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Navigating the Computational Turn: Global Trends and Cross-Cultural Challenges in AI-Enabled Financial Statement Analysis

ABSTRACT

Objective: The paper aims to map the recent methodological reconfiguration of financial statement analysis (FSA) and to identify the analytical trajectories emerging between 2015 and 2025. It specifically examines how corporate disclosure is being reshaped by the computational turn, as it expands beyond structured financial data to include narrative, sustainability and machine-readable reporting across different cultural and regulatory contexts.

Methodology: A Scopus-based bibliometric design was adopted, applied to a corpus of 454 documents. It combines performance analysis, co-word analysis, thematic mapping and trend-topic analysis, processed through the Bibliometrix/Biblioshiny environment to visualize the evolution of the field.

Findings: The results indicate that FSA is undergoing a profound rearticulation, moving from traditional ratio-based interpretation to an AI-enabled ecosystem. The evidence suggests a three-phase evolution: an initial decision-support phase, an intermediate expansion towards broader reporting architectures and non-financial disclosures and a recent computational turn centred on AI-enabled methods. The analysis reveals a five-cluster conceptual structure: (1) the traditional financial-statement core, (2) computational learning methods (ML/DL), (3) predictive applications in auditing and fraud detection, (4) sustainability and ESG extensions and (5) the cross-cultural dimensions of accounting research. Furthermore, the findings highlight a recent shift in which Artificial Intelligence (AI), natural language processing (NLP) and Large Language Models (LLMs) have become foundational to navigating global disclosure processing costs. Finally, the geography of collaboration reveals that methodological innovation in FSA is being shaped through specific cross-cultural research corridors, particularly the Sino–Anglophone and Asia–Pacific networks, while European participation currently lags behind regulatory developments such as CSRD/ESRS.

Value Added: The study contributes to the literature by conceptualizing the “computational turn” in FSA, offering an empirically grounded map of field’s methodological evolution. The paper argues that this transformation is a rearticulation rather than a substitution; new computational methods are being embedded within the traditional inferential logic of FSA rather than replacing it. Furthermore, the research integrates previously isolated streams – specifically NLP in accounting, machine learning in finance, ESG analytics and digital reporting – into a unified framework. A key contribution lies in the finding that while AI provides universal analytical power, cross-cultural challenges in the linguistic and contextual interpretation of narrative disclosures remain a critical frontier. By repositioning FSA as a domain where language, accounting tradition and institutional culture jointly dictate the credibility of computational measurements, this study opens a vital research interface between international management and global accounting practices.

Recommendations: Future research should develop integrative cross-stream studies that treat the five identified clusters as connected subsystems, with particular attention paid to the interface between computational methods and sustainability reporting. Domain-specific validation frameworks for ML applications in accounting and structured research programmes on LLM-based financial document analysis have been identified as priority agendas.

Key words: financial statement analysis, bibliometric analysis, artificial intelligence, computational turn, cross-cultural accounting, bibliometric mapping, corporate disclosure, cross-cultural research

JEL codes: M40, M41, G30, F23, M16

Introduction

Financial statement analysis (FSA) has long been a foundational domain of empirical accounting research, yet its conceptual and methodological boundaries are

now being reconfigured. For much of the twentieth century, FSA was understood primarily as the extraction of value-relevant signals from numerical financial statements through ratios, accruals and other indicators used to support investment, credit and governance decisions (Ou & Penman, 1989; Lev & Thiagarajan, 1993; Altman, 1968). That view, while analytically strong, assumed a relatively stable and narrow informational object: the periodic financial statement as a structured numerical document. Over the past decade, this assumption has become increasingly difficult to sustain. The informational object has expanded to include management commentary, footnotes and sustainability disclosures. At the same time, the analytical toolkit has shifted toward computational methods such as machine learning (ML), natural language processing (NLP) and, more recently, large language models (LLMs). In parallel, the infrastructure of corporate reporting has become progressively digitalised through structured data formats and machine-readable taxonomies. This study examines that shift not as a passing technological development, but as a structural change in how financial information is produced, processed and analysed.

A useful theoretical starting point is the literature on disclosure processing costs. Blankespoor et al. (2020) show that public disclosure does not automatically become usable information: acquisition, parsing and interpretation all involve costs, and those costs vary across users and disclosure formats. When technologies reduce them, as digital reporting systems and automated analytical tools increasingly do, the effects extend to information asymmetries, market liquidity and the distribution of benefits from corporate transparency. This perspective allows the methodological changes documented in this study to be interpreted as endogenous responses to informational frictions rather than as isolated technological shocks. It also helps distinguish this paper from technology-centred surveys. The question here is not which computational method performs best, but how the analytical ecosystem of FSA has changed as the costs and capabilities of processing corporate disclosure have changed.

The literature on this reconfiguration is extensive but fragmented, and can be organised around six interrelated streams: traditional FSA grounded in ratios and accruals; computational analysis of corporate text; machine learning and predictive analytics applied to structured accounting data; digital corporate

reporting infrastructures (XBRL and taxonomies); sustainability disclosure analytics; and the recent frontier of generative AI and large language models.

What is still missing is an integrative and empirically grounded account of how they connect, diverge and jointly reconfigure the field during the period in which methodological discontinuity has been most visible, roughly 2015 to 2025. Malchev et al. (2025) offer a broad bibliometric overview of FSA from 1937 to 2023, but the contemporary period is only one segment within a longer historical arc, and the study centres on the keyword “financial statement analysis” without specifically targeting methodological innovation. This paper addresses a narrower and more specific gap: the lack of a bibliometric mapping able to trace the intersections among structured numerical data, NLP and ML methods, digital reporting infrastructures and sustainability-related disclosures during the decade marked by deep learning diffusion, iXBRL adoption, ESG standardisation and the rise of generative AI. The research gap is therefore not simply empirical, in the sense of an unexplored area, but analytical. The field still lacks a synthesis that treats FSA as a data-type × task × method ecosystem. Specifically, it remains to be shown how that ecosystem has been reorganised by the joint expansion of informational inputs and computational capacity.

Against this background, the study is guided by three research questions:

- RQ1:** *How has the literature on financial statement analysis evolved between 2015 and 2025 in terms of scientific production, source distribution and geographical patterns?*
- RQ2:** *What conceptual structure characterises this literature, and how are its main methodological and thematic streams organised?*
- RQ3:** *Which methodological trajectories are emerging most clearly in contemporary financial statement analysis?*

While the methodological reconfiguration of FSA is often presented as a technical phenomenon, it is also a profoundly intercultural one. Financial statements are produced under different national accounting traditions (IFRS, US GAAP, Chinese Accounting Standards and numerous local frameworks), narrated in different languages and interpreted by analysts whose disclosure-processing practices are

themselves culturally embedded. Sentiment lexica calibrated on US 10-K filings do not necessarily transfer to annual reports prepared in Mandarin, Polish or Bahasa Indonesia; ESG materiality judgments differ systematically between European stakeholder-oriented and Anglo-American shareholder-oriented reporting cultures; and the speed at which AI-based analytical tools are adopted varies with national institutional environments. This intercultural dimension is not a peripheral concern of contemporary FSA – it is constitutive of how computational methods perform in practice. The study therefore reads its bibliometric evidence not only as a map of methodological innovation, but also as a map of how that innovation is unevenly distributed across national, linguistic and institutional contexts. In doing so, it situates FSA within the broader concerns of intercultural management research.

In this paper, FSA includes not only the analysis of numerical financial statements, but also the computational analysis of management commentary, footnotes and sustainability disclosures, insofar as these materials serve as inputs for tasks such as prediction, classification, extraction and anomaly detection that remain aligned with the informational aims of traditional FSA. The study is descriptive and bibliometric in design. Its purpose is to map the structure and recent evolution of the literature rather than to compare the performance of individual methods. Digital reporting infrastructure (XBRL and taxonomies), computational methods (ML, NLP and LLMs), and sustainability-related content (ESG disclosures) are treated as distinct but interacting dimensions. The paper contributes an empirically grounded map of the methodological reconfiguration of FSA between 2015 and 2025. In doing so, it distinguishes and connects the six streams identified above and locates emerging frontiers such as multimodal data integration, interpretability in accounting settings and LLM-enabled document analysis within the broader evolution of the field. The remainder of the paper is organised as follows. Section *Materials and methods* outlines the bibliometric methodology and corpus construction. Section *Current state of knowledge* presents the descriptive and science-mapping results. Section *Results* discusses the findings in light of the research question and theoretical framework. Section *Discussion* concludes with implications for research and practice.

Materials and methods

The study adopts a Scopus-based bibliometric design to map the recent evolution of financial statement analysis and to identify the methodological innovations emerging within the field (Massaro et al., 2016; Calandra et al., 2025).

Bibliometric analysis is particularly appropriate when a research domain expands rapidly across adjacent disciplines and produces a body of literature too broad to be assessed effectively through a purely narrative review. In such settings, bibliometric methods provide a transparent and reproducible basis for identifying publication trends, conceptual concentrations and thematic trajectories (Secinaro et al., 2025). In the present case, the literature on financial statement analysis increasingly intersects with artificial intelligence, machine learning, predictive analytics, automation, sustainability-related metrics, data visualisation and blockchain-enabled reporting infrastructures. A bibliometric approach is therefore suitable for capturing the structure and recent reconfiguration of the field (Cobo et al., 2011; Paul & Criado, 2020).

