INNOVAR
VOL. 35. NÚM. 98. OCT.- DIC. 2025 (E123101)

Combined Assurance Models and Sustainability Assurance: Impacts on Market Liquidity and Analyst Forecast Accuracy in South Africa*

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JEL CODES
I21, M14, Q01
RECEIVED
2/02/2025
APPROVED
07/07/2025
PUBLISHED
01/10/2025
SECTION
Accounting & Sustainability Reporting

Disclosures: Authors declare no institutional or personal conflicts of interest.

Abstract: In emerging markets, growing regulatory demands and investor scrutiny have intensified concerns regarding the credibility of sustainability disclosures. This study investigates how the assurance of Integrated Reports (IR), particularly through Combined Assurance Models (CAMS), affects market liquidity and analysts' forecast accuracy in South Africa, a market recognized for its early adoption of integrated reporting practices. Using 630 reports from Johannesburg Stock Exchange-listed firms during the initial phase following the IR Framework launch (2013-2015), we examine whether assurance mechanisms enhance information reliability and capital market efficiency. Our findings reveal that while ir assurance alone does not significantly improve forecast accuracy, CAM implementation is significantly associated with reduced bid-ask spreads and lower forecast errors, suggesting that integrated assurance structures mitigate information asymmetry more effectively than traditional assurance practices. Unlike prior research, which has focused primarily on disclosure quality, this study uniquely isolates the market effects of CAM as a structural assurance mechanism. Despite relying on historical data, our results provide valuable empirical benchmarks for understanding how assurance architectures might function under emerging standards such as ISSA 5000 and the CSRD. Limitations include the study's specific setting and the binary measurement of assurance practices. Future research should explore how assurance depth and evolving regulatory contexts influence the utility of sustainability information for financial markets.

Keywords: Analyst forecast accuracy, assurance, Combined Assurance Models, Integrated Reporting, market liquidity, sustainability assurance.

Suggested citation: Zúñiga, F. & Pincheira, R. (2025). Combined Assurance Models and Sustainability Assurance: Impacts on Market Liquidity and Analyst Forecast Accuracy in South Africa. *Innovar, 35*(*98*). e123101. https://doi.org/10.15446/innovar.v35n98.123101

* This article is derived from the doctoral thesis of the corresponding author: Zúñiga, F. A. (2025). Integrated reporting: Economic incentives for disclosure and assurance. The University of Queensland. Available at: https://n9.cl/29g7f

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Modelos combinados de aseguramiento y aseguramiento de la sostenibilidad: repercusiones en la liquidez del mercado y la precisión de las previsiones de los analistas en Sudáfrica

Resumen: En los mercados emergentes, las crecientes exigencias normativas y el escrutinio de los inversionistas han intensificado las preocupaciones sobre la credibilidad de la información divulgada en materia de sostenibilidad. Este estudio investiga cómo la avaliação de los informes integrados (IR), en particular a través de los modelos de aseguramiento combinado (CAM), afecta a la liquidez del mercado y a la precisión de las previsiones de los analistas en Sudáfrica, un mercado reconocido por su temprana adopción de las prácticas de información integrada. Utilizando 630 informes de empresas que cotizan en la Bolsa de Johannesburgo durante la fase inicial tras el lanzamiento del Marco de Informes Integrados (2013-2015), examinamos si los mecanismos de aseguramiento mejoran la fiabilidad de la información y la eficiencia del mercado de capitales. Nuestros resultados revelan que, si bien el aseguramiento de los IR por sí sola no mejora significativamente la precisión de las previsiones, la implementación de los CAM se asocia significativamente con una reducción de los diferenciales entre la oferta y la demanda y con menores errores de previsión, lo que sugiere que las estructuras de aseguramiento integrado mitigan la asimetría de la información de manera más eficaz que las prácticas de aseguramiento tradicionales. A diferencia de investigaciones anteriores, que se han centrado principalmente en la calidad de la divulgación, este estudio aísla de forma única los efectos en el mercado de los modelos combinados de aseguramiento como mecanismo de aseguramiento estructural. A pesar de basarse en datos históricos, nuestros resultados proporcionan valiosos puntos de referencia empíricos para comprender cómo podrían funcionar las arquitecturas de aseguramiento en el marco de normas emergentes como la ISSA 5000 y la CSRD. Entre las limitaciones se incluyen el contexto específico del estudio y la medición binaria de las prácticas de aeguramiento. Las investigaciones futuras deberían explorar cómo la profundidad del aseguramiento y los contextos normativos en evolución influyen en la utilidad de la información sobre sostenibilidad para los mercados financieros.

Palabras clave: Precisión de las previsiones de los analistas, aseguramiento, modelos de aseguramiento combinados, informes integrados, liquidez del mercado, aseguramiento de sostenibilidad.

Modelos combinados de avaliação e avaliação da sustentabilidade: impactos na liquidez do mercado e na precisão das previsões dos analistas na África do Sul

Resumo: Nos mercados emergentes, as crescentes exigências regulatórias e o escrutínio dos investidores intensificaram as preocupações quanto à credibilidade das divulgações de sustentabilidade. Este estudo investiga como a garantia dos Relatórios Integrados (IR), particularmente por meio de Modelos de Garantia Combinada (CAM), afeta a liquidez do mercado e a precisão das previsões dos analistas na África do Sul, um mercado reconhecido por sua adoção precoce de práticas de relatórios integrados. Utilizando 630 relatórios de empresas listadas na Bolsa de Valores de Joanesburgo durante a fase inicial após o lançamento da Estrutura de RI (2013-2015), examinamos se os mecanismos de garantia aumentam a confiabilidade das informações e a eficiência do mercado de capitais. Nossas descobertas revelam que, embora a garantia de IR por si só não melhore significativamente a precisão das previsões, a implementação de CAM está significativamente associada à redução dos spreads entre oferta e demanda e a erros de previsão menores, sugerindo que as estruturas de garantia integradas mitigam a assimetria de informações de forma mais eficaz do que as práticas tradicionais de garantia. Ao contrário de pesquisas anteriores, que se concentraram principalmente na qualidade da divulgação, este estudo isola de forma única os efeitos de mercado do CAM como um mecanismo de garantia estrutural. Apesar de se basear em dados históricos, os nossos resultados fornecem referências empíricas valiosas para compreender como as arquiteturas de garantia podem funcionar sob normas emergentes, como a ISSA 5000 e a CSRD. As limitações incluem o cenário específico do estudo e a medição binária das práticas de garantia. Pesquisas futuras devem explorar como a profundidade da garantia e os contextos regulatórios em evolução influenciam a utilidade das informações de sustentabilidade para os mercados financeiros.

Palavras-chave: Precisão das previsões dos analistas, garantia, Modelos de Garantia Combinada, Relatórios Integrados, liquidez do mercado, garantia de sustentabilidade.

