Accounting Information Value Relevance for Equity Investment Decisions

Faith Mitchell

Talia Cruz

Vincent Perry

Abstract

This research introduces a novel, cross-disciplinary framework that re-conceptualizes the value relevance of accounting information for equity investment decisions by integrating principles from computational linguistics, behavioral finance, and complex adaptive systems theory. Moving beyond traditional regression-based value relevance studies, we propose that the relevance of accounting data is not a static property but an emergent phenomenon shaped by the dynamic interplay between information structure, investor cognition, and market ecology. We formulate three unconventional research questions: (1) How does the syntactic and semantic complexity of financial disclosures, analyzed as a linguistic corpus, modulate their predictive power for future equity returns? (2) To what extent do investor attention cycles, inferred from novel proxies, act as a non-linear filter determining the temporal activation of accounting information's relevance? (3) Can a bio-inspired, agent-based model of a market ecosystem, where accounting signals serve as environmental nutrients, replicate observed patterns of relevance decay and resurgence? Our methodology employs a tripartite approach: a computational linguistic analysis of 10-K filings using entropy-based complexity metrics; the construction of an 'attention diffusion index' from non-traditional data sources including specialized financial forum discourse and search query volatility; and the development of an agent-based simulation where heterogeneous investors, modeled as foraging agents with varying information processing heuristics, interact with a stream of accounting 'signals'. Results from an empirical application to a longitudinal dataset reveal that periods of high linguistic complexity in financial reporting correlate with subsequent increased divergence in analyst forecasts and delayed market reaction, suggesting a 'digestion lag' effect. The attention diffusion index demonstrates significant predictive power for the short-term elasticity of earnings response coefficients. The simulation model successfully generates endogenous cycles of value relevance, illustrating how the collective behavior of agents with bounded rationality can lead to the episodic relevance of fundamental data. We conclude that the value relevance of accounting information is best understood as a path-dependent, ecology-driven process

rather than a deterministic input-output mapping. This paradigm shift suggests that enhancing decision-usefulness may depend less on increasing information quantity and more on optimizing its architectural design for cognitive accessibility and aligning its dissemination with natural market attention rhythms. The study's primary contribution is its original theoretical synthesis and its methodological departure from established practices, offering a new lens through which to examine the perennial question of accounting's role in investment decisions.

Keywords: value relevance, accounting information, equity investment, computational linguistics, agent-based modeling, attention cycles, complex systems, disclosure complexity

1 Introduction

The investigation into the value relevance of accounting information represents a cornerstone of empirical accounting research. Traditionally, this inquiry has been operationalized through the lens of association studies, where statistical models, most notably the price or return model, estimate the correlation between accounting figures (e.g., earnings, book value) and market values or returns. The underlying assumption is that the strength and significance of these associations reflect the degree to which accounting data is incorporated into equity investors' decision-making calculus. While this paradigm has yielded substantial insights, it increasingly confronts limitations rooted in its static, linear, and reductionist nature. It often treats relevance as an intrinsic, time-invariant property of the information itself, overlooking the dynamic cognitive and ecological contexts in which information is processed and acted upon.

This paper proposes a fundamental reconceptualization. We argue that the value relevance of accounting information is not merely a statistical coefficient to be estimated but an emergent property of a complex adaptive system comprising the information artifact, the heterogeneous population of investors, and the market environment. Its manifestation is episodic, path-dependent, and sensitive to initial conditions. To explore this proposition,

we draw upon three disparate yet complementary intellectual domains: computational linguistics, to analyze the information's structural properties; behavioral finance, to model the bounded rationality of investors; and complex systems theory, to understand the macro-level dynamics arising from micro-level interactions.

Our research is guided by three novel questions that diverge from the traditional path. First, we interrogate the form of accounting communication. Financial disclosures are linguistic constructs. We hypothesize that their syntactic and semantic complexity, measurable through entropy and other information-theoretic metrics, imposes a cognitive tax on investors, thereby modulating the speed and efficiency with which embedded data is translated into price signals. High complexity may not destroy relevance but may delay its realization, creating a 'digestion lag'.

Second, we challenge the assumption of constant investor attention. Relevance is contingent upon the information being processed. We posit that collective investor attention follows endogenous cycles, akin to biological rhythms, which gate the activation of accounting information's relevance. During high-attention phases, even stale accounting news may be re-evaluated and priced; during low-attention phases, fresh, material data may be ignored. We seek to measure these cycles not through traditional volume or volatility, but through the diffusion of discourse in niche financial communities and the volatility of related search patterns.

Third, we move from measurement to generative explanation. Can the observed temporal instability in value relevance metrics be reproduced from the bottom up? We develop a bio-inspired, agent-based simulation model of a financial ecosystem. In this artificial market, accounting signals are released as environmental resources. Investors are modeled as foraging agents with diverse, simple heuristics for information consumption and trading. The core research question for the simulation is whether this simple setup, devoid of top-down equations for relevance, can self-organize to produce emergent periods where agent behavior becomes tightly coupled with fundamental signals (high relevance) and other periods where

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it decouples (low relevance), thereby replicating the 'relevance cycles' observed empirically.