The empirical design was organised into four sequential steps: study design, data collection, data analysis and interpretation. This structure follows the logic of workflow mapping approaches towards literature reviews in which the review process is organised around the definition of the study design, the collection of bibliographic data, the analysis of the dataset, the visualisation of results and their interpretation (Zupic & Čater, 2015). The study design phase defined the research objective, the scope of the review and the conceptual boundaries of financial statement analysis. The data collection phase identified and exported the bibliographic records from Scopus. The data analysis phase combined performance analysis and keyword-based science mapping. Finally, the interpretation phase connected the empirical bibliometric evidence to the broader methodological transformation of financial statement analysis.

The bibliographic dataset was retrieved from Scopus on April 2026. Scopus was selected because of its broad multidisciplinary coverage and its suitability for bibliometric studies in business, management, accounting, finance and related fields (Okoli & Schabram, 2010). The search was conducted in the TITLE-ABS-KEY

field and combined a core block related to financial statement analysis with a second block capturing the methodological and technological developments currently associated with the field.

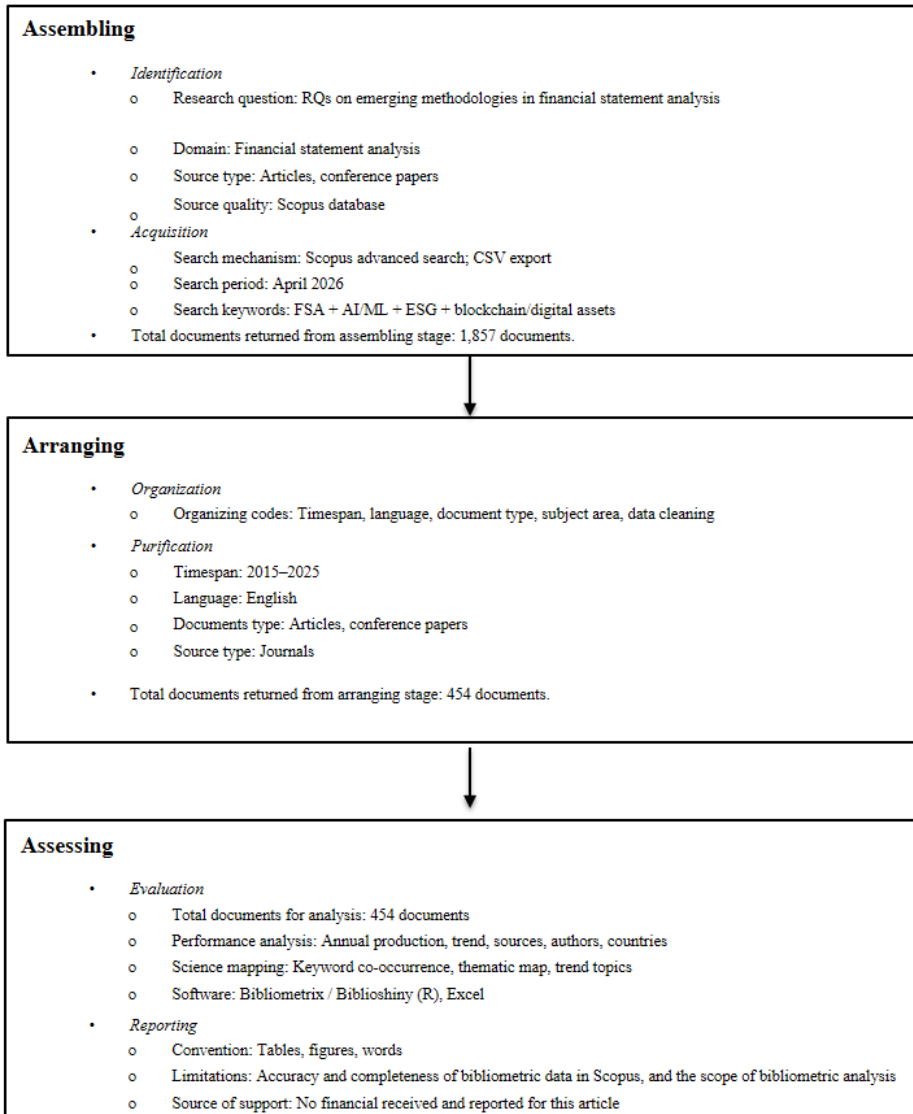
The first block included terms such as “financial statement analysis”, “analysis of financial statements”, “financial statement*”, “financial report*”, “annual report*”, “accounting information”, “accounting data” and “financial ratio*” in proximity with analys*.

The second block included “artificial intelligence”, “machine learning”, “deep learning”, “predictive analytics”, automat*, “robotic process automation”, “real-time reporting”, “continuous reporting”, “continuous analytics”, “continuous monitoring”, “ESG”, sustainab*, “data visualization”, dashboard*, “blockchain”, “distributed ledger”, “digital asset*” and tokeni?ation.

The search was restricted to English-language documents indexed in Business, Management and Accounting, Economics, Econometrics and Finance, Decision Sciences and Computer Science, and to the document types article and conference paper (Sadraei et al., 2023; Fijałkowska & Lanzalonga, 2025). The inclusion of conference papers was retained because technologically dynamic areas such as artificial intelligence, machine learning, digital reporting and blockchain often develop partly through conference-based dissemination before stabilising in journal outlets (Secinaro et al., 2022). The data collection protocol was designed consistently with systematic review procedures aimed at reducing selection bias through the explicit reporting of search criteria, inclusion parameters and screening decisions (Paul et al., 2021). Figure 1 summarises the search protocol and corpus construction process.

The initial Scopus query returned 1,847 records. The corpus was then refined through a sequential screening and cleaning procedure. In the first stage, preliminary eligibility filters were applied on the basis of the study design, including timespan, language, document type, subject area and general relevance to the domain of financial statement analysis. This stage reduced the initial set to 743 records. In the second stage, a manual thematic and conceptual screening of titles and abstracts was conducted.

Figure 1. Search protocol and corpus construction of the bibliometric dataset



Source: Authors' elaboration based on Paul et al. (2021)

This screening aimed to retain only those contributions in which the financial-statement-analysis dimension and the methodological-innovation dimension

were simultaneously and substantively present. Records were excluded when the expression “financial statement” appeared only in a generic or definitional sense, when the study addressed accounting or reporting only incidentally, or when artificial intelligence, machine learning, blockchain, ESG analytics or other digital methods were applied to contexts not directly related to financial statement analysis. Following this manual screening, 454 records were retained for bibliometric processing.

The empirical analysis was conducted through Biblioshiny (Aria & Cuccurullo, 2017). Performance analysis was used to describe the main characteristics of the corpus, including annual scientific production, source distribution, authorship patterns and country-level production. Keyword-based science mapping was then used to explore the conceptual structure of the field. More specifically, co-word analysis was employed to identify thematic proximity through keyword co-occurrence, while thematic mapping and trend-topic analysis were used to distinguish central, emerging and declining themes and to trace the temporal visibility of the methodological trajectories currently reshaping financial statement analysis (De Bem Machado et al., 2022). Co-citation analysis was not employed in this study, as the cited references field (CR) was empty or missing in the Scopus extraction processed by Bibliometrix, making citation-based techniques such as co-citation mapping, bibliographic coupling and historiographic mapping unavailable for this corpus (Cobo et al., 2011; van Eck & Waltman, 2010).

Finally, transparency and reproducibility were pursued by explicitly reporting the database used, the extraction date, the search field, the search logic, the filtering criteria, the corpus-cleaning procedure and the analytical tools employed, following the reporting standards recommended for bibliometric studies (Donthu et al., 2021). In this sense, the methodology is designed to provide an auditable basis for the subsequent results section in which the evolution of the field is examined through publication growth, source distribution, country patterns, keyword networks, thematic positioning and trend topics.

Current state of knowledge

Research on financial statement analysis has developed along several streams whose joint evolution provides the conceptual background for the present mapping. The traditional FSA literature established that the calculation of ratios is straightforward but the derivation of valid inferential rules from accounting signals is far more demanding. Ou and Penman (1989), Lev and Thiagarajan (1993) and Piotroski (2000) framed FSA as a structured inferential problem in which information is extracted from financial statements to support investment, credit and governance decisions. Altman (1968) provided the foundational contribution to bankruptcy prediction, anchoring a quantitative tradition that has remained an empirical reference point for subsequent work.

A second stream addresses the computational analysis of corporate text. Loughran and McDonald (2011) demonstrated that general-purpose sentiment dictionaries systematically misclassify financial language, motivating the development of domain-specific lexica and, later, more advanced NLP approaches. Loughran and McDonald (2016) surveyed the methodological landscape of textual analysis in accounting and finance, while Bochkay et al. (2023) addressed more recent issues such as construct validity, deep learning and the conditions under which textual measures capture economically meaningful variation. This stream is particularly relevant for this study because it documents how the analytical perimeter of FSA has expanded from numerical disclosures to narrative ones.