Introduction

Over the past two decades, sustainability reporting has evolved from a peripheral corporate activity into a central component of the financial markets' information landscape. By 2022, 96% of G250 companies issued sustainability reports, reflecting mounting investor expectations for transparency in environmental, social, and governance (ESG) performance (KPMG, 2023). However, the credibility of these disclosures remains a persistent concern, particularly in emerging markets where regulatory frameworks and institutional maturity often lag behind global standards (Maroun, 2018; Zúñiga *et al.*, 2025). Questions persist as to whether sustainability reports—often voluntary and lacking standardized assurance—truly reduce information asymmetry or merely serve symbolic purposes.

Integrated Reporting (IR) emerged as a response to these challenges, seeking to connect financial and non-financial performance into a single, coherent narrative. Yet even within IR frameworks, stakeholders remain skeptical about the reliability of sustainability disclosures without robust external assurance mechanisms. In this context, the development of Combined Assurance Models (CAMS) represents an innovative evolution in the assurance landscape. CAMs integrate diverse assurance providers—including internal audit, external audit, risk management, compliance, and sustainability specialists—to create a holistic and coordinated approach to verifying ESG information (Donkor *et al.*, 2021; Prinsloo & Maroun, 2021). Unlike traditional single-provider assurance, CAMs promise deeper insights and potentially greater confidence among investors.

Despite increasing regulatory attention through initiatives such as the European Union's Corporate Sustainability Reporting Directive (CSRD), the International Sustainability Standards Board's IFRS S1 and S2, and the IAASB'S proposed ISSA 5000 standard, empirical research on the capital market consequences of assurance structures remains limited. Prior studies, such as Zúñiga *et al.* (2020, 2025) and Zhou *et al.* (2019), have demonstrated associations between IR quality and reduced information asymmetry, often reflected in narrower bid-ask spreads and lower analysts' forecast errors. However, these studies have largely focused on the quality of reporting rather than the structural mechanisms of assurance itself.

This paper aims to bridge that gap by isolating the specific impact of cam adoption on market liquidity and analysts' forecast accuracy in South Africa, a market recognized for its early adoption of integrated reporting practices. Using a large sample of 630 integrated reports from 2013 to 2015, our study provides a historical baseline for understanding how combined assurance structures influence market outcomes. Unlike prior research, which emphasizes disclosure quality, our analysis uniquely examines CAM as an independent variable shaping capital market dynamics. While our data reflects an earlier phase of IR adoption, the findings offer critical insights relevant to current regulatory debates under ISSA 5000 and the CSRD. The results suggest that although assurance of integrated reports alone does not significantly improve analysts' forecast accuracy, the adoption of CAMS has tangible market effects. Specifically, firms disclosing CAM structures experience narrower bid-ask spreads, indicating

enhanced market liquidity, and exhibit lower forecast errors, suggesting reduced information asymmetry between management and financial analysts.

These findings distinguish our study from prior research that has focused predominantly on disclosure quality without isolating the structural mechanisms of assurance. By empirically demonstrating the market relevance of CAMs, this paper contributes a unique perspective to the ongoing debate on how advanced assurance practices influence capital market dynamics, particularly in emerging markets transitioning toward more rigorous sustainability reporting frameworks such as ISSA 5000 and the CSRD.

The remainder of this paper is organized as follows. First, we present a review of the literature on IR, assurance practices, and CAMs. Next, the methodology and empirical models are described, followed by the presentation of results and analysis. We then discuss the findings, and finally, outline the conclusions, limitations of the study, and directions for future research.

Literature review

Integrated reporting

The benefits of publishing sustainability information through standalone reports, rather than financial reports, have been widely studied. Over time, it has been argued that the primary motivation behind such reporting practices is the reduction of agency costs by mitigating information asymmetries, which in turn influence capital costs (Prasad *et al.*, 2022; Zhu *et al.*, 2024). Other research streams consider voluntary disclosure of data as a means to address legitimacy issues (Del Gesso & Lodhi, 2024; Rouf & Siddique, 2023), improve corporate reporting practices (Ferri *et al.*, 2023), or respond to market pressures (García-Sánchez *et al.*, 2022). However, despite these benefits, standalone sustainability reports have been criticized for their lack of integration between financial and non-financial information, focusing on aspects with weak material bases and disconnected from corporate strategy (de Villiers *et al.*, 2022; Zúñiga *et al.*, 2021). Such weak links undermine stakeholders' ability to assess governance and overall performance, as financial information alone fails to fully capture the present and future impacts of sustainability on corporate outcomes (Sciulli & Adhariani, 2023).

In this context, the International Integrated Reporting Council (IIRC) published the Framework for Preparing and Presenting Integrated Reports in December 2013 (IIRC, 2013). Integrated reports represent the convergence of sustainability and financial reporting into a unified narrative with distinct objectives and approaches. Unlike integrated reports, standalone sustainability reports primarily focus on disclosing ESG impacts, lacking genuine integration with financial information. It has been argued that integrated reports are not merely extensions of standalone sustainability reports but rather an evolution of them, complementing financial reporting.

Economic theories suggest that information disclosed in integrated reports is associated with better financial performance (Qian *et al.*, 2023), lower capital costs (Maama & Marimuthu, 2022), and reduced errors in earnings forecasts (Zúñiga *et al.*, 2020). Evidence also indicates a positive relationship between firms publishing integrated reports and market liquidity (Donkor *et al.*, 2024), corporate value (Utomo *et al.*, 2021), and future cash flows (Andronoudis *et al.*, 2024). In general, integrated reports are considered a flexible tool to communicate value creation narratives, integrating financial and non-financial data with overall performance (Arora *et al.*, 2022).

Assurance of integrated sustainability information and combined assurance models (CAMs)

The CAM represents an advanced assurance approach that integrates multiple lines of assurance within an organization into a coordinated framework. Unlike traditional single-provider assurance

engagements, where an internal auditor, an external auditor, or another assurance provider independently verifies specific information, CAM combines inputs from several assurance functions to provide a holistic and cohesive assessment of an organization's sustainability disclosures and overall risk management (Donkor *et al.*, 2021; Prinsloo & Maroun, 2021). Specifically, CAM encompasses contributions from internal audit (IA), external audit (EA), risk management (RM), compliance functions, and sometimes sustainability specialists. This integrated approach seeks to minimize duplication, enhance coverage, and strengthen the reliability of disclosures by leveraging diverse areas of expertise within and outside the organization. The literature suggests that CAM can reduce information asymmetry, improve stakeholder trust, and potentially decrease the cost of capital (Zhou *et al.*, 2019). However, the model also introduces challenges, such as the need for strong governance structures to coordinate various assurance activities effectively and to avoid overlapping roles or gaps in coverage.

Increased disclosure of sustainability performance creates opportunities and incentives for companies to engage in greenwashing practices (Ghitti *et al.*, 2023). External assurance serves as a mechanism to enhance the credibility of sustainability data (Hoang & Trotman, 2021). In 2021, the European Commission adopted a proposal to implement mandatory sustainability assurance, starting with limited-scope audits (KPMG, 2022). The type of information and the audit scope are associated with risk levels. International assurance frameworks allow auditors to perform two levels of assurance: reasonable and limited assurance. Limited assurance reduces risk to acceptable levels with limited evidence, whereas reasonable assurance minimizes audit risk more comprehensively. Currently, over 90% of sustainability audits are conducted under limited assurance (Zhou, 2022). International organizations such as IFAC and iirc have emphasized transitioning from limited to reasonable assurance for non-financial disclosures in integrated reports (IFAC, 2021). Reasonable assurance is associated with higher quality due to the depth of data analysis, providing better market information and reducing the risk of false disclosures.

