▪ Advances in Scientific and Applied Accounting, ▪ ISSN 1983-8611 ▪ São Paulo ▪ v.18, n.3 ▪ p. 006-010 ▪ Sep. / Dec. 2025
▪ DOI: 10.14392/asaa.2025180301

Accounting and Finance in the Age of AI: The Leap from Statistical Inference to Objective Solution

Moacir Manoel Rodrigues Junior[1], **Marcelo Botelho da Costa Moraes**[2]

[1] Universidade Federal de Santa Catarina (UFSC), Florianópolis, Santa Catarina, Brasil
[2] Universidade de São Paulo (USP Ribeirão Preto), Ribeirão Preto, São Paulo, Brasil

[1]moacir.rodrigues@ufsc.br
[2]mbotelho@usp.br

The technological evolution occurring in recent times presents the scientific community with new challenges and perspectives for the advancement of human knowledge. The impact on theoretical discussions and the development of knowledge is largely tied to how the corporate and social environments adapt to the increasing availability of advanced technological tools. The current debate centers on the application of Data Science approaches (Artificial Intelligence, Machine Learning, Process Automation, among others) in decision-making processes, whether for generating information for internal users or for external stakeholders, such as investors, regulators, and civil society.

Artificial Intelligence, and Data Science as a whole, are not entirely new topics. Since the 1940s, models for solving specific problems have been undergoing computational alternatives to streamline the process of "concluding" a task. The war effort of that decade led to the emergence of scientific fields such as Operations Research, with study groups focused on resource optimization, and the creation of The Bombe, a machine developed by the British mathematician Alan Turing to break the Enigma code used by Germany during World War II (Haenlin & Kaplan, 2019). Turing's invention paved the way for the tool responsible for all this development today: the computer.

Optimization problems, such as those initially solved by George Dantzig (1914–2005) using the Simplex Method, started to be addressed much faster than human operational capacity could achieve. With the easing of processes to find optimal solutions, other areas began to develop, such as parameter estimation in statistical models, both in classical frequentist and Bayesian frameworks. Estimation methods like Ordinary Least Squares, Maximum Likelihood, eigenvalue and eigenvector estimation, the backbone of regression models, factor analysis, and discriminant analysis shifted from requiring weeks of calculations to, in many cases, just seconds.

How to cite:

Rodrigues Junior, M. M., & Moraes, M. B. da C. (2025). Accounting and Finance in the Age of AI: The Leap from Statistical Inference to Objective Solution. *Advances in Scientific and Applied Accounting,* 18(3), 001–005/006. https://doi.org/10.14392/asaa.2024180301

The foundation of computational modeling studies typically considers the idea of a solution that optimizes a problem, whether by seeking the lowest cost (deviation) or the highest profit (accuracy). In general, computational models aim to solve standard modeling problems—what could be called interchangeable models—that can be applied to various types of situations across multiple fields. This set of models gives rise to strategies for addressing such scenarios, driving the development of areas like Metaheuristics, with Genetic Algorithms, Ant Colony Optimization, Particle Swarm Optimization, and Neural Networks, an area that was first conceptualized in 1943 by Warren McCulloch and Walter Pitts. The development of methods in both approaches often draws inspiration from natural phenomena or existing behaviors in nature that represent strategies for problem-solving. Algorithms based on ant colonies typically address route optimization problems, using a basic graph topology, much like several ant species do. The classic literary analogy for these problems is the so-called Traveling Salesman Problem. Neural Networks, as initially conceived by McCulloch and Pitts (1943), are based on the knowledge-building process that the human mind performs through cerebral synapses, seeking among a set of neurons the paths that connect an action to a reaction.

Understanding the background of Data Science highlights that the main goal for these methods is to design solutions within a feasible scenario. To achieve this, it is also important to consider the application environment or the field of knowledge from which the problems arise. Route optimization or container allocation on a ship are challenges typically faced by logistics professionals. The positioning of a radiotherapy machine for cancer treatment, ensuring the maximum impact on diseased cells while sparing healthy ones, is one of the outcomes that research in medicine has achieved over the years.

The question that arises in this scenario is: what research in Accounting and Finance has produced in this context? At first glance, it can be observed that much has already been accomplished. Since the 1950s, there have been studies employing less robust procedures, such as Monte Carlo Simulation, to investigate scenarios. In fact, many investment and business plans in large corporations use economic and financial feasibility analyses based on simulations of macroeconomic indicators and growth rates. There are also studies that primarily apply linear or logistic regression models or discriminant analysis to forecast returns, demand, revenue, bankruptcy, financial distress, tax evasion, and more. However, it is important to emphasize that the driver for applying these techniques is the specific problem executives and managers are facing.