A third stream applies machine learning and predictive analytics to structured accounting data. Liaras et al. (2024) review this literature and highlight three recurring patterns: the dominance of supervised models, persistent implementation risks linked to data quality and feature selection, and the additional gains observed when numerical and textual features are combined. These gains are most pronounced in fraud detection and financial distress prediction, two task families in which corpus-level studies such as those of Hajek and Henriques (2017), Nguyen and Huynh (2022) and Nießner et al. (2023) have produced substantial cumulative evidence.

Three further streams extend the informational and infrastructural scope of FSA but have so far remained partly disconnected from the previous threads.

The first concerns digital corporate reporting, including XBRL filings, iXBRL mandates and the taxonomy choices that support machine-readable disclosure. Troshani and Rowbottom (2021) describe this literature as fragmented across the reporting supply chain, while Rowbottom et al. (2021) argue that digitalisation is not analytically neutral: making a principles-based reporting system machine-readable introduces standardisation pressures that can reshape what becomes measurable and comparable. The second concerns sustainability disclosure analytics, an area gaining regulatory relevance through the Corporate Sustainability Reporting Directive and the ESRS framework. Ferjančič et al. (2024) use advanced topic modelling to trace thematic evolution in the sustainability sections of annual reports, while Seow (2025) reviews the use of ML in ESG analytics and identifies persistent problems of data standardisation and model explainability. The third frontier concerns generative AI and large language models, where Stratopoulos and Wang (2025) propose a framework for AI-accounting research and discuss early applications of LLMs to the automated retrieval of information from unstructured corporate documents.

A further stream, less visible in the methodologically focused corpus but conceptually important, examines how national culture and institutional context shape accounting practices and disclosure behaviour. Following the foundational framework of Gray (1988), which links the cultural dimensions identified by Hofstede (1980) to accounting values such as conservatism, secrecy, professionalism and uniformity, subsequent work (Salter & Niswander, 1995; Doupnik & Tsakumis, 2004) has documented systematic cross-jurisdictional variation in how financial information is produced and interpreted. This stream remains largely separate from the computational FSA literature mapped here, yet its concerns become increasingly relevant as analytical methods cross linguistic and institutional borders. Sentiment dictionaries, machine-learning models and large language models are not culturally neutral instruments: they encode the disclosure conventions, rhetorical norms and accounting traditions of the corpora on which they were trained. The intercultural dimensions discussed in section *Intercultural dimensions of methodological transfer* below should be read as an attempt to reconnect these two literatures – the computational and the cultural – within a unified analytical perspective.

Each of these streams has generated a substantial body of evidence on its own, yet they have developed largely in isolation from one another. The bibliometric analysis presented in the next section is designed to examine how they cluster, intersect and jointly configure the current state of the field, treating FSA as a data-type × task × method ecosystem rather than as a fixed set of ratio-based techniques.

Results

This section reports the main descriptive findings of the bibliometric analysis. Specifically, it examines the corpus through annual scientific production, trend topics, co-word clustering, geographical collaboration patterns and the most relevant authors in order to identify the methodological trajectories currently reshaping research on financial statement analysis.

Descriptive bibliometric analysis

Table 1. Main information about the analysed corpus

Description	Results
<i>Main information about data</i>	
Timespan	2015:2025
Sources (journals, books, etc.)	298
Documents	454
Annual growth rate (%)	27.48
Document average age	3.73
Average citations per document	13.97
References	0
<i>Document contents</i>	
Keywords Plus (ID)	1,390
Author's keywords (DE)	1,530

Description	Results
Authors	
Authors	1,273
Authors of single-authored documents	65
Authors' collaboration	
Single-authored documents	65
Co-authors per document	3.02
International co-authorships (%)	26.65
Document types	
Article	339
Conference paper	108
Review	7

Source: Authors' elaboration based on Scopus data processed in Bibliometrix. Note: the value reported as "References: 0" should not be interpreted literally as the absence of bibliographic references in the analysed documents. It reflects the fact that the cited references field (CR) was empty or missing in the Scopus extraction processed by Bibliometrix.

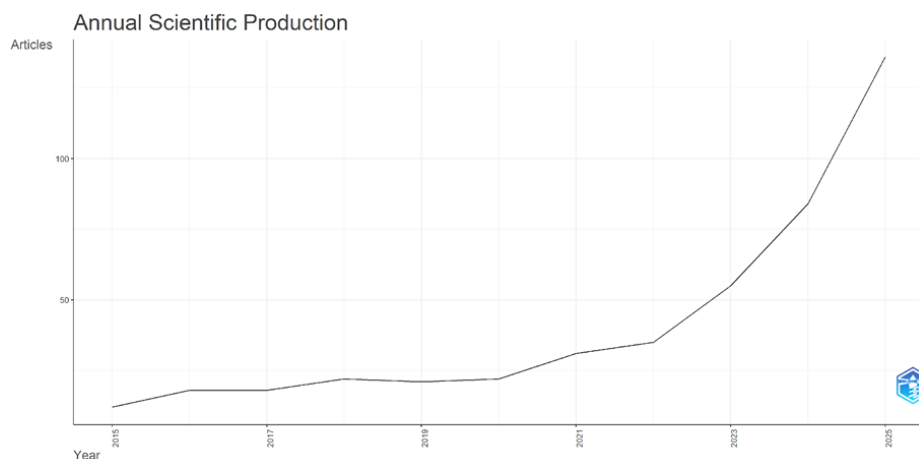
As shown in Table 1, these documents are distributed across 298 sources and involve 1,273 authors, with 1,530 author keywords and 1,390 Keywords Plus. Taken together, these figures already suggest that financial statement analysis is no longer confined to a narrowly delimited accounting niche but has developed into a broader and increasingly heterogeneous research space. Within the corpus, this expansion is visible in the coexistence of studies on ESG disclosure and firm performance (Atan et al., 2016), web-based financial report analysis and visualisation systems (Liu et al., 2016), textual approaches to bankruptcy prediction (Nguyen & Huynh, 2022), machine-learning-based methods for analysing financial statements (Li & Zhou, 2024), and AI-assisted interpretations of narrative and audit-related disclosures (Hasan et al., 2025; Küster et al., 2025; Wang & Kang, 2025).

The descriptive evidence also highlights the collaborative and document-profile characteristics of the field. The average number of co-authors per document is 3.02, while international co-authorship reaches 26.65%, indicating that collaboration is common although cross-border integration is not yet dominant. This is consistent with a field that is expanding rapidly but still partly segmented

across regional and methodological agendas. The document mix is led by journal articles (339), followed by conference papers (108) and a smaller number of reviews (7). This composition is analytically relevant. On the one hand, it indicates that a substantial share of the literature is already consolidated in journal outlets. On the other hand, the strong presence of conference contributions suggests that part of the field is still being shaped by frontier experimentation, especially in fast-moving areas such as deep learning, natural language processing and generative AI applied to financial reports and financial statement analysis (Lin & Yang, 2025; Mehul et al., 2025; Wang & Kang, 2025). In this sense, the profile reported in Table 1 is fully consistent with the methodological choice to retain conference papers in the corpus when mapping emerging analytical trajectories.

Figure 2 reinforces this reading from a temporal perspective. Annual scientific production remains relatively limited in the first part of the period and then rises sharply in the most recent years. The curve moves from a modest initial base in 2015 to a markedly steeper expansion after 2021, culminating in a strong peak in 2025. Read descriptively, this pattern indicates that research on financial statement analysis has entered a clear expansionary phase only in the most recent period. Read substantively, however, the figure suggests more than simple growth in publication counts. It points to a reconfiguration of the field in which financial statement analysis is increasingly treated not only as a traditional ratio-based or reporting-based practice but also as a broader methodological domain connected to textual analysis, predictive modelling, digital transformation and sustainability-related information structures.

Figure 2. Annual scientific production



Source: Authors' elaboration based on Scopus data processed in Bibliometrix.

Table 2. Summary table of documents published before and after 2017

	2015–2016	2017–2025
Number of published documents	30	424
Number of sources	26	278
Top five author keywords	Corporate social responsibility; Profitability; Content analysis; Sustainability; Corporate governance	Machine learning; Sustainability; Artificial intelligence; Deep learning; Sustainable development
Sum of citations received by documents	528	5,813

Source: Authors' elaboration based on Scopus data processed in Bibliometrix.

Table 2 makes this change more visible by comparing the two time slices of the corpus, namely 2015–2016 and 2017–2025. Because the observation window begins in 2015, the first slice is necessarily shorter and should therefore be interpreted with caution. Even so, the contrast between the two periods is informative. The early slice is smaller in both document volume and source variety and is characterised by keywords centred on corporate social responsibility,

profitability, content analysis, sustainability and corporate governance. This profile suggests that the initial configuration of the field was more strongly rooted in reporting quality, disclosure practices and sustainability-related corporate communication. Early corpus contributions are consistent with this orientation, including work on the effect of financial reporting quality on sustainability information disclosure, ESG disclosure and firm performance, and CSR content analysis in annual reports (Martínez-Ferrero et al., 2015; Atan et al., 2016; Markhayeva, 2016).