The benefits of external assurance are mixed. On one hand, studies suggest it can increase data credibility (Fuhrmann *et al.*, 2017; Hoang & Trotman, 2021) and enhance corporate reputation (Peters & Romi, 2015). On the other hand, some argue that sustainability assurance is often symbolic, serving as a reputational strategy without significantly improving the quality of disclosed information or its impact on capital markets (Michelon *et al.*, 2015; Zúñiga *et al.*, 2020).

Evidence on combined assurance mechanisms remains limited. The iirc recognizes the importance of enhancing credibility, particularly through independent assurance providers (IIRC, 2015). CAM has been proposed as an innovative method to improve credibility by integrating various assurance methods. However, implementation remains underdeveloped. Studies indicate that weak risk management practices and lack of expertise hinder CAM's adoption (Decaux & Sarens, 2015). Empirical evidence suggests that CAM implementation does not yet add market value. For instance, Zhou *et al.* (2019) found a negative association between CAM and analysts' forecast dispersion but no significant effect on forecast errors, indicating that CAM enhances the reliability of disclosed information without introducing new insights to capital markets. Although CAM is still evolving alongside de facto mandatory

requirements, it signals a commitment to improving credibility in assurance processes and risk management.

Despite progress in understanding the benefits and limitations of IR and assurance practices, significant gaps remain in the literature. Specifically, limited research has empirically examined how assurance practices, particularly under CAMs, influence both market dynamics and stakeholder trust. This study aims to address these gaps by investigating the relationship between the assurance of non-financial information, the application of CAM, and key market outcomes such as liquidity and analysts' forecast accuracy. By building on prior literature, this research contributes to a deeper understanding of the mechanisms through which assurance practices can enhance the credibility and utility of integrated reporting, offering practical insights for regulators, practitioners, and policymakers.

Contribution of this study relative to existing literature

Several studies have investigated either the quality of integrated reporting or the concept of combined assurance in South Africa. Zúñiga *et al.* (2020) examined the impact of IR quality on market liquidity and analyst forecast accuracy, finding that higher quality IR disclosures reduce information asymmetry and forecast errors. However, their study did not focus on assurance practices or the specific mechanisms of CAM. Zhou *et al.* (2019) provided evidence that disclosing the details of CAM can lower analysts' forecast errors and bid-ask spreads in firms with weaker information environments. While valuable, their analysis focused narrowly on the disclosure of CAM as a signaling mechanism rather than on its empirical impact across broader market variables. Donkor *et al.* (2021) explored how the quality of combined assurance impacts reporting quality (IR, sustainability, and financial), highlighting its relevance for enhancing credibility. However, their work did not examine market consequences such as liquidity or forecast accuracy. Finally, Prinsloo and Maroun (2021) analyzed the components and quality of CAM through content analysis, proposing a schematic for measuring combined assurance quality. Yet, their approach remains largely descriptive and limited to disclosure practices, without testing market outcomes.

Against this background, our study advances the literature by empirically examining the economic consequences of CAM adoption, focusing simultaneously on market liquidity and analyst forecast accuracy. To our knowledge, this is the first study to provide such a comprehensive analysis using a large sample from the initial period of IR adoption in a mandatory context. This makes our findings relevant both as historical evidence and as a reference for future studies under new regulatory frameworks such as ISSA 5000, CSRD, and IFRS sustainability standards.

Recent regulatory developments and related research on sustainability assurance

The sustainability assurance landscape has undergone significant evolution with the introduction of major regulatory initiatives, notably the ISSA 5000 standard, the European Union's CSRD, and the IFRS S1 and S2 standards. These frameworks reflect an emerging global consensus on the need for credible, comparable, and decision-useful sustainability disclosures, elevating both the expectations placed upon companies and the role of assurance in supporting capital markets.

The International Auditing and Assurance Standards Board (IAASB) proposed the International Standard on Sustainability Assurance (ISSA) 5000 in 2023 to provide a principles-based framework for both limited and reasonable assurance engagements (Hay *et al.*, 2024). Scholars note its flexibility and focus on clearer materiality definitions but also highlight implementation challenges, particularly for emerging markets (Hoyos Giraldo *et al.*, 2024). Although our data predates ISSA 5000, the evidence from South Africa's combined assurance practices offers insights into how such standards might function in mandatory reporting environments.

The CSRD, adopted in 2022, expands sustainability reporting obligations in the EU and introduces the principle of double materiality, requiring companies to report both financially material information and impacts on society and the environment (Dunfjäll, 2025). It mandates limited assurance over sustainability disclosures, reflecting a decisive regulatory shift. Recent studies show mixed evidence on how sustainability disclosures under such frameworks influence financial performance and market perceptions (Dewi, 2015; Farkas & Matolay, 2024). Middelaar (2024) emphasizes the increased legal risks associated with ESG disclosures under the CSRD, while Vander Bauwhede and Van Cauwenberge (2022) document positive valuation effects tied to sustainability assurance. This context is directly relevant to our study, as our South African evidence illustrates how combined assurance can enhance market liquidity and potentially reduce information asymmetry, a core concern under the CSRD.

The ISSB's IFRS S1 and S2 standards, released in 2023, set global baselines for sustainability disclosures, with S1 covering general sustainability risks and opportunities and S2 focusing on climate-related information (Du Toit, 2024). Research highlights challenges in implementing standardized metrics and integrating sustainability data into financial analysis (Mulligan *et al.*, 2024). While our dataset predates these standards, the empirical results on the market effects of assurance mechanisms like CAM offer valuable historical context for anticipating how investors and analysts might respond to sustainability information under IFRS S1 and S2, particularly in emerging markets where institutional contexts differ from developed economies.

Our study, though based on historical data, provides empirical evidence that remains relevant for understanding how assurance structures such as combined assurance may shape market dynamics under evolving global standards.

Unlike Zúñiga *et al*. (2025), who investigated the impact of integrated reporting quality on market liquidity and analyst forecast accuracy in a different emerging market context, the present study specifically focuses on the adoption and implications of CAM in South Africa. While both studies share a broad interest in how sustainability disclosures and assurance affect market outcomes, the variables of interest and analytical frameworks differ considerably. Our paper uniquely examines how CAM, as a distinct organizational and assurance structure integrating internal audit, external audit, and risk management, influences both market liquidity and forecast accuracy during the initial adoption phase of integrated reporting in South Africa. In contrast, Zúñiga *et al*. (2025) emphasize the overall disclosure quality of IR reports without isolating the specific effects of CAM structures. Thus, our study contributes an empirical perspective not previously integrated into a single analysis, offering insights that extend beyond earlier research on IR quality alone.

