaho (2002) return news decomposition methodology, outlined in section 3. The estimation approach is presented in the Supplementary Material.
DRN	Discount rate news estimated with the Vuolteenaho (2002) return news decomposition methodology, outlined in section 3. The estimation approach is presented in the Supplementary Material.
var(CFN)	Variance of cash flow news (CFN) estimated with the Vuolteenaho (2002) return news decomposition methodology, outlined in section 3. The estimation approach is presented in the Supplementary Material.
var(DRN)	Variance of discount rate news (DRN) estimated with the Vuolteenaho (2002) return news decomposition methodology, outlined in section 3. The estimation approach is presented in the Supplementary Material.
covar	The covariance between firm-level cash flows news, CFN, and discount rate news, DRN, estimated with the Vuolteenaho (2002) return news variance decomposition methodology, outlined in section 3. The estimation approach is presented in the Supplementary Material.
var(Ret)	Variance of firm-level return news, conditional on the Vuolteenaho (2002) expectation model for returns. It is equal to: $\text{var}(\text{CFN}_{i,t}) + \text{var}(\text{DRN}_{i,t}) - 2 * \text{covar}_{i,t}$
Panel B: Independent variables	
IR	Indicator variable that is equal to one for the periods after the mandatory adoption of IR in South Africa, and zero otherwise.
OPAC	Earnings opacity measured following Bhattacharya et al. (2003) and Dhaliwal et al. (2014) as the change in working capital accruals adjusted for depreciation and amortization and scaled by one year ago total assets. The change in working capital accruals is estimated as: year-on-year change in total current assets (Datasteam item: WC02201) minus year-on-year change in total current liabilities (Datasteam item: WC03101) minus year-on-year change in cash (Datasteam item: WC02001) plus year-on-year change in the current portion of long-term debt included in total current liabilities (Datasteam item: WC03051) minus depreciation and amortization expense (Datasteam item: WC01151) plus year-on-year change in income taxes payable (Datasteam item: WC03063). Total assets for the previous year end are obtained from Datastream (Item:WC02999). We define opacity as the negative of Bhattacharya et al. (2003)'s and Dhaliwal et al. (2014)'s measure whereby a more positive (negative) value indicates greater (lower) earnings opacity.
LEV	Total debt divided by total equity item (Datasteam items: WC03255 and WC03501, respectively)
BM	Book to market ratio (Datasteam items: WC03501 and WC08001, respectively).
SIZE	The natural logarithm of total assets (Datasteam item: WC02999)
BETA	Stock market beta estimated using 12 months returns over the local index (estimated and provided by Datastream)
DY	Total dividend to common equity over the market value of equity (Datasteam items: WC05376 and WC08001, respectively).
Panel C: Variables used in sensitivity analysis	
MarketDev	Market development measured as the market capitalization of listed companies as a % of GDP (source: World Bank)
Inflation	Inflation measured by the consumer price index (source: World Bank).
MarketTradingVolume	Market trading volume measured as the annual market trading volume by value of Datastream's Global index for South Africa divided by this index's market capitalization (source: Datastream).
Panel D: State variables used in the VAR system	
RETURN ^{VAR}	The log of annual firm-level stock market return net of the annual log risk-free rate. Annual stock returns are compounded from monthly returns starting from July

	calendar year t to June calendar year t+1 (Datastream item: RI). To avoid missing values due to the log-transformation, we redefine stock return as an annually re-balanced portfolio consisting of 90% stock and 10% risk-free asset. We then subtract the annual log rate on the risk-free asset which is compounded from monthly US T-Bill returns from July calendar year t to June calendar year t+1. RETURN ^{VAR} is annually winsorized at the 1st and 99th percentiles.
ROE ^{VAR}	Earnings before extraordinary items for fiscal year ending in calendar year t-1 scaled by the t-1 opening book value of equity, both as reported by Datastream (items WC01551 and WC03501, respectively). Firms are not allowed to lose more than their opening book equity by truncating ROE to -100%. To ensure that the return news decomposition holds exactly we subtract from the (log) ROE the annual log risk free rate. ROE ^{VAR} is annually winsorized at the 1st and 99 th percentiles.
BE/ME ^{VAR}	Book value of equity for calendar year t-1 (BE) scaled by market value of equity for December calendar year t-1 (ME). Both BE and ME are obtained from Datastream (item WC03501 and WC08001, respectively). To ensure the stationarity and convergence to zero in the long run we smooth the (log) BE/ME as: $\ln[(0.90*BE + 0.10*ME)/ME]$. BE/ME ^{VAR} is annually winsorized at the 1st and 99th percentiles.
dmRETURN ^{VAR}	Annually demeaned RETURN ^{VAR}
dmROE ^{VAR}	Annually demeaned ROE ^{VAR}
dmBE/ME ^{VAR}	Annually demeaned BE/ME ^{VAR}