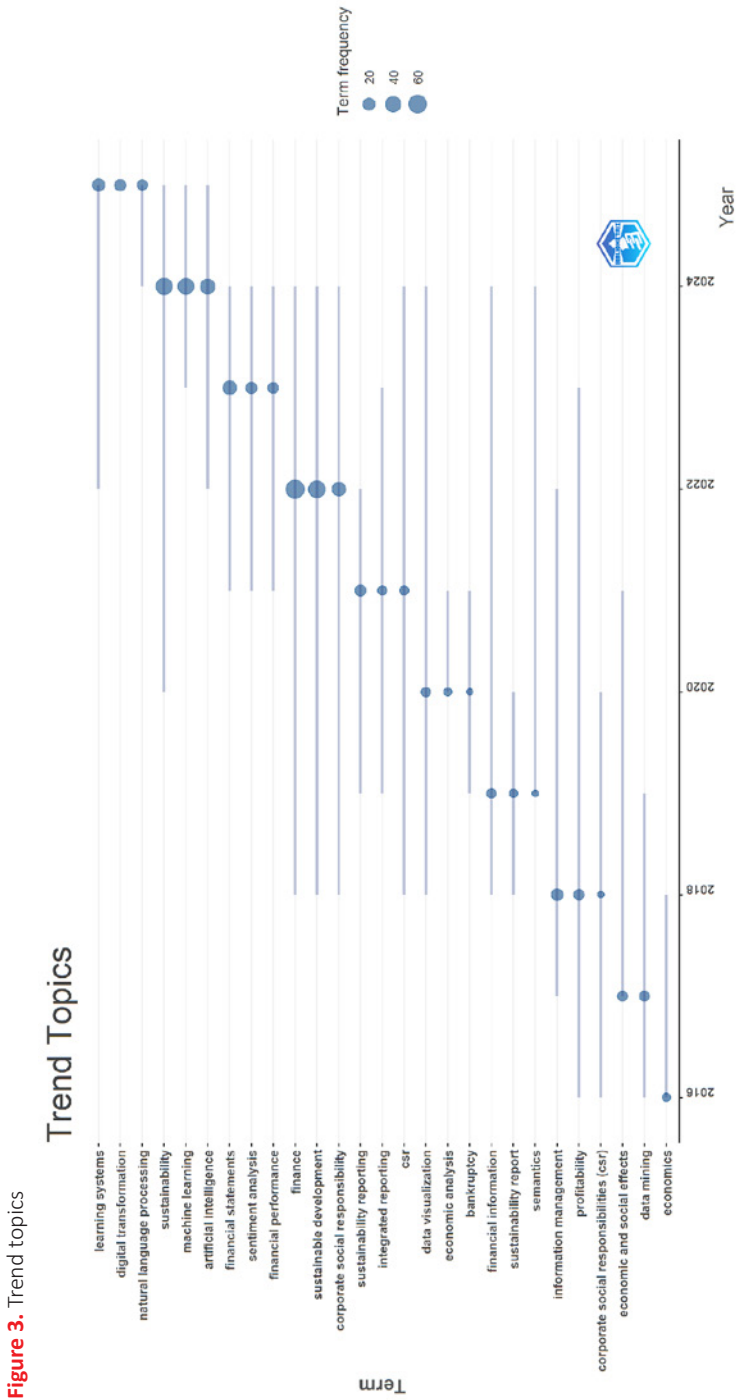
By contrast, the second slice shows a much larger and more diversified body of research and a different thematic centre of gravity. Its leading keywords are machine learning, sustainability, artificial intelligence, deep learning and sustainable development, indicating that the field has moved towards a hybrid configuration in which conventional financial analysis increasingly coexists with computational, AI-assisted and digitally-mediated approaches. Recent corpus contributions reflect exactly this shift, addressing themes such as large-language-model-based corporate risk evaluation, data visualisation in financial reporting and analysis, intelligent fraud detection through machine learning, big-data-based financial risk warning and deep-learning-based financial statement analysis (Lin & Yang, 2025; Wang & Kang, 2025; Zeng & Dai, 2025). In this sense, Table 2 does not simply document a temporal increase in publications. It captures a substantive transition in the field's analytical orientation, from disclosure-centred and sustainability-related readings of reporting practices towards computationally-enhanced forms of financial statement analysis.

A second reading of Table 2 highlights a cultural-geographical undercurrent: the early period's keywords (CSR, sustainability, content analysis) reflect a Continental European stakeholder-oriented agenda, while the later period's vocabulary (machine learning, AI, deep learning) signals the rise of a more Anglophone and East-Asian technology-centred research culture. This shift in analytical vocabulary is not merely topical; it tracks the relative weight of different national accounting and research traditions within the field over the decade.

Trend topics and thematic reorientation

Figure 3 provides a more fine-grained view of the thematic reorientation underlying the recent expansion of the field. Rather than showing a uniform accumulation of topics, the trend-topic map suggests a sequential restructuring of research attention. The earliest layer of visible topics is anchored in relatively general and economically framed terms, such as economics, data mining, economic and social effects, information management and profitability. This early configuration indicates that the literature initially approached financial statement analysis as a broad decision-support and information-processing domain, with methodological innovation present but not yet dominant.

A transitional phase becomes visible between roughly 2019 and 2023, when topics related to reporting architectures and disclosure practices gain salience. Terms such as financial information, sustainability report, sustainability reporting, integrated reporting, CSR, corporate social responsibility, semantics and data visualization suggest that the field progressively widened from traditional statement-based analysis towards broader reporting environments in which financial, narrative and non-financial information are jointly examined. This shift is consistent with corpus contributions that focus on integrated reporting adoption, transparency and accountability through reporting infrastructures (Darus et al., 2019), heterogeneity in sustainability and integrated-report disclosure (Injeni et al., 2022), environmental auditing within integrated reporting and the quality of stakeholder-engagement disclosure under mandatory non-financial reporting regimes (Bananuka et al., 2019; Hichri, 2023; Petruzzelli & Badia, 2024).



Source: Authors' elaboration based on Scopus data processed in Bibliometrix.

The most recent phase, concentrated in 2023–2025, marks a clearer methodological turn. While financial statements, financial performance and sentiment analysis remain central, they are increasingly co-visible with machine learning, artificial intelligence, digital transformation, natural language processing, learning systems and the broader umbrella of sustainability. Read together, these topics indicate that current research is not abandoning the traditional objects of analysis but is instead reprocessing them through computational techniques and digitally enriched information environments. Recent studies in the corpus reflect exactly this movement: machine-learning approaches to narrative disclosure tone and analysts' forecast accuracy (Acheampong & Elshandidy, 2025), textual fraud detection in annual reports (Zhu et al., 2025), machine-learning methods for analysing financial statements, AI-based interpretation of key audit matters, deep-learning models for financial statement analysis, GenAI-based querying of annual reports and AI-enabled ESG disclosure and digital-transformation effects on ESG performance (Hasan et al., 2025; Lin & Yang, 2025; Mehul et al., 2025).

Overall, the trend-topic evidence suggests that the recent growth of the field is associated not simply with a rise in publication volume, but with a substantive reorientation from conventional financial interpretation towards hybrid analytical configurations in which accounting data, textual disclosures, sustainability-related information and AI-based methods increasingly intersect. In this sense, the temporal profile of the topics supports the argument that methodological innovation is becoming one of the principal organising logics of contemporary research on financial statement analysis.

Conceptual structure of the field: Co-word clustering

Figure 4 examines the conceptual structure of the field through co-word clustering. Consistent with the methodological design, the aim here is not to reconstruct citation genealogy, but to identify the thematic proximities through which recent research on financial statement analysis is being organised. Read in this way, the dendrogram does not portray a fragmented set of disconnected niches. Rather, it reveals an internally differentiated but still connected field, structured around

five colour-coded clusters that jointly show how financial statement analysis is expanding beyond its traditional statement-based boundaries.