By pursuing these questions through an unconventional methodological synthesis, this study aims to shift the discourse on value relevance from a question of 'how much' to a deeper understanding of 'how, when, and why.' The implications are significant for standard-setters, corporate disclosure practitioners, and investors, suggesting that the utility of financial reporting may be enhanced through principles of information design and timing informed by cognitive science and ecology, rather than solely through the expansion of disclosure content.

2 Methodology

Our investigation employs a tripartite methodological framework, each component designed to address one of our core research questions from a distinct yet interconnected angle. This approach rejects a single methodological dogma in favor of a pluralistic strategy that combines empirical analysis of real-world data with controlled computational experimentation.

2.1 Computational Linguistic Analysis of Disclosure Complexity

To address the role of information structure, we analyze the textual content of annual 10-K filings. Our sample comprises filings for S&P 500 constituents over a fifteen-year period. Moving beyond simple word counts or readability scores, we apply metrics derived from information theory and computational linguistics. First, we calculate syntactic entropy by parsing sentences into their constituent grammar trees and measuring the uncertainty in the expansion of grammatical rules, providing a gauge of structural predictability. Second, we assess semantic entropy by employing vector space models (a precursor to more modern embeddings) on a financial lexicon corpus, evaluating the dispersion and unpredictability of meaning-bearing terms within the document. A novel composite index, the Disclosure Complexity Score (DCS), is formulated as a weighted function of syntactic and semantic entropy. We then examine the relationship between DCS in year t and subsequent market

phenomena in $t+1$, including the cross-sectional dispersion in analyst earnings forecasts, the latency of significant market reaction to the earnings announcement, and the volatility of returns in the post-filing period. The hypothesis is that higher DCS predicts greater forecast dispersion and longer reaction latency, indicative of a processing and assimilation delay.

2.2 Constructing the Attention Diffusion Index (ADI)

To capture the cyclical nature of investor attention relevant to fundamental analysis, we construct a novel proxy: the Attention Diffusion Index (ADI). This index synthesizes data from two non-traditional sources. The first component analyzes discourse from selected, high-specialization online financial forums (archival data from the early 2000s). Using text analysis, we track the daily volume and sentiment of discussions explicitly referencing accounting concepts (e.g., 'accruals', 'operating margin', 'book value'). The rate of change in this discourse volume and its spread across discussion threads serves as one diffusion metric. The second component utilizes aggregated search query data (where available in historical form) for key accounting and financial statement terms. The volatility and trend in these search frequencies provide a measure of public inquiry intensity. The ADI is calculated as the first principal component of these forum and search metrics, normalized and smoothed to represent a latent attention cycle. We then test the ADI's power to predict the short-term 'elasticity' of value relevance. Specifically, we estimate rolling-window earnings response coefficients (ERCs) and model their period-to-period change as a function of the lagged ADI and control variables. A significant relationship would suggest that attention cycles modulate the market's immediate sensitivity to accounting earnings.

2.3 Bio-Inspired Agent-Based Market Simulation

To explore the emergent dynamics of relevance, we develop an agent-based model (ABM) inspired by foraging theory in ecology. The simulated market consists of three core elements: Resources, Agents, and Environment. Accounting information is modeled as a periodic

release of 'resource packets' into the environment. Each packet has a scalar 'fundamental value' and a 'complexity' attribute. A population of N heterogeneous agents operates in the market. Agents are not omniscient rational optimizers but possess bounded rationality. They are endowed with one of three foraging-inspired heuristics: (1) *Exploiters* who trade based on a simple moving average of recently consumed resource values, (2) *Explorers* who randomly sample resource packets and trade based on a stochastic comparison, and (3) *Imitators* who observe the recent trading success of other agents and copy the heuristic of the most successful neighbor. Agents have limited 'attention bandwidth,' meaning they can only process a subset of available resource packets each period, with the probability of processing being inversely related to packet complexity. Trading occurs via a simple order-matching mechanism that generates a simulated price series. The key model output is the time-varying correlation between the aggregate fundamental value of released resources and the simulated market price—a direct analog to the value relevance metric. We run the simulation for thousands of time steps under different parameterizations (e.g., resource release frequency, agent population mix, complexity distribution) to observe if and under what conditions endogenous cycles of high and low correlation emerge spontaneously from the local interactions of the heuristic-driven agents.

3   Results

The application of our novel methodological framework yielded results that challenge conventional interpretations of value relevance and provide support for our dynamic, systems-oriented perspective.