Research methodology

The sample for this study comprises companies listed on the Johannesburg Stock Exchange (JSE) between 2013 and 2015. While the data span this three-year period, their selection is highly relevant for understanding the initial adoption and impact of the International Integrated Reporting Framework. These years represent a critical transition phase following the framework's publication in December 2013, capturing the early stages of its implementation across South African listed firms—a context in which integrated reporting was effectively mandated. Analyzing this period provides unique insights into the initial responses of firms, including the adoption of assurance practices and their effects on market dynamics, at a time when integrated reporting was still novel and its practices unrefined.

The sample selection was subdivided into two separate analyses, as different dependent variables were employed for each. The primary databases used were Thomson Reuters I/B/E/S, Datastream, and ASSET4, which together cover the 170 largest companies in South Africa. For the market liquidity analysis, after filtering for dependent, independent, and control variables, the final sample consists of 333 firm-year observations (representing 111 unique firms) across the period 2013-2015. For the analysis of analysts' forecast accuracy, the final sample includes 131 firms over the same three years. Focusing on this period allows for the evaluation of early adoption effects of the International Integrated Reporting Framework (table 1).

Table 1. *Sample description panel data 2013-2015*

	Firms		
	bas	ferror	
Thomson Reuters I/B/E/S coverage	170	170	
spread missing data	-39	-50	
Control variables	-20	-21	
Final sample panel analysis	111	99	
	bas	ferror	Overall
Firm-year observations (2013-2015)	333	297	
Stand-alone CSR report	199	161	0.57
Set of reports	134	136	0.43
Reports independently assured	126	132	0.41
Limited	79	72	0.59
Limited and reasonable	29	32	0.24
Reasonable	6	6	0.05
Big-Four	81	93	0.67
Others accounting firms	12	12	0.09
Other firms	33	27	0.23
Reports referencing AA1000AS	30	27	0.22
Reports referencing ISAE3000	100	110	0.81
Reports disclosed application of CAM	205	204	0.65

Variable definitions are consistent with the prior discussion.
Source: authors.

Bid-ask spread model

The bid-ask spread (SPREAD) is commonly used as a proxy for market liquidity and, more broadly, for information asymmetry (Zúñiga *et al.*, 2020). It is measured as the median value of the natural logarithm of the daily difference between bid and ask closing prices, divided by the midpoint price. Following Barth *et al.* (2017), a six-month window before and after the analyzed period was applied to control for spread effects. To analyze the relationship between the assurance of IR and the liquidity of a firm's shares, the variable ass is introduced in model 1. This dummy variable equals 1 if the IR has been assured by an external provider, and 0 otherwise.

Additional tests evaluate whether spread is sensitive to the application of assurance standards. To this end, the dummy variable ASS_STD is incorporated into model 1, taking the value of 1 if the company's sustainability information was assured following the AA1000AS and/or ISAE3000 standards, and 0 otherwise. The analysis also examines the sensitivity of results to the specific standard applied.

An additional analysis tests the effect of the assurance scope on market liquidity. According to international assurance frameworks, external parties can perform two types of assurance engagements: reasonable assurance and limited assurance. It is also possible for both levels to coexist within a single engagement, covering different aspects of sustainability performance, which must be explicitly identified in the assurance statement. The level of assurance reflects the acceptable risk level for the company. Higher levels of assurance, particularly reasonable assurance, focus more on the reliability of disclosed information rather than its plausibility (AccountAbility, 2020). To capture the impact of assurance coverage, four dummy variables were manually extracted from annual and sustainability reports. If no information is disclosed regarding assurance (making it impossible to determine the assurance level), the variable UND equals 1, and 0 otherwise. Similarly, limited assurance (Limited_ASS), combined limited and reasonable assurance (Lim_&_Rea_ASS), and fully reasonable assurance (Reasonable_ASS) are represented by their respective dummy variables.

To further explore the association between the CAM and market liquidity, the variable CAM is incorporated into model 1. This manually collected dummy variable takes a value of 1 if the company disclosed the application of CAM, and 0 otherwise. CAM is considered a mechanism that enhances risk management and governance by coordinating internal controls and external verification. A negative association is expected between the implementation of CAM and market liquidity, as measured by spread.

A variety of control variables are also included in model 1. Prior studies suggest a positive association between the quality of disclosed information and market liquidity (Zúñiga *et al.*, 2020). The Sustainability Disclosure Transparency Index (SDTI) is used as a proxy for IR quality. The SDTI is a South African index that provides the most comprehensive annual review of environmental, social, and governance reports in South Africa (IRAS, 2015).

Institutional investors (INST_INV) are included as a control variable, measured as the percentage of total shares held as strategic, long-term investments by investment banks or institutions seeking long-term returns. Institutional investors are associated with better access to information, positively influencing their market participation (Cho *et al.*, 2013). The number of analysts following the firm (ANANO) is included as a natural logarithm of the analysts tracking the firm during the fiscal year, given its association with reduced information asymmetry (Cheng *et al.*, 2011). Additionally, firm size (SIZE) is included as the natural logarithm of the company's market value at the end of the fiscal year.

Barth *et al.* (2017) found that firm complexity is positively associated with the bid-ask spread in South Africa. To control firm complexity, two internal and two external proxies are employed. External complexity is proxied by cross-listing status (CROSSLISTED) and the sales-to-industry ratio (SALES_IND), both validated in the literature (Markarian & Parbonetti, 2007).

The models include fixed effects for year and industry, while Ɛ represents the error term. Hypotheses are tested using a balanced panel dataset in STATA software by estimating the following ordinary least squares (OLS) regression in model 1:

$$SPREAD_{i,t} = \alpha + \beta_1 ASS_{it} + \beta_2 SDTI + \beta_3 INST\_INV_{it} + \beta_4 ANANO_{it} + \beta_5 SIZE_{it} + \beta_6 COMPLEX_{it}^{4} + \beta_7 IND_{it} + \mathcal{E}_{it} \quad (1)$$

Modeling error in financial analysts' forecasts

To analyze the relationship between the assurance of IR and the error in earnings-per-share (EPS) forecasts reported by financial analysts, the model developed by Zúñiga *et al.* (2020) was adapted to the South African context. The accuracy of analysts' forecasts is inversely measured through forecast error over three consecutive periods (model 2). Forecast error is calculated as the mean absolute error of all forecasts issued during the year for target earnings, scaled by the stock price at the beginning of the year. The specific calculation of forecast error, denoted as FERROR(Y)it, is defined as the mean absolute error of all projections for target earnings made during the year, scaled by the stock price at the time of the forecast:

$$FERROR(Y)_{it} = \frac{\frac{1}{N}\sum_{j=1}^{N}\left|AEF_{i,t,j}^{Y} - EPS_{i,t}^{Y}\right|}{P_{i,t}} \quad (2)$$

$FERROR(Y)_{it}$: The mean absolute error of all projections made during the year for target earnings, scaled by the stock price at the beginning of the year.

- AEF: Analysts' earnings forecast.
- EPS: Earnings per share.
- P: Stock price at the time of the forecast.
- Y: Takes three values—0, 1, or 2—representing the target earnings projection for the current year, one year ahead, and two years ahead, respectively.
- The subscripts *i*, *t*, and *j* represent firm *i*, year *t*, and projection *j*.