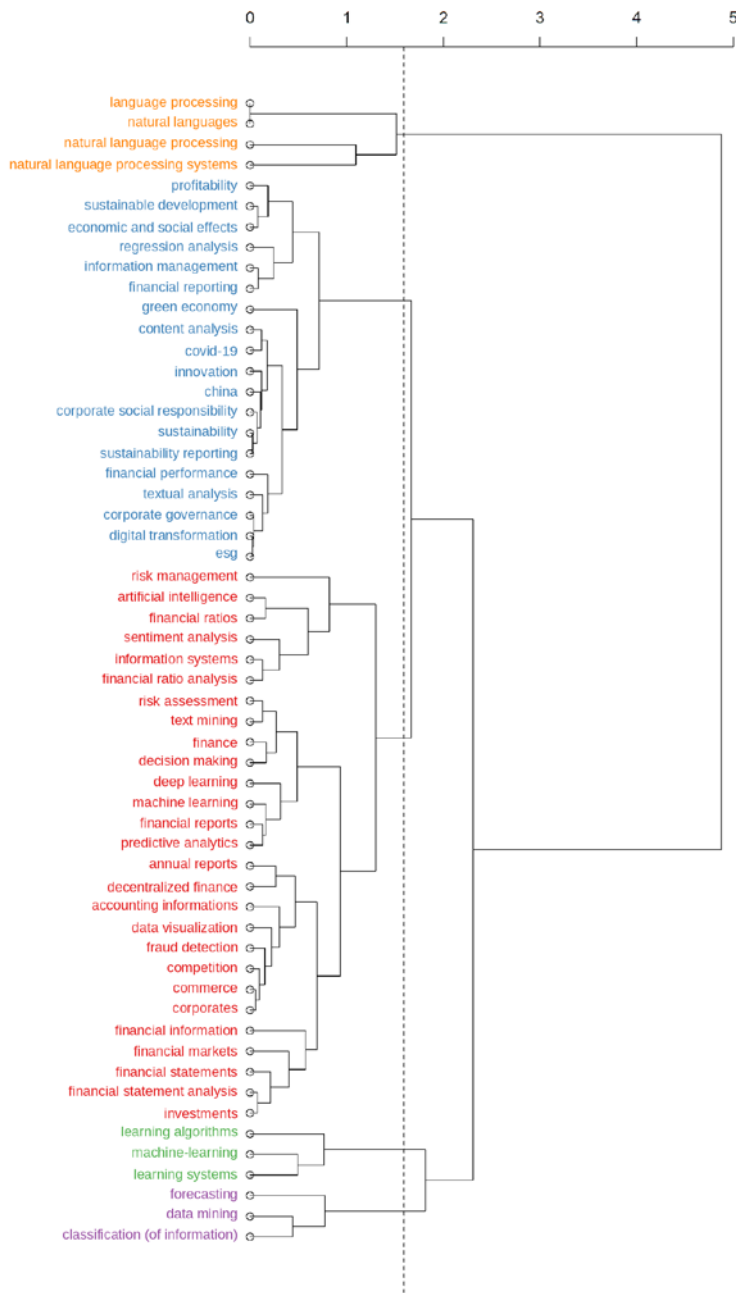
The yellow cluster isolates terms related to language-centred analytical infrastructures, including natural language processing, language processing, natural language processing systems and natural languages. This cluster is comparatively specialised and more distant from the rest of the conceptual structure, suggesting that language-processing approaches still represent a more technical and method-specific stream rather than the dominant core of the field. At the same time, its presence is substantively important. It indicates that part of recent research is moving towards the treatment of annual reports, narrative disclosures and other textual materials as analysable data objects, thus extending financial statement analysis into computational linguistics and automated text interpretation. This reading is consistent with corpus contributions that apply AI and text-based techniques to disclosure tone, audit-related narratives, corporate risk evaluation and report-querying architectures (Hasan et al., 2025; Küster et al., 2025; Wang & Kang, 2025). The cultural specificity of this frontier deserves explicit acknowledgement: the NLP tools that dominate the yellow cluster were developed and validated almost exclusively on English-language US corporate filings, which means their analytical reach into Chinese, European or Latin American disclosure environments remains empirically uneven and methodologically contested.

The blue cluster groups together terms associated with broader reporting, governance and sustainability-oriented concerns, such as sustainable development, sustainability, corporate social responsibility, corporate governance, ESG, financial reporting, sustainability reporting, financial performance, profitability, content analysis, textual analysis and green economy. This part of the dendrogram shows that the field is no longer confined to the narrow interpretation of financial statements as purely quantitative accounting artefacts. Instead, it is increasingly embedded in a wider disclosure architecture where governance quality, stakeholder-oriented transparency, sustainability communication and non-financial reporting matter alongside conventional financial indicators. The inclusion of terms such as China, COVID-19 and innovation also suggests that

this stream is frequently studied through contextualised empirical settings and contemporary institutional transformations.

This interpretation is coherent with corpus studies on integrated reporting adoption, sustainability disclosure heterogeneity, stakeholder-engagement disclosure, environmental auditing and AI-enabled ESG disclosure dynamics (Bananuka et al., 2019; Qian et al., 2025; Rauf & Baolei, 2025).

Figure 4. Factorial analysis: dendrogram



Source: Authors' elaboration based on Scopus data processed in Bibliometrix.

The red cluster represents the largest and most central conceptual core of the field. It includes terms such as finance, financial statements, financial statement analysis, financial reports, annual reports, financial ratios, financial ratio analysis, financial information, financial markets, investments, risk assessment, risk management, decision making, fraud detection, information systems and decentralised finance. What emerges here is not the disappearance of the traditional analytical nucleus of the field but its rearticulation. Conventional objects of analysis remain highly visible, yet they are increasingly connected to risk-oriented, decision-support and digitally-mediated applications. The proximity of artificial intelligence, sentiment analysis and fraud detection to this central financial core suggests that computational and diagnostic logics are no longer external additions to financial statement analysis; they are becoming embedded within its main analytical domain. This pattern is consistent with corpus contributions on fraud detection in annual reports, textual bankruptcy analysis, AI-based corporate failure prediction and automated financial statement evaluation (Nguyen & Huynh, 2022; Nießner et al., 2023; Lin & Yang, 2025).

The green cluster is more explicitly associated with the computational learning architecture that now supports methodological innovation in the field. Terms such as machine learning, deep learning, machine-learning, learning algorithms, learning systems, text mining and predictive analytics indicate that a substantial share of recent research is oriented towards automated pattern recognition, model-based prediction and scalable analysis of both structured and unstructured information. This cluster is particularly important because it signals that financial statement analysis is increasingly being redefined not only by what it studies, but also by how it studies it. In other words, the field is shifting from traditional ex post interpretation towards more automated, predictive and model-driven forms of analysis. This reading aligns with corpus studies on machine-learning-based methods for analysing financial statements, AI-assisted narrative interpretation, deep-learning approaches to financial-report analysis and fuzzy-logic-enhanced automated statement analysis (Li & Zhou, 2024; Hasan et al., 2025; Lin & Yang, 2025; Liu, 2025).

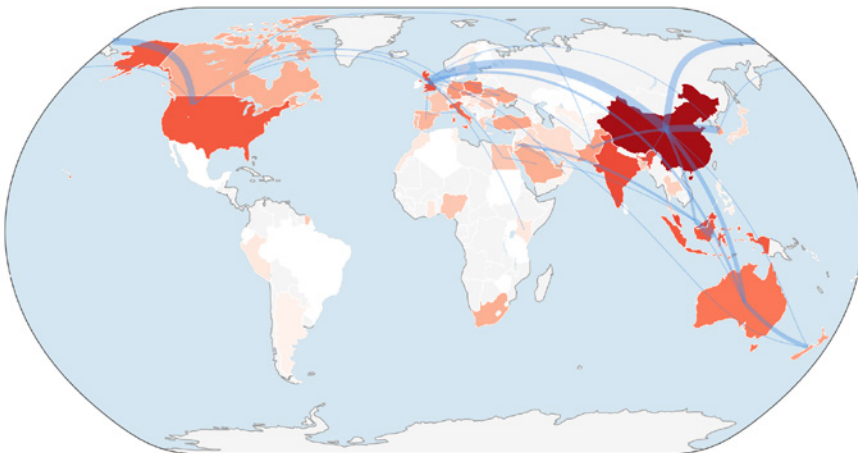
The purple cluster captures a closely related but more application-oriented predictive branch, built around forecasting, data mining and classification (of information). If the green cluster reflects the methodological engine of computational innovation, the purple cluster reflects its operational outputs. The

clustering of these terms suggests that recent work increasingly uses digital tools not simply to describe reporting information, but to classify, forecast and transform it into decision-relevant signals. In this sense, the purple cluster marks the movement from methodological potential to applied analytical use. This is consistent with corpus contributions on competition-sensitive business forecasting, intelligent early fraud detection and AI-supported corporate risk evaluation (Nießner et al., 2022; Wang & Kang, 2025; Zeng & Dai, 2025).

Taken together, the co-word structure suggests that recent innovation in financial statement analysis is additive rather than substitutive. The field continues to be anchored in its traditional financial-reporting and ratio-analysis core, but that core is increasingly surrounded and reshaped by broader sustainability and governance concerns, by computational learning methods, predictive applications and specialised language-processing approaches. In this sense, the dendrogram supports the view that the recent growth of the field is associated with a progressive hybridisation of analytical objects, data types and research methods, rather than with a simple expansion of an otherwise unchanged accounting domain.

Geographical collaboration patterns

Figure 5. Country collaboration world map



Source: Authors' elaboration based on Scopus data processed in Bibliometrix.

Consistent with the methodological design, the country collaboration map is read here as an indicator of the social structure of the field rather than as a proxy for research quality or causal influence. The purpose of this subsection is to identify where the debate is most visibly connected internationally and how those collaboration patterns relate to the current reconfiguration of financial statement analysis.

Figure 5 shows that international collaboration is present but not evenly distributed across the corpus. The network is clearly hub-based. China emerges as the most visible connector, with recurrent links to the United Kingdom, the United States, South Korea, Australia and several Asian partners. Around this core, a second layer of regional collaboration is visible in the Asia-Pacific area, especially among Malaysia, Indonesia, Australia and New Zealand. By contrast, large portions of the map remain weakly connected, suggesting that the field is internationally active but still far from fully integrated.

This pattern is informative. The geography of collaboration appears to follow the main problem settings currently driving the literature: AI-assisted investment and forecasting, machine-learning applications to bankruptcy and risk evaluation, digital reporting infrastructures and the intersection between financial disclosure and sustainability. China's centrality is consistent with several corpus contributions that connect Chinese institutions with Anglo-American or wider international partners in precisely these domains, including work on AI and accounting-information transparency (Zhao et al., 2024), AI-agent collaboration in investment analysis, machine-learning-based bankruptcy prediction, forward-looking information and integrated reporting, and CSR assurance and firm value (Qu et al., 2019; Choi et al., 2025; Farooq et al., 2025).