Miller (1999) describes an especially compelling scenario regarding the origins of Portfolio Theory as proposed by Markowitz (1952), one of the most influential theories in the field of Finance. According to Miller, Harry Markowitz disrupted the status quo by developing an investment portfolio selection model based solely on two statistical parameters: the expected return (mean) and variance of the data distribution. It is worth noting that Markowitz's work originated from his doctoral dissertation in Economics at the University of Chicago. Academic dissertations in economics often focus on the development of generic conceptual models applicable to scenarios were assumptions limit generalization. Progress in research typically arises from relaxing or modifying the premises of established results. The proposition of models, sometimes heuristics, as solutions to specific problems was a more common practice in business school theses. The traditional logical deduction of economic models was replaced as a strategy for analyzing financial assets, thereby addressing a specific problem, albeit one that is common in portfolio management.

Still according to Miller (1999), this logic is reversed when the premises of the Capital Asset Pricing Model (CAPM) were formulated by William Sharpe in his economics doctoral dissertation at the University of California, Los Angeles. Despite having more experience in Business Schools, Sharpe developed his dissertation following the normative approach more typical of economics programs at the time. In Sharpe's (1964) study, the central idea was: if Markowitz's (1952) portfolio selection model is accepted as valid, then asset pricing should factor in compensation for both the time value of investment and risk exposure. In this context, Sharpe was able to model the estimator for what would be the systematic risk of an asset, or the ratio between the covariance of the asset being evaluated with a market-representative portfolio, and the variance of that portfolio.

This progression highlights the differing schools of thought that have been essential to research development, especially in finance. More normative models tend to focus more on the phenomenon under investigation and less on the ultimate solution to the problem. The evolution of research in asset pricing illustrates this; for example, Fama and French (2018) show how to select factors that maximize the explanatory power of Sharpe's ratios for a portfolio. The main emphasis is on exploring the problem based on the underlying phenomenon or what might help explain its existence. The core issue, from the outset, is estimating how much an asset is worth or what kind of return to expect from it.

An important factor that has enabled these lines of research for many years—and which was accelerated by advances in computing and provided the primary insight for Markowitz—is Statistics. Since the rise of Positive Research, notably in Accounting with Ball and Brown (1968) and Beaver (1968), the research landscape in Accounting and Finance has shifted toward empirical verification of conceptually modeled phenomena. Theories gained strength and served as "benchmarks" for analyzing certain scenarios, such as Agency Theory, Information Asymmetry, and the Efficient Market Hypothesis, among others. Generally, especially in Financial Accounting, Corporate Finance, and Capital Markets, research links the corporate environment to pre-established theoretical models through inferential statistical methods. In some ways, these studies have become more robust in their statistical methods than in their depth analysis of the phenomena themselves.

For instance, one of the most researched issues in Corporate Finance is predicting corporate bankruptcy. In Altman (1968), the discussion was about applying an early twentieth-century statistical method to forecast bankruptcy, thereby estimating the probability of default. The model proposed at the time addressed the prediction of bankruptcy or, at a minimum, what the literature refers to as insolvency risk or financial distress. Altman's contribution utilized discriminant analysis to solve an operational problem, but later usage focused more on determining which variables most affect the phenomenon, as seen in Altman, Iwanicz-Drozdowska, Laitinen, and Suvas (2016).

The study of phenomena still dominates research in Financial Accounting and Finance. Most published research relies on statistical inference to validate research hypotheses, always seeking empirical evidence for what theory has already outlined as the "standard" model. This research paradigm which, in some hard sciences or engineering fields, is called basic research, is crucial for understanding the causes and consequences of decision-making processes. However, there is a next step: applied research, as termed in those fields, where the investigation aims to deliver actionable solutions to decision-makers.

This shift in perspective means moving from studies focused on how a problem might be solved to research centered on delivering solutions for the decision-maker. Here, the researcher stops focusing on the factors influencing the decision process—since, after more than seventy years of research, the main issues in finance and financial accounting are well-mapped—and instead targets a final answer or a decision strategy. This change in perspective is expected to become even more pronounced with the integration of the third pillar of Data Science: computational models.

As noted earlier, computational models that focus on problem-solving are more directly oriented toward actionable outcomes rather than the paths leading to them. In some approaches, such as Neural Networks, the process resembles a simulated experiment based on a natural event. Beyond the statistical modeling perspective, research that leverages Artificial Intelligence or any Data Science method tends to emphasize the nature of the original problem and its proposed solution, rather than the theoretical background that led there.

The research paradigm shift when applying Data Science is closely tied to the kind of problem being addressed. Selecting the target variable is critical for defining the methodological path to be used. For many users, machine learning, artificial intelligence, or even automated data collection processes are perceived as "black boxes." Still, the main foundation in all these approaches is the response provided to the presented problem—and, increasingly, the system's own problem-solving capabilities.