The study is limited to a maximum of two years, as analysts typically do not provide forecasts beyond the second fiscal year, which would drastically reduce the sample size. To examine the relationship between non-financial information assurance and the accuracy of earnings forecasts, the variable ASSASS is included in model 3. This variable is a dummy that equals 1 if the IR has been assured by an external provider and 0 otherwise.

Control variables

A range of control variables, established in prior studies, is incorporated into model 3. Higher disclosure quality is expected to improve analysts' forecast accuracy (Zúñiga *et al.*, 2020). To capture disclosure quality, the Sustainability Disclosure Transparency Index (SDTI) is included. Additionally, an interaction term (SDTI × ASS) is introduced to explore whether ir quality combined with assurance enhances analysts' ability to accurately value firms. This assumes that the assurance of sustainability disclosures improves corporate reputation (Cohen & Simnett, 2015), thereby influencing financial performance.

Dhaliwal *et al.* (2012) found that standalone voluntary disclosure is associated with lower forecast error. A dummy variable stand equals 1 if the company issued a standalone IR during the year, and 0 otherwise. The natural logarithm of the time-series standard deviation of eps (VAREARN) is included as a proxy for earnings variability, which negatively impacts forecast predictability due to increased complexity (Zúñiga *et al.*, 2020).

The number of analysts following the firm (ANANO) and firm size (SIZE) are also included, as they are positively associated with forecast accuracy (Dhaliwal *et al.*, 2012). A dummy variable loss equals 1 if the firm reported a loss during the period and 0 otherwise, capturing the increased volatility and reduced predictability associated with loss-making firms. Cross-listed firms (CROSSLISTED) are more visible and likely to disclose higher-quality information.

Additionally, FHORIZON, representing the forecast horizon, measures the number of days between the earnings forecast and the earnings announcement date. Analysts' predictions closer to the announcement date are generally more accurate (Dhaliwal *et al.*, 2012). This variable is defined as the median forecast horizon for each firm annually. In summary, model 3 is specified as follows:

$$FERROR\ (y)_{i,t} = \alpha + \beta_1 ASS_{it} + \beta_2 SDTI * ASS_{it} + \beta_3 SDTI_{it} + \beta_4 STAND_{it} + \beta_5 ANANO_{it} + \beta_6 SIZE_{it} + \beta_7 VAREARN_{it} + \beta_8 LOSS_{it} + \beta_9 FHORIZON_{it} + \beta_{10}\ CROSSLISTED_{it} + \beta_{11}\ IND_{it} + \mathcal{E}_{it} \quad (3)$$

Additional analyses

Additional analyses investigate whether the results are driven by specific international assurance standards and the type of assurance providers used. The AA1000AS and ISAE3000 standards are incorporated into model 3 as variables of interest. Accordingly, further assessments examine the relationship between the type of assurance provider, the assurance standards employed, and the level of information covered.

The level of assurance is included in model 3 to analyze its effect on forecast error accuracy. This evaluation focuses on whether the level of assured information—limited assurance (LIMITED_ASS), combined limited and reasonable assurance (LIM_&_REA_ASS), or fully reasonable assurance (REASONABLE_ASS)—influences analysts' forecast error. The analysis aims to discern whether any observed effects are associated with the extent of information assured. Finally, the CAM is included in model 3 to assess its relationship with analysts' forecast accuracy.

In this study, the CAM variable captures whether firms explicitly disclose the integration of multiple assurance functions—including internal audit, external audit, risk management, and compliance—into a single coordinated assurance framework. This distinguishes CAM from traditional assurance models, in which individual assurance providers operate in isolation. The CAM approach seeks to provide a more comprehensive and credible evaluation of sustainability disclosures, aligning assurance efforts to mitigate information risks more effectively.

The CAM aims to maximize assurance coverage across risk areas affecting the organization. Its implementation is evolving alongside integrated reporting assurance practices. IF CAM achieves its intended purpose, a negative association with forecast error is expected, as it enhances the reliability and credibility of disclosed information. All models include fixed effects for year and industry to control unobservable heterogeneity.

Results

Main results: SPREAD

The results demonstrate that the assurance of non-financial disclosures is negatively associated with the bid-ask SPREAD (SPREAD) (table 2). The expectations are supported, with a negative and significant association (-0.116; $p < 0.067$) observed for the proxy of market liquidity. In economic terms, the findings suggest that the assurance of key sustainability indicators is associated with an 11.6% reduction in SPREAD.

Regarding control variables, the results show that the proxy for IR quality, represented by the SDTI, is significant (-0.525; $p < 0.007$). This supports the view that high-quality information disclosure, coupled with the assurance of soft disclosures, enhances market liquidity by reducing informational risk. These findings confirm that IR and its assurance have the potential to mitigate informational asymmetry in a de facto mandatory setting such as South Africa. Furthermore, analyst coverage and firm SIZE are negatively and significantly associated with SPREAD at the 0.01 level, supporting the prediction that larger firms and those followed by more analysts tend to experience reduced informational asymmetry. Consistent with prior literature, institutional investors appear to leverage

their informational advantages, positively influencing their ability to participate in the market (-1.085; $p < 0.000$).

To better understand whether reduced informational risk influences market liquidity, the variable of interest, i.e., CAM, was included in model 1 to test its relationship with market liquidity. Model 1 in table 2 indicates that the existence of a CAM is statistically significant, with a 9.3% reduction in SPREAD (-0.093; $p < 0.058$). Additionally, the variable ASSASS maintains a negative and significant association with SPREAD (-0.129; $p < 0.042$). The regressions include fixed effects for industry and are estimated using OLS for coefficient estimates. To verify the robustness of the results under alternative model specifications, the regressions were re-estimated using linear and random effects models. Consistent with the main findings, the results (not tabulated) remained stable. Sensitivity analyses were also conducted by calculating clustered robust standard errors by firm and year.

Table 2. Market liquidity, IR assurance, and CAM

Dependent variable SPREAD			
		H1	H3
Variables	Pred. Sign	ASS	CAM
ASS	-	-0.116**	-0.129**
CAM	-		-0.093**
SDTI	-	-0.525***	-0.453**
INST_INV	-	-1.085***	-1.1***
ANANO	-	-0.146***	-0.138***
SIZE	-	-0.324***	-0.32***
R&D	+	-3.926	-8.494
MVBVA	+	-5.253	-9.664
CROSSLISTED	+	-0.007	-0.007
SALES_IND	+	-0.07	-0.006
N		333	333
Adj R-squared		0.7025	0.706
F		84.76***	77.33***
Industry Indicator		Included	Included
Year Indicator		Included	Included

All continuous variables, excluding the indicator variable SDTI, are winsorized at the 1st and 99th percentiles. Interaction terms ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The models include year and industry fixed effects.
Source: authors.

Additional analyses delve deeper into the effects of assurance on market liquidity, specifically examining whether the type of assurance provider, the use of international assurance standards, the type of standard, and the quality of assurance mitigate informational asymmetry. Using model 1 for this analysis, table 3 shows that the type of audit firm influences the significance previously observed. The results in column 3A indicate that while both accounting and non-accounting firms are negatively

associated with the bid-ask SPREAD (SPREAD), the assurance effect is primarily driven by accounting firms, as the association is significant at the 0.05 level (-0.133; $p < 0.048$). In contrast, other providers, such as specialists and consultancies, are not statistically significant (-0.117; $p > 0.05$).