Read through an intercultural-management lens, the geography of collaboration also reflects deeper institutional and linguistic asymmetries. The Sino–Anglophone corridor connects two financial reporting cultures with substantively different disclosure traditions, audit institutions, and stakeholder expectations; the productivity of this corridor suggests that methodological innovation in FSA is being shaped through cross-cultural knowledge integration rather than within any single national tradition. The Asia-Pacific cluster, by contrast, exhibits intra-regional cultural proximity that lowers the costs of joint research on shared ESG

and sustainability concerns. The relative weakness of European participation, despite the regulatory weight of CSRD, points to a possible mismatch between regulatory leadership and research community formation – an issue that inter-cultural management scholarship is well positioned to investigate.

At the same time, the map does not point to a single global research centre. It instead suggests a segmented internationalisation of the field. One segment is organised around China and its links with major English-speaking systems. Another is anchored in regional collaboration across Southeast Asia and the broader Asia-Pacific space, where sustainability practices, green finance, banking performance and reporting quality appear particularly salient. This is reflected in corpus studies developed across Indonesia and Malaysia on ownership concentration and sustainability practices, green bonds and investor attention, sustainability programmes in banking, and social and environmental reporting (Indrasari et al., 2021; Aini et al., 2023; Sukmadilaga et al., 2023; Fariyah et al., 2024).

Overall, the collaboration evidence suggests that recent methodological innovation in financial statement analysis is being shaped through selective cross-border networks rather than through a uniformly globalised research community. The field is international, but its internationalisation is structured around a limited number of active corridors linking countries where digital finance, AI adoption, sustainability reporting and advanced analytical techniques are particularly visible. In this sense, the geography of collaboration reinforces the broader result already emerging from the previous subsections: the contemporary evolution of financial statement analysis is being driven by hybrid research agendas at the intersection of accounting, computational methods and digitally-mediated disclosure environments.

Most relevant authors

The author-level distribution further clarifies the social organisation of the field. Table 3 shows a relatively dispersed authorship structure rather than a strongly concentrated intellectual core. No single author dominates the corpus by a wide margin. The most productive author labels reach four publications, while a broader second tier is clustered around three. Read bibliometrically, this pattern

suggests that recent work on financial statement analysis is being developed through multiple partially connected micro-streams rather than through one stable and highly centralised school of thought.

Table 3. Most relevant authors

Rank	Author	Articles	Articles fractionalised
1	Li, Z.	4	1.28
2	Yang, M.	4	0.93
3	Ali, W.	3	0.75
4	Ghani, E. K.	3	0.92
5	Li, H.	3	1.50
6	Li, X.	3	1.53
7	Nießner, T.	3	1.00
8	Schumann, M.	3	1.00
9	Tsiouni, M.	3	0.67
10	Wang, L.	3	1.58
11	Wang, S.	3	0.78
12	Wang, W.	3	1.00
13	Zhang, X.	3	1.70
14	Zhu, X.	3	0.75

Source: Authors' elaboration based on Scopus data processed in Bibliometrix.

This fragmentation is consistent with the hybrid character already visible in the previous subsections. The field currently brings together scholars working on bankruptcy prediction, text mining, AI-based classification, financial forecasting, ESG disclosure, green accounting, integrated reporting and sector-specific applications of ratio analysis. In that sense, author productivity does not simply identify individual prominence; it also signals the coexistence of several methodological entry points into the broader domain of financial statement analysis.

A first visible stream is the computational and AI-oriented branch. Authors such as Nießner and Schumann are associated with contributions on AI-based corporate failure prediction, competition-sensitive financial forecasting, and the systematisation of AI-based methods in financial statement analysis, which aligns

closely with the methodological turn identified in the trend-topic and co-word evidence (Nießner et al., 2021; Nießner et al., 2022; Nießner et al., 2023). Their presence among the most productive authors indicates that one of the most coherent author-based clusters in the corpus is built around predictive modelling, text mining and AI-supported analytical architectures.

A second stream is linked to sustainability, disclosure quality and governance-related extensions of financial analysis. This is reflected, for example, in the work of Maama on green accounting and ESG accounting in banking environments, in Ghani's co-authored contributions on sustainability practices, cost of debt and green-bond-related investor reactions in ASEAN contexts, and in Tsiouni's work on ESG advisory and financially grounded sustainability assessment in agri-food settings (Maama & Appiah, 2019; Maama, 2021; Aini et al., 2023; Tsiouni et al., 2023; Tsiouni et al., 2024). These contributions reinforce the result already emerging from the conceptual structure: financial statement analysis is increasingly being embedded in wider reporting and sustainability-oriented problem settings.

Overall, the most-relevant-authors analysis suggests that the field is not yet organised around a narrow canonical centre. Instead, it appears to be evolving through parallel clusters of scholars who share an interest in methodological innovation but apply it to different analytical objects: failure prediction, forecasting, disclosure interpretation, ESG reporting and sustainability-linked performance evaluation. This helps explain why the recent expansion of the literature is accompanied by thematic diversification rather than by simple cumulative growth.

Discussion

The combined evidence from the trend-topic analysis and the co-word dendrogram provides a clear, if nuanced, answer to the study's research questions. Multiple families of computational methods are emerging across the corpus, and their emergence is not uniform: it follows a structured, temporally layered process in

which new methods attach to progressively expanded analytical objects rather than displacing the traditional financial-statement core. The most accurate characterisation of the methodological transformation underway is therefore not substitution but rearticulation: FSA is acquiring new instruments and extending its reach, while retaining the inferential ambition that has defined the field since its empirical foundations (Ou & Penman, 1989; Lev & Thiagarajan, 1993).

Temporal trajectory and phases of methodological reconfiguration

The temporal trajectory of the field suggests that this rearticulation has proceeded in three broadly identifiable phases whose sequencing is not arbitrary. The earliest visible layer (pre-2019) reflects a broad decision-support framing in which financial statement analysis was approached as an information-processing domain without yet being reshaped by dedicated computational architectures. The intermediate phase (2019–2023) is marked by the progressive entry of reporting-architecture concerns into the thematic core of the field, signalling that the informational object of FSA was expanding before the methods used to analyse it had fully adapted. The most recent phase (2023–2025) completes the reorientation: machine learning, artificial intelligence, NLP and digital transformation become co-visible with financial statements and sentiment analysis, indicating that the methodological response has arrived at scale. This three-phase sequence is coherent with the disclosure processing cost framework developed by Blankespoor et al. (2020). As the informational object expanded, the cost-benefit calculus of deploying computational methods shifted. Methods that would have been disproportionately expensive relative to the analytical gains they offered on narrowly structured numerical statements became progressively more tractable as disclosures grew in volume, textual complexity and structural heterogeneity. The 2021+ growth inflection point in the publication curve reinforces this reading: it coincides with the widespread availability of pre-trained language models, the extension of iXBRL mandates to major reporting jurisdictions and the institutionalisation of ESG reporting under frameworks subsequently formalised through the CSRD/ESRS architecture. The acceleration is, in this sense, endogenous.

Conceptual architecture of the field: The five-cluster structure

The co-word dendrogram brings the conceptual architecture of this transformation into structural relief. Interpreted jointly, the five clusters do not reveal a fragmented field but a centrifugally differentiated one – that is a field organised around a strong, persistent centre from which more specialised thematic and methodological extensions radiate outward as concentric layers, rather than coexisting as disconnected niches: new methods and informational objects are being added at the periphery while the traditional analytical core remains recognisable at the centre. Each cluster occupies a distinct position in this architecture and corresponds to a specific dimension of the methodological reconfiguration currently underway.

The red cluster: Reconfiguration of the traditional core

The red cluster's internal reconfiguration: computational and diagnostic logics embedded within the traditional FSA core rather than appended to it, is the most structurally significant finding of the mapping. This is the rearticulation that the foundational literature anticipated but could not yet operationalise: the inferential agenda of Ou and Penman (1989) and Lev and Thiagarajan (1993) is now being pursued with fundamentally different instruments, applied to a broader and more heterogeneous informational object.

The persistence of this cluster across a decade of bibliometric output reflects what Blankespoor et al. (2020) identify as the enduring information-processing demands placed on financial statement users: even as analytical tools evolve, the foundational structure of the income statement, balance sheet and cash flow statement continues to organise the field's cognitive architecture. This observation is consistent with the historical perspective offered by Ou and Penman (1989) and subsequently by Lev and Thiagarajan (1993), whose articulation of fundamental signals established the template for ratio-based and accrual-based inference that still constitutes the baseline against which new methods are benchmarked. The survival of this cluster thus does not indicate analytical stasis. Rather, it confirms that the conceptual vocabulary of traditional FSA remains the

referential grammar of the discipline, even as its syntax is increasingly rewritten by algorithmic and computational methods documented in adjacent clusters.