These tools can significantly enhance discussions in Finance and Accounting. When stock market participants noticed that news related to the American actress Anne Hathaway affected the market positioning of Berkshire Hathaway—where American businessman Warren Buffet is a shareholder—it became evident that something beyond fundamental and technical analysis was influencing operations, a phenomenon dubbed "The Hathaway Effect." Following the automation of trading sessions, the market began to be directly impacted by trading bots, which use Big Data to analyze and forecast the market in real time. This is a natural development of such operations and presents a vital avenue for scientific debate, relevant to all types of transactions and disclosures.

Classic issues like portfolio optimization, capital structure, investment construction, and cash management remain present and still require investigation. Scientific research should aim to understand the nature of the problem, assess what properties the available data offer, and determine how management can gain precision and agility in response. It is crucial to recognize, especially within the more focused realm of Finance and Financial Accounting research, that the approach to the problem—using Data Science—is the key to building the solution.

Currently, in the scientific landscape—particularly within the Brazilian research community—there is still limited adoption of studies involving Artificial Intelligence, Big Data, Machine Learning, and similar technologies. The most frequently addressed issue is data collection, especially through Computational Automation. Some studies on the readability of financial reports and sentiment analysis in social media posts use automated data collection models to build their databases. These studies are evolving to solve a problem relevant to both the market and academia: access to information. However, issues of greater interest to the market—such as predicting the optimal cash balance or risk management—also exist.

Classic problems, like Altman's Z-score, are being revisited, now with a focus on predicting financial distress—

just as the original 1968 work intended—but utilizing Machine Learning instead of Discriminant Analysis, as seen in Barboza, Kimura, and Altman (2017). The rise of quantitative investment funds opens a new avenue for research with an emphasis on management methods that enable faster, less biased decision-making.

This suite of techniques, methods, and tools—under the broad concept of Artificial Intelligence (AI)—enables significant improvements in operational efficiency and the accuracy of decision-making and practices in Accounting and Finance. Technologies such as Machine Learning and Robotic Process Automation (RPA) simplify routine tasks previously performed by professionals, allowing for faster processing of data and reports (Greenman et al., 2024). For example, AI-based tools can classify vast data sets to identify anomalies and trends, facilitating real-time data analysis (Peng et al., 2023). Automating tasks like data entry not only reduces human error but also frees professionals to focus on strategic decision-making and value-added activities, which boosts overall productivity (Greenman et al., 2024).

AI integration further enables organizations to enhance accountability, ensuring compliance with regulatory standards through proactive risk management (Almufadda & Almezeini, 2021). However, technological advances also raise important considerations regarding ethics, data privacy, and the potential for job displacement in the profession. This shift demands a commitment to continuous education and the development of new skills aligned with technological advancements in the sector (Tandiono, 2023). Research in Corporate Finance, Capital Markets, and

Financial Accounting as a whole, to achieve practical applications of Data Science, must increasingly incorporate programming skills. The research paradigm in these fields has evolved from normative studies to a more empirical approach, where theoretical models were validated through statistical inference. With the expansion of Data Science, programming will become integral for delivering more objective solutions to current problems. Understanding the ultimate problem is always the first step. Designing the response model is a direction that research should rapidly pursue in the coming years. To this end, it is necessary to intensify the competencies of research teams in statistical modeling and computational implementation of decision models, without neglecting the essential effort to understand the phenomenon itself.

References

Almufadda, G. and Almezeini, N. (2021). Artificial intelligence applications in the auditing profession: a literature review. Journal of Emerging Technologies in Accounting, 19(2), 29-42. https://doi.org/10.2308/jeta-2020-083

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. The Journal of Finance, 23(4), 589-609.

Altman, E. I., Iwanicz-Drozdowska, M., Laitinen, E. K., & Suvas, A. (2017). Financial distress prediction in an international context: A review and empirical analysis of Altman's Z-score model. Journal of International Financial Management & Accounting, 28(2), 131-171.

Ball, R., & Brown, P. (2013). An empirical evaluation of accounting income numbers. Journal of Accounting Research, 6(2), 159-178.

Barboza, F., Kimura, H., & Altman, E. (2017). Machine learning models and bankruptcy prediction. Expert Systems with Applications, 83, 405-417.

Beaver, W. H. (1968). The information content of annual earnings announcements. Journal of Accounting Research, 67-92.

Fama, E. F., & French, K. R. (2018). Choosing factors. Journal of Financial Economics, 128(2), 234-252.

Greenman, C., Esplin, D., Johnston, R., & Richard, J. (2024). An analysis of the impact of artificial intelligence on the accounting profession. Journal of Accounting, Ethics & Public Policy, 25(2). https://doi.org/10.60154/jaepp.2024.v25n2p188

Haenlein, M., & Kaplan, A. (2019). A brief history of