Column 3B in table 3 presents the regression used to test whether the application of assurance standards affects market efficiency. As expected, the use of ISAE3000 and/or AA1000AS assurance standards is negatively and significantly associated with the liquidity of the company's shares. A deeper analysis of the specific standards employed, shown in column 3C, suggests that this negative association is primarily driven by firms using ISAE3000 as guidance for the assurance process (-0.155; $p < 0.017$). In contrast, AA1000AS is not statistically significant (0.042; $p < 0.641$).

Finally, column 3D examines the level of assurance provided. Given the nature of sustainability disclosures, it is expected that the level of assurance conducted is positively associated with the amount of information covered. The results in column 3D in table 3 support these predictions, suggesting that firms providing limited assurance do not show a statistically significant association with SPREAD (-0.102; $p < 0.116$). However, firms conducting both limited and reasonable assurance within the same report, covering different sustainability performance areas, exhibit a negative and significant association (-0.262; $p < 0.007$). Similarly, firms disclosing fully reasonable assurance for key sustainability indicators also demonstrate a negative and significant association with SPREAD (-0.369; $p < 0.041$).

These findings indicate that the level of assurance provided influences a firm's stock liquidity, thereby mitigating informational asymmetry. This underscores the importance of robust assurance practices in enhancing market efficiency and transparency.

Main results: FERROR

The results presented in table 4 for model 3 do not provide evidence supporting the prediction that assurance of IR improves the accuracy of analysts' earnings forecasts. The coefficients for the assurance variable (ASS) across all fiscal years (fy1-fy3) are statistically insignificant (-0.04, -0.006, 0.01), suggesting no measurable effect of assurance on reducing forecast error. Furthermore, the interaction TERM SDTI*ASS, which explores whether the combination of IR quality and assurance influences forecast accuracy, also lacks statistical significance across all years (0.11, 0.057, 0.027), indicating no additional benefit. In contrast, the quality of IR, measured by the SDTI score, exhibits a consistently significant and negative association with analysts' forecast error across all fiscal years (e.g., fy1: -0.2***; fy2: -0.164***; fy3: -0.153**). These results reinforce the importance of high-quality disclosure in improving the accuracy of analysts' earnings forecasts, independent of assurance practices.

The implementation of a CAM demonstrates a significant negative association with FERROR for all fiscal years analyzed (fy1: -0.027**; fy2: -0.028**; fy3: -0.034***), aligning with expectations and suggesting that the coordination of assurance providers through CAM improves the reliability of disclosed information, thus supporting analysts in reducing forecast errors. The industry analysis indicates that these results are particularly pronounced among firms in the basic materials sector.

Control variables provide additional insights. Earnings volatility (VAREARN) is positively and significantly associated with forecast error across all fiscal years, confirming that volatile earnings complicate the forecasting process. Firm size (SIZE) shows a significant negative relationship with FERROR across all fiscal years (fy1: -0.02***; fy2: -0.024***; fy3: -0.024***), consistent with the notion that larger firms provide more stable and accessible information for analysts. Overall, these findings suggest that while assurance practices may not directly improve analysts' forecast accuracy, the quality of IR and the implementation of CAM play critical roles in mitigating informational asymmetry and enhancing forecast reliability.

Table 3. Market liquidity, IR assurance, and CAM: Additional analysis and dependent variable SPREAD

		Column 3A	Column 3B	Column 3C	Column 3D
	Pred. Sign	Type of assurer	Standards	Type of standard	Assurance scope
Non-accounting Firm	-	-0.117			
Accounting Firm	-	-0.133**			
ASS_STD	-		-0.07**		
AA1000AS	-			0.042	
ISAE3000AS	-			-0.155**	
Limited_ASS	-				-0.103
Lim_&_Rea_ASS	-				-0.262***
Reasonable_ASS	-				-0.369**
CAM	-	-0.094*	-0.094*	-0.109**	-0.092*
SDTI	-	-0.456**	-0.436**	-0.518***	-0.446**
INST_INV	-	-1.105***	-1.105***	-1.141***	-1.108***
ANANO	-	-0.137***	-0.138***	-0.13***	-0.135***
SIZE	-	-0.32***	-0.319***	-0.323***	-0.32***
R&D	+	-8.42	-8.696	-5.648	-10.481
MVBVA	+	-9.59	-9.851	-6.549	-9.408
CROSSLISTED	+	-0.006	-0.007	0.001	-0.014
SALES_IND	+	-0.003	-0.01	0.034	0.003
N		333	333	333	333
Adj R-squared		0.6961	0.7065	0.6988	0.7087
F		70.14***	77.51***	71.03***	64.88***
Industry indicator		Included	Included	Included	Included
Year indicator		Included	Included	Included	Included

All continuous variables, excluding the indicator variable SDTI, are winsorized at the 1st and 99th percentiles. Interaction terms ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The models include year and industry fixed effect.

Source: authors.

Table 4. Analyst forecast accuracy, IR Assurance, and CAM: Dependent variable FERROR

Variables	Pred. Sign	FY1	FY2	FY3	FY1	FY2	FY3
ASS	-	-0.04	-0.006	0.01	-0.032	0.0003	0.017
SDTI*ASS	-	0.11	0.057	0.027	0.102	0.045	0.012
CAM	-				-0.027**	-0.028**	-0.034***
SDTI		-0.2***	-0.164***	-0.153**	-0.176***	-0.141**	-0.126**
STAND		-0.01	-0.013	-0.012	-0.012	-0.012	-0.011
ANANO		-0.001	-0.001	0.0003	0.0004	0.001	0.002
SIZE		-0.02***	-0.024***	-0.024***	-0.023***	-0.023***	-0.024***
VAREARN		0.02***	0.017***	0.02***	0.016***	0.017***	0.021***
LOSS		0.01	0.002	-0.002	0.009	0.002	-0.002
FHORIZON		-0.004	-0.005	-0.005	-0.004	-0.006	-0.006
CROSSLISTED		0.03	0.019	0.008	0.025	0.012	-0.001
N		297	297	297	297	297	297
Adj R-squared		0.1141	0.1254	0.1355	0.1362	0.1494	0.1659
F		4.81***	5.24***	5.64***	5.24***	2.73***	6.35***
Industry and Year Indicators		Included	Included	Included	Included	Included	Included

All continuous variables, excluding the indicator variable SDTI, are winsorized at the 1st and 99th percentiles. Interaction terms ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The models include year and industry fixed effects.
Source: authors.