The green cluster: The computational learning engine

Immediately adjacent to the red core, the green cluster captures the methodological engine driving the current reconfiguration: machine learning, deep learning, learning algorithms, text mining and predictive analytics. Its proximity to the central cluster is structurally significant; it maps, in spatial bibliometric terms, the process by which computational methods have been internalised rather than appended to the traditional analytical domain. The field is being redefined not only by what it studies, but by how it studies it: the shift from traditional *ex post* interpretation towards automated, model-driven analysis is directly reflected in the thematic weight of this cluster (Liaras et al., 2024; Li & Zhou, 2024; Hasan et al., 2025).

The consolidation of this methodological cluster reflects a broader disciplinary shift that Liaras et al. (2024) characterise as the transition from interpretive to model-driven financial analysis. In this reconfigured framework, the analyst's role shifts from applying standardised ratios to curating training datasets, selecting model architectures and evaluating out-of-sample predictive performance. The practical implications of this transition are already visible in the empirical literature: gradient boosting and neural network models consistently outperform logistic regression on bankruptcy prediction tasks, while hybrid architectures combining textual and numerical signals demonstrate incremental accuracy gains that no individual feature class achieves alone. At the same time, the cluster's lexical proximity to text mining and natural language processing underscores the dual nature of the machine learning contribution; simultaneously a computational method and an information-extraction strategy, operating on structured financial data and unstructured narrative disclosure alike.

The purple cluster: Applied predictive outputs

If the green cluster reflects methodological potential, the purple cluster reflects its practical deployment: forecasting, data mining, and classification as

decision-oriented outputs. Their joint adjacency to the red core suggests that this deployment is being absorbed into the mainstream analytical domain rather than remaining confined to specialised technical sub-fields (Nießner et al., 2022; Wang & Kang, 2025; Zeng & Dai, 2025).

The applied orientation of this cluster is significant for understanding the practical trajectory of the field. Whereas the green cluster documents methodological capability, the purple cluster documents deployment: the transformation of that capability into working decision-support systems, credit-scoring models and regulatory-grade classification tools. Liaras et al. (2024) observe that this deployment logic increasingly shapes how financial institutions procure and evaluate analytical services, creating feedback loops between academic model development and commercial system design. For the bibliometric mapping, the fact that output-oriented terms cluster separately from method-oriented terms suggests that the research community has developed distinct epistemic norms around the building of methods and the reporting of outcomes; a division of labour that may warrant closer attention in future systematic reviews of the field's practical impact.

The blue cluster: Sustainability and governance extension

The blue cluster extends the informational scope of FSA beyond the narrow interpretation of financial statements as purely quantitative artefacts. FSA is increasingly embedded in a wider disclosure architecture where non-financial information, stakeholder-oriented transparency and sustainability communication matter alongside conventional financial indicators (Ferjančič et al., 2024; Seow, 2025; Qian et al., 2025).

The growth of this cluster acquires additional urgency in the context of regulatory developments underway at the time of writing. The European Union's Corporate Sustainability Reporting Directive (CSRD), effective for large undertakings from 2024, imposes mandatory double-materiality reporting that substantially expands the informational perimeter of what constitutes a financial statement. Ferjančič et al. (2024) document how preparers are responding to this expansion, and Seow (2025) analyses the implications for analytical practice. Both

contributions reinforce the view emerging from the bibliometric evidence: that sustainability is no longer a supplementary disclosure layer but a constitutive element of the informational environment in which financial analysis is conducted. For researchers in the field, this regulatory acceleration implies that co-word proximity between ESG terms and core FSA vocabulary will likely intensify further, making the blue cluster one of the fastest-growing areas of the literature in the coming years.

The yellow cluster: The language-processing frontier

The yellow cluster's distance from the central core is not merely spatial but epistemological: it signals that language-processing approaches represent a frontier-facing stream that has not yet been absorbed into the dominant analytical core of FSA. This positioning is consistent with the observation by Bochkay et al. (2023) that NLP approaches in accounting are still navigating unresolved questions of construct validity and domain-specific adaptation. The conference paper share of the corpus reinforces this reading: frontier experimentation in LLMs and generative AI is producing outputs that have not yet fully migrated to journal consolidation (Stratopoulos & Wang, 2025).

The conceptual distance of this cluster from the computational core is not merely spatial but epistemological. Natural language processing and automated text interpretation operate on a fundamentally different category of financial data that traditional ratio-based and even machine-learning-based approaches do not adequately capture. The foundational lexical resources developed by Loughran and McDonald (2011, 2016) established the empirical basis for this research trajectory, demonstrating that generic sentiment dictionaries systematically misclassify financial language and that domain-specific lexicons are required. Subsequent contributions by Bochkay et al. (2023) and by Stratopoulos and Wang (2025) have extended this insight into earnings call transcripts, MD&A sections and forward-looking disclosures, showing that language choices by management carry systematic information content beyond what structured numerical data convey. The yellow cluster thus represents the frontier where FSA intersects with computational linguistics and communication theory.

Reading the five clusters together, the co-word structure reveals a field in organised transition. The red cluster acts as a centripetal anchor, while the green and yellow clusters operate as centrifugal forces extending the field's reach in complementary directions: the former through structured numerical prediction, the latter through unstructured language interpretation. The purple and blue clusters occupy intermediary positions, translating methodological capability into applied outputs and expanding the thematic scope towards sustainability and governance. This architecture is not accidental. It reflects the underlying logic of what Blankespoor et al. (2020) call the disclosure-processing cost framework: as processing costs decline through automation and computational scaling, the informational perimeter of the field expands to accommodate data types and analytical questions that were previously prohibitively expensive to address. The bibliometric map is, in this sense, a structural record of how declining processing costs have reorganised the research frontier of financial statement analysis over the past decade.

The absent cluster: Digital corporate reporting as invisible infrastructure

Against the legibility of the five-cluster structure, the non-emergence of a distinct digital corporate reporting cluster is itself an interpretable finding rather than a gap in the evidence. Two readings are available. The first is a corpus-level explanation: keyword-based filtering on methodological innovation may have underweighted the digital reporting literature, which often organises itself around regulatory and standardisation vocabulary rather than analytical method terms. The second, and arguably more substantive, reading connects to the characterisation by Troshani and Rowbottom (2021) of digital reporting research as fragmented and sparse across the reporting supply chain, and to the argument by Rowbottom et al. (2021) that taxonomy design is performative but structurally invisible to the users of the resulting data. If digital reporting is functioning as background infrastructure rather than as a recognised research programme within the FSA community, its partial absorption into the red and blue clusters is expected rather than surprising. The implication is not that digital reporting is unimportant; it is that its influence on FSA methodologies may be indirect and

undertheorised, and that future work should attend explicitly to the infrastructure–analytics interface rather than treating data quality and structure as given.

Geographical and social structure of the field

The geographical collaboration evidence contextualises and reinforces the thematic findings. China’s position as the most visible international hub reflects the concentration within Chinese and Sino-international research of precisely the problem settings that dominate the computational and sustainability clusters: AI-assisted investment analysis, ML-based bankruptcy prediction, digital reporting adoption and the FSA–sustainability intersection. More interpretively significant than the China and Asia-Pacific patterns documented in section *Geographical collaboration patterns* is the relative absence of strong European and North American hub structures, despite the fact that the most consequential current driver of sustainability disclosure standardisation, the CSRD/ESRS framework, is a European regulatory initiative. This pattern may indicate a lag between regulatory development and research output that bibliometric evidence can identify but not causally explain. If so, it points to a high-priority empirical opportunity: the research community best positioned to analyse the analytical consequences of CSRD-compliant sustainability disclosures is not yet the most bibliometrically visible contributor to this literature. The dispersed authorship structure reinforces this picture of a field in structural transition, generating methodological innovation across multiple entry points without yet having consolidated around a canonical intellectual centre.

Unresolved methodological tensions

The growth and hybridisation documented across the corpus do not, however, resolve the methodological tensions that the introduction flagged. The dominance of ML methods in the green cluster does not guarantee that those methods are being applied with sufficient attention to accounting meaning, construct validity or audit-trail requirements. The concerns raised by Loughran and McDonald (2011, 2016) regarding domain-specific validity in textual analysis apply with at

least equal force to the broader ML and predictive analytics literature. The identification by Seow (2025) of data standardisation and explainability as persistent structural problems in ESG-ML research points to a gap that the bibliometric evidence can observe but cannot close: the field is innovating rapidly, but the rigour conversation has not kept pace with the rate of methodological adoption. This asymmetry between innovation speed and validation depth is arguably the most consequential open problem the present mapping identifies.

Intercultural dimensions of methodological transfer

A further unresolved tension emerges when the methodological evidence is read against the intercultural dimension of FSA practice. Computational methods, particularly those grounded in NLP, are rarely culturally neutral. Sentiment dictionaries developed for English-language US filings encode American disclosure conventions and rhetorical norms; transferring them to filings prepared in different languages and under different accounting cultures introduces measurement error that is itself culturally patterned. Loughran and McDonald (2011) demonstrated this problem within a single language; the multilingual and multi-jurisdictional expansion of FSA documented in this corpus suggests it now operates at a substantially larger scale. Similarly, large language models trained predominantly on English corporate text may underperform when applied to disclosures shaped by collectivist communication styles, indirect rhetorical conventions or different materiality frameworks. The bibliometric evidence cannot resolve these tensions, but it can identify them as priority areas. Future research at the intersection of intercultural management and computational FSA should examine how analytical models perform across reporting cultures, how cross-border analyst teams navigate interpretive disagreements amplified by AI tools, and how international standard-setters can design taxonomies that remain machine-readable without flattening the cultural specificity of disclosure practices.