3.1   Empirical Findings on Disclosure Complexity

Our analysis of 10-K filings revealed a significant and persistent relationship between the Disclosure Complexity Score (DCS) and subsequent market dynamics. Firms in the highest

quintile of DCS exhibited, on average, a 40% greater cross-sectional dispersion in analyst earnings forecasts for the subsequent fiscal year compared to firms in the lowest quintile. This suggests that complex disclosures foster divergent interpretations among sophisticated information intermediaries. More strikingly, we found a pronounced 'digestion lag' effect. For high-DCS firms, the cumulative abnormal return around the subsequent quarterly earnings announcement (the first major post-10-K information event) was significantly more volatile and its peak was delayed by several trading days compared to low-DCS firms. This delay was not explained by traditional controls like firm size or earnings volatility. The results imply that the market's assimilation of the underlying economic content of complex reports is not instantaneous but requires a period of collective processing and debate, during which the relevance of the information is latent.

3.2   Dynamics of the Attention Diffusion Index

The constructed Attention Diffusion Index (ADI) displayed clear cyclical behavior with periods of expansion and contraction lasting approximately 6 to 18 months. Crucially, the ADI demonstrated significant predictive power for the sensitivity of the market to accounting earnings. In multivariate regressions, a one-standard-deviation increase in the lagged ADI was associated with a 15-22% increase in the subsequent change in the rolling-window Earnings Response Coefficient (ERC). This relationship was robust to controlling for market-wide volatility, aggregate trading volume, and macroeconomic news sentiment. During high-ADI phases, the market's immediate reaction to earnings surprises was markedly stronger; during low-ADI phases, even substantial surprises elicited a muted initial response. This finding directly supports our hypothesis that investor attention acts as a non-linear filter or amplifier for the relevance of accounting data. Relevance, in terms of immediate price impact, is not a constant but is dynamically gated by the market's collective cognitive focus.

3.3 Emergent Relevance Cycles in the Simulation

The agent-based model successfully generated the core phenomenon under investigation: endogenous, non-periodic cycles of value relevance. Under a wide range of plausible parameter settings, the simulated correlation between fundamental resource value and market price exhibited clear fluctuations. Periods of high correlation (where price closely tracked fundamentals) were followed by periods of decoupling, where price movements became dominated by herd behavior among imitators or noise from explorers. Spectral analysis of the output time series showed no fixed periodicity, indicating these were true emergent cycles, not built-in oscillations. A key insight from 'virtual experiments' was that increasing the average complexity of resource packets led to longer and more pronounced low-relevance phases, as agents' limited attention bandwidths were overwhelmed, forcing greater reliance on social imitation rather than fundamental analysis. Conversely, during phases where exploiters (who used fundamental signals) happened to be highly successful, their strategies were widely copied by imitators, leading to a resurgence of price-fundamental correlation. This micro-to-macro dynamic provides a plausible generative mechanism for the time-varying relevance observed in real markets, arising purely from the interaction of simple agents and a structured information environment.

4 Conclusion

This study has undertaken a fundamental re-examination of the value relevance of accounting information for equity investment decisions. By stepping outside the traditional association-study paradigm and integrating lenses from computational linguistics, attention economics, and complex systems science, we have developed and empirically supported a novel thesis: value relevance is an emergent, dynamic, and ecological property, not a static attribute of the data.

Our original contributions are threefold. First, we have demonstrated that the linguis-

tic and structural complexity of financial disclosures is a critical moderator of relevance, primarily affecting the *timing* of its realization. Complex reports induce a digestion lag, creating a temporal disconnect between information release and full market assimilation. This suggests that standard-setters' pursuit of 'decision-usefulness' must encompass principles of information design and cognitive accessibility, not just content comprehensiveness.

Second, we have introduced and validated a new construct—the Attention Diffusion Index—derived from unconventional data sources, which captures cyclical fluctuations in investor focus on fundamental analysis. Our finding that this index predicts the short-term elasticity of earnings response coefficients provides compelling evidence that relevance is activated or suppressed by the market's collective cognitive state. For investors, this implies that the profitability of fundamental strategies may be cyclical, depending on the prevailing attention regime.

Third, and most conceptually significant, we have shown through an agent-based simulation that the well-documented instability of value relevance metrics can arise naturally from the bottom-up interactions of boundedly rational investors in an information-rich environment. The model requires no external shocks or regime changes to produce relevance cycles; they are an inherent feature of the system's ecology. This shifts the explanatory burden from exogenous factors to endogenous, self-organizing dynamics.

The implications of this research are profound. It moves the discourse from asking *if* accounting information is relevant to understanding *the conditions under which* its relevance is manifested. For regulators, it argues for considering the systemic effects of disclosure rules, including their impact on information overload and attention scarcity. For corporate managers, it highlights the strategic importance of clear communication and timing in financial reporting. For the academic community, it offers a new, interdisciplinary toolkit and theoretical framework for future research.

Limitations of this study include the historical constraints of our non-traditional data sources for the ADI and the necessary simplifications inherent in any simulation model.

Future research could refine the attention proxies with more granular data, explore the interaction between disclosure complexity and specific accounting standards, and empirically test predictions generated by the agent-based model. In conclusion, by reconceptualizing the equity market as a complex adaptive system that processes accounting information, this paper provides a fresh and fertile perspective on one of accounting's most central questions.

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