Additional sensitivity analysis

Additional sensitivity analysis As part of the additional analyses (table 5), the study examines whether the results are sensitive to the use of assurance standards and the level of information assured. The findings indicate that the core results remain consistent across different assurance contexts, suggesting that firms in the South African regime may exhibit imitative behavior or rely on standardized "boilerplate" language in their assurance practices. Specifically, the use of the AA1000AS and ISAE3000 standards does not produce a statistically significant effect on forecast error (FERROR), with coefficients that remain insignificant across fiscal years (e.g., AA1000AS: FY1: -0.04, FY2: -0.029; ISAE3000: FY1: -0.007, FY2: -0.0005). While assurance standards are widely referenced, their application may lack depth or tailored implementation in practice.

Regarding the level of assurance, firms providing limited assurance or a combination of limited and reasonable assurance (Lim_Rea_ASS) also show no significant impact on forecast accuracy. However, firms offering reasonable assurance alone (Reasonable_ASS) demonstrate marginally stronger associations in reducing forecast error, although not consistently across all years. Higher levels of assurance may slightly enhance information reliability but are not decisive in improving analysts' forecast accuracy.

Consistent with the earlier conclusion that CAM contributes to reducing informational asymmetry and improving the reliability of disclosed information, CAM remains a significant factor, consistently showing a negative association with FERROR across fiscal years (e.g., FY1: -0.026**, FY3: -0.033***).

Control variables follow expected patterns. For example, IR quality (SDTI) continues to exhibit a significant negative association with FERROR, while earnings volatility (VAREARN) is positively associated with forecast error across all fiscal years.

Table 5. *Analyst forecast accuracy, IR assurance, and CAM*

Panel A: Additional analysis. Dependent variable FERROR								All
		Standards						
Variables	Pred. Sign	FY1	FY2	FY3	FY1	FY2	FY3	
AA1000AS	-	-0.04	-0.029	-0.021				
ISAE3000	-	-0.007	-0.0005	0.002				
Limited_ASS	-				0.016	0.016	0.016	
Lim_Rea_ASS	-				0.033	0.022	0.015	
Reasonable_ ASS	-				0.005	-0.007	-0.013	
CAM	-	-0.026**	-0.027**	-0.032***	-0.027**	-0.028**	-0.033***	
SDTI	-	-0.18***	-0.15**	-0.138**	-0.154***	-0.135**	-0.128**	
SDTI*ASS	-	0.154	0.107	0.081	0.021	0.021	0.02	
STAND		-0.01	-0.011	-0.009	-0.01	-0.011	-0.01	
ANANO		0.0001	0.001	0.002	0.0002	0.002	0.003	
SIZE		-0.023***	-0.023***	-0.024***	-0.023***	-0.024***	-0.024***	
VAREARN		0.017***	0.018***	0.021***	0.016***	0.017***	0.021***	
LOSS		0.007	0.0002	-0.004	0.012	0.003	-0.001	
FHORIZON		-0.005	-0.006	-0.006	-0.005	-0.006	-0.007	
CROSSLISTED		0.026	0.013	0.00005	0.025	0.012	-0.0002	
STAND×ASS	-							
N		297	297	297	297	297	297	
Adj R-squared		0.1385	0.1512	0.1659	0.1395	0.1502	0.1643	
F		4.97***	5.39***	5.91***	4.69***	50.2***	5.48	
Industry and Year Indicators		Included	Included	Included	Included	Included	Included	

continuous variables, excluding the indicator variable SDTI, are winsorized at the 1st and 99th percentiles. Interaction terms ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The models include year and industry fixed effects.

Source: authors.

Discussion

The results of this study offer important empirical insights into the debate on the effectiveness of sustainability assurance and CAM, as outlined in the literature review. The finding that IR assurance is associated with improved market liquidity, but not with greater analyst forecast accuracy, reflects the dual role identified by prior research: assurance may bolster credibility and investor trust (Fuhrmann *et al.*, 2017; Hoang & Trotman, 2021), yet still lack decision-useful content for analysts due to its qualitative nature (Michelon *et al.*, 2015). This reinforces the notion that assurance remains primarily symbolic in some contexts and supports critiques of its limited depth and standardization.

Furthermore, the study confirms that the quality of IR disclosures, as measured by the SDTI index, plays a more significant role than assurance per se in reducing informational asymmetry. This finding aligns with the literature emphasizing the relevance of high-quality integrated disclosures for improving capital market efficiency (Barth *et al.*, 2017; Zúñiga *et al.*, 2020, 2025). The strong association between CAM implementation and both liquidity and reduced forecast errors suggests that integrated assurance efforts, when coordinated internally and externally, offer a more holistic approach to risk management and information credibility (Decaux & Sarens, 2015; Zhou *et al.*, 2019). This supports calls in the literature to move beyond standalone assurance practices toward more robust assurance frameworks.

These findings should be interpreted in light of South Africa's regulatory environment, where mandatory integrated reporting may influence both disclosure practices and assurance adoption. Nonetheless, the results contribute new empirical evidence by demonstrating how CAMs can simultaneously affect market liquidity and analysts' forecast accuracy, extending legitimacy and stakeholder theories by highlighting the interplay between perceived credibility and practical informational value in capital markets.

It is important to consider the study's historical context. Although our data originate from the 2013-2015 period, this timeframe represents a formative stage in the global transition toward integrated reporting and sustainability assurance. The insights into how CAMs influenced market liquidity and forecast accuracy during this early phase offer valuable lessons for current regulatory debates, including the implementation of ISSA 5000 and the CSRD. The South African experience provides an empirical benchmark that may help anticipate how similar assurance mechanisms could perform in today's rapidly evolving sustainability landscape, particularly in emerging economies facing comparable institutional challenges.

In this study, the CAM variable captures whether firms explicitly disclose the integration of multiple assurance functions, including internal audit, external audit, risk management, and compliance, into a single coordinated assurance framework. This distinguishes CAM from traditional

assurance models in which individual assurance providers operate in isolation. The CAM approach aims to provide a more comprehensive and credible evaluation of sustainability disclosures, aligning assurance efforts to mitigate information risks more effectively.

Although limited assurance engagements involve a lower level of scrutiny compared to reasonable assurance, they still play a critical role in enhancing stakeholder confidence. Limited assurance provides an external review that, while not offering absolute certainty, signals a firm's commitment to transparency and accountability. This signaling effect can reduce investors' perceptions of information risk, particularly in contexts where sustainability disclosures lack standardization. Moreover, limited assurance is often more feasible for companies in emerging markets due to cost considerations, yet it still contributes meaningfully to market confidence. Our findings support the notion that even lower-intensity assurance processes, when integrated through a CAM, can produce tangible impacts on market liquidity and forecast accuracy by mitigating information asymmetry.

It is also important to clarify that, although our research builds on themes similar to those examined by Zúñiga *et al*. (2025), the focus and scope of our study are distinct. Unlike Zúñiga *et al*. (2025), who analyze the general quality of integrated reporting, our study concentrates specifically on CAMs and their direct market consequences. This distinction allows us to shed light on how integrated assurance practices affect both liquidity and analyst forecast accuracy, providing unique insights that complement rather than duplicate previous findings.