Limitations

Several limitations of the study should be acknowledged. Scopus coverage, while broad, may underrepresent regional journals and non-English-language contributions; this may partially account for the relative underrepresentation of European digital reporting research noted above. The keyword-based corpus construction introduces a dual risk: relevant contributions that use different terminology may have been excluded, while some included studies may sit adjacent to, rather than strictly within, the domain of financial statement analysis as defined here. Co-word analysis maps thematic proximity as evidenced by keyword co-occurrence, but it cannot capture theoretical lineage, methodological quality or the direction of influence between streams; the clusters should be read as empirical configurations rather than as causal genealogies. The study also inherits the intrinsic limitations of Scopus in terms of author disambiguation: surname-initial combinations may conflate distinct researchers or fragment a single author's output across name variants, particularly for East Asian contributors; the author-level analysis in Table 3 should accordingly be read as name-cluster productivity rather than individual attribution. Finally, the corpus was extracted on 3 April 2026, and the field is evolving rapidly enough that some findings, especially those concerning the yellow cluster and the conference paper frontier, may already require updating.

Implications for research and practice

These limitations notwithstanding, the mapping offers actionable signals for both researchers and practitioners. For researchers, the clearest implication is the need for integrative, cross-stream work: the vertical reviews that have mapped individual streams – NLP in accounting (Bochkay et al., 2023), ML in finance (Liaras et al., 2024), ESG analytics (Seow, 2025), digital reporting (Troshani & Rowbottom, 2021) – each capture part of the conceptual architecture revealed by the dendrogram, but necessarily miss the dynamics at the intersections. Studies that treat the five clusters as analytically connected rather than as separate research programmes are likely to produce the most substantively

novel contributions at the current frontier. The underrepresentation of European digital reporting research, combined with the regulatory urgency of the CSRD/ESRS rollout, points to a high-priority empirical gap that the present mapping can locate but not fill. For practitioners and standard-setters, the embedding of AI and fraud detection within the traditional FSA core indicates that the computational re-tooling of analytical workflows is not a future prospect but an ongoing structural transformation. The open problem of explainability and interpretability in these applications is therefore not merely academic: it is operationally relevant for audit firms, financial analysts and regulators who must account for how analytical conclusions are reached and what assurance can be attached to computationally generated outputs.

Final remarks

This paper set out to map the recent methodological reconfiguration of financial statement analysis using a Scopus-based bibliometric design applied to a corpus of 454 documents published between 2015 and 2025. It proceeded from the theoretical presupposition that methodological innovation in FSA is an endogenous response to changing disclosure processing costs (Blankespoor et al., 2020): as the informational object of the field has expanded to absorb narrative disclosures, sustainability reporting and machine-readable digital formats, the cost-benefit calculus of deploying computational methods has shifted from disproportionate through tractable to necessary. It further presupposed that FSA is most productively understood as a data-type × task × method ecosystem rather than as a fixed set of ratio-based techniques – a conceptual reframing that justified constructing a corpus spanning NLP, ML, ESG analytics and digital reporting, and that enabled the identification of cross-stream dynamics not accessible through vertical reviews of individual sub-fields.

The evidence supports a unified interpretive claim: the 2015–2025 period FSA has not abandoned its foundational inferential ambition, but is now pursuing it with fundamentally different instruments and across a more heterogeneous

informational object. The temporally structured pattern of methodological adoption is consistent with the processing cost logic: each phase corresponds to a moment at which the expansion of the informational object made a new category of methods economically and technically tractable. The 2021+ growth inflection, coinciding with the availability of pre-trained language models, the extension of iXBRL mandates and the institutionalisation of ESG reporting, is not incidental but endogenous to this dynamic.

The conceptual structure of the field, as revealed by the co-word dendrogram, is centrifugally organised. The red cluster remains dominant but has been internally reconfigured: artificial intelligence, sentiment analysis and fraud detection are now embedded within it rather than external to it. Surrounding this rearticulated core, the green and purple clusters form an immediately adjacent computational layer, while the blue and yellow clusters extend progressively outward towards sustainability-governance concerns and the NLP frontier, respectively. This architecture confirms that recent innovation is additive rather than substitutive: new methods and informational objects are accumulating at the periphery while the traditional core persists, yielding a field that is simultaneously more capable and more conceptually dispersed than it was a decade ago. The non-emergence of a distinct digital reporting cluster is the most revealing finding of this kind: XBRL- and taxonomy-related terms are absorbed into adjacent clusters, suggesting that digital reporting is functioning as invisible infrastructure – enabling the computational and sustainability streams without generating a visible research community of its own, a result consistent with the characterisation of this literature as fragmented and sparse (Troshani & Rowbottom, 2021) and with the argument that taxonomy construction is performative but structurally invisible to downstream users (Rowbottom et al., 2021).

The paper makes three contributions. Theoretically, it operationalises the disclosure processing cost framework (Blankespoor et al., 2020) at the level of collective research practice rather than individual investor behaviour, demonstrating that the phased adoption of computational methods in FSA is empirically traceable to successive expansions of the informational object – a result that both validates and extends the framework beyond its original application. Empirically, it provides the first bibliometric mapping explicitly focused on the

methodological discontinuity of the 2015-2025 period, producing a five-cluster architecture and a three-phase temporal structure that are original contributions not available from the prior comprehensive bibliometric review of FSA (Malchev et al., 2025) or from any of the vertical reviews covering individual streams (Liaras et al., 2024; Seow, 2025). Methodologically, it demonstrates that reframing FSA as a data-type × task × method ecosystem renders the fragmented literature on NLP, ML, digital reporting and ESG analytics mutually comparable: a conceptual contribution that holds independently of the specific bibliometric results and that may serve as an organising framework for future integrative research.

The five-cluster architecture generates a structured and prioritised research agenda. The most pressing need is integrative cross-stream research: the centrifugal structure of the field means that the most consequential analytical developments are taking place at the intersections between clusters that are currently studied in isolation. Future studies should explicitly design corpora and analytical frameworks that treat the five clusters as connected subsystems, with particular attention to the interface between the computational layer and the sustainability extension. Closely related is the infrastructure-to-analytics pipeline: the non-emergence of a distinct digital reporting cluster signals that the relationship between taxonomy design, XBRL data quality and downstream analytical feasibility remains undertheorised (Troshani & Rowbottom, 2021; Rowbottom et al., 2021). Future research should map this pipeline explicitly rather than treating structured data as a given input to ML models. The geographical evidence generates a third priority: European FSA research on CSRD/ESRS analytics. The lag between the regulatory ambition of the European sustainability reporting framework and the bibliometric visibility of European scholars in this corpus is a structural gap that empirical and methodological studies should urgently address, examining how CSRD-compliant disclosures are being structured, processed and analytically exploited.

Two further priorities concern the methodological integrity and the frontier trajectory of the field. On integrity: the dominance of ML methods in the green cluster does not guarantee that they are being applied with accounting-consistent construct validity, explainability, or audit-trail requirements. Following Bochkay et al. (2023) and Loughran and McDonald (2011), future research

should develop domain-specific validation frameworks that address the specific interpretive demands of accounting and regulatory contexts: frameworks that go beyond predictive accuracy to ask what computational measures actually mean in the accounting sense, whether they can be replicated across reporting regimes and jurisdictions and whether they satisfy the transparency requirements that audit and regulatory oversight impose. On the frontier: the yellow cluster's peripheral position and the concentration of conference papers in LLM and generative AI applications signal that this methodological wave is real but not yet consolidated. Structured research programmes on LLM-based financial document analysis represent the most consequential open agenda this mapping has identified (Stratopoulos & Wang, 2025).

Future research may also address methodological constraints by integrating Web of Science data, extending the time horizon, and combining co-word with co-citation and bibliographic-coupling analyses in a multi-layer network framework.

Beyond its methodological contribution, the study has implications for intercultural management research. The geography of collaboration, the language-processing frontier, and the uneven adoption of AI-based analytical tools across reporting jurisdictions all indicate that FSA is becoming a domain in which culture, language and institutional context shape what computational methods can credibly measure. Reframing FSA as a data-type × task × method × jurisdiction ecosystem – adding the intercultural axis to the three already discussed – opens a research agenda at the intersection of accounting, computer science and intercultural management. This agenda is particularly relevant for global enterprises whose internal financial reporting must satisfy multiple cultural and regulatory audiences simultaneously, and for analysts working across linguistically and institutionally heterogeneous markets.

What the field now requires is not more vertical depth in any individual cluster but analytical frameworks capable of operating across all five simultaneously: integrating the inferential ambition of traditional FSA, the computational power of ML and NLP, the expanding informational scope of sustainability disclosure and the enabling but largely invisible infrastructure of digital reporting. The bibliometric evidence presented here establishes that the field has the

structural preconditions for such integration: a rearticulated core, an adjacent computational layer and progressively outward extensions towards sustainability and language-processing frontiers. Realising that integration, however, requires crossing the disciplinary and methodological boundaries that the centrifugal architecture of the field has so far kept apart.

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