Our findings partially align with prior research while also extending the literature in unique ways. Similar to Zúñiga *et al*. (2025), we observe that mechanisms aimed at enhancing the credibility of sustainability disclosures, such as integrated reporting quality or assurance practices, can reduce information asymmetry, leading to improved market liquidity and lower forecast errors. However, our study differs by isolating the specific role of CAM as an integrated structural mechanism. Unlike the work by those authors, who focused on the overall quality of integrated reports, our results indicate that adopting a CAM framework can have an independent and significant impact on both liquidity and analyst forecast accuracy.

Compared to Zhou *et al*. (2019), who documented the benefits from disclosing details about CAM in lowering forecast errors and bid-ask SPREADS, our study confirms that integrated assurance models contribute to market confidence. However, our broader dataset and simultaneous analysis of liquidity and forecast accuracy provide more comprehensive empirical evidence. Donkor *et al.* (2021) and Prinsloo and Maroun (2021) also emphasized CAM's potential, but largely from a reporting quality perspective rather than direct market consequences. Thus, our study bridges this gap by empirically linking CAM adoption with tangible market outcomes in an emerging market context. This divergence from earlier findings underscores the importance of examining assurance structures not merely as disclosure mechanisms but as substantive drivers of market behavior.

Overall, this study contributes to the sustainability reporting literature by uniquely linking the implementation of CAMs to both market liquidity and analysts' forecast accuracy. Such dual analysis has not previously been examined in the context of mandatory integrated reporting, thereby offering insights that extend beyond prior studies focused solely on disclosure quality or individual market effects.

Conclusions

This study provides new empirical evidence on the role of sustainability assurance and CAM in capital markets within the context of South Africa's integrated reporting environment. The findings show that while IR assurance alone does not significantly influence analysts' forecast accuracy, it is positively associated with market liquidity, suggesting that assurance primarily functions as a credibility mechanism enhancing investor confidence rather than as a source of decision-useful data for analysts (Fuhrmann *et al.*, 2017; Hoang & Trotman, 2021). These results reflect ongoing concerns about the qualitative and forward-looking nature of ESG disclosures, which may limit their direct use in financial forecasts, particularly in emerging markets where reporting frameworks are still evolving.

Notably, the study confirms that the quality of integrated reports, as measured by the SDTI index, plays a more decisive role than assurance alone in reducing information asymmetry, aligning with previous research emphasizing the importance of high-quality disclosures for market efficiency (Barth *et al.*, 2017; Zúñiga *et al.*, 2025). Additionally, the adoption of CAMs is found to be significantly associated with both narrower bid-ask SPREADS and lower forecast errors, suggesting that integrated assurance frameworks provide a more holistic and credible assessment of ESG information (Donkor *et al.*, 2021; Zhou *et al.*, 2019). This supports the shift toward more sophisticated assurance models that transcend traditional, single-provider approaches.

These insights are particularly relevant for emerging markets, where regulatory environments, assurance cultures, and the availability of sustainability expertise can vary significantly. While challenges remain, such as the heterogeneity of assurance standards and the limited depth of sustainability-specific expertise, the evidence suggests that combined assurance practices can enhance market confidence and contribute meaningfully to capital market transparency.

This study also examined whether the implementation of a CAM is associated with market liquidity and the reduction of analysts' forecast errors. The results support the research expectation that this assurance model has a negative and significant association with both forecast error and market liquidity. Indeed, 409 of the 630 reports analyzed in this study (65%) reported the adoption of a CAM, reinforcing its growing role as a credibility-enhancing mechanism in sustainability assurance practices. The evidence from this research broadens the discussion of the benefits of this mechanism and its informational value to the market, particularly in emerging economies, where

ensuring the reliability of ESG disclosures is critical for investor confidence. The use of a homogeneous process between internal and external assurance to reduce material informational risk through the implementation of a CAM appears to provide financial analysts with valuable insights regarding the credibility and quality of sustainability performance and reporting.

Although based on historical data, this study offers timely insights by serving as an empirical baseline for evaluating how integrated reporting and combined assurance mechanisms impact capital markets. As global regulatory initiatives like ISSA 5000, the CSRD, and the IFRS sustainability standards reshape reporting and assurance practices, the South African experience documented here can inform both scholars and regulators about the potential market consequences of implementing advanced assurance frameworks in mandatory reporting contexts. This research thus fills an important gap in the literature by empirically demonstrating how CAMs can influence capital market outcomes, offering an original perspective that complements prior studies and provides a valuable benchmark for assessing the potential impacts of emerging sustainability assurance standards.

In summary, this study makes an original empirical contribution by isolating and empirically analyzing the impact of CAM on both market liquidity and analysts' forecast accuracy, an area not jointly explored in previous research. Unlike prior studies focused primarily on integrated reporting quality, our research emphasizes the structural assurance processes themselves and how their integration through CAM can influence information asymmetry and capital market efficiency. This unique perspective not only enriches the academic discourse on sustainability reporting assurance but also provides practical insights for regulators and firms navigating evolving global standards such as ISSA 5000 and the CSRD. Thus, the findings serve as a critical empirical benchmark for understanding how assurance architectures may shape market dynamics in emerging economies.

Limitations

This study has certain limitations that should be acknowledged. First, the results are specific to the South African context, an emerging economy with widespread adoption of IR. While this provides a valuable case for examining assurance practices, it may limit the generalizability of the findings to markets with different regulatory frameworks, industry compositions, or reporting cultures. Second, the use of dummy variables to represent assurance practices, such as ASS and CAM, may oversimplify complex assurance processes and overlook nuances in implementation, potentially affecting the precision of the empirical estimates. Third, the dataset spans the period from 2013 to 2015, capturing the critical early adoption phase of the International Integrated Reporting Framework in South Africa. Although this historical perspective offers unique insights into how assurance mechanisms initially shaped market dynamics, it also limits the temporal relevance of the findings. Nonetheless, this period serves as an empirical baseline for understanding how assurance structures like CAM might function under emerging regulatory frameworks such as

ISSA 5000, the CSRD, and IFRS sustainability standards. Future research should extend these analyses using more recent data to assess whether the relationships observed here persist under evolving market conditions and regulatory developments.

Future research directions

This study opens several avenues for future research on sustainability assurance and its implications for capital markets. One critical area is examining whether the assurance of sustainability disclosures primarily functions as a transparency mechanism or serves as a strategic signaling tool aimed at enhancing perceived credibility among stakeholders. Future studies could investigate the extent to which different types of sustainability disclosures are prioritized for assurance and whether the scope or depth of assurance influences investor or analyst perceptions, particularly under emerging regulatory frameworks such as ISSA 5000 and the EU CSRD.

Further research is warranted to analyze the methodologies and scope of assured sustainability information in practice. While companies often report that sustainability data have been assured, such assurance may cover only selective indicators, potentially undermining overall report credibility. Empirical studies could explore whether selective assurance leads to imitation effects among firms with weaker disclosure practices or influences capital market responses.

Another promising direction is to assess how financial analysts incorporate assured ESG information into their evaluations and forecasts, especially as sustainability disclosures increasingly integrate with financial reporting standards such as IFRS S1 and S2. Finally, the adoption and operationalization of CAM remain underexplored. Future work could investigate CAM's effectiveness in aligning internal and external assurance functions and evaluate its long-term market impacts across different regulatory and cultural contexts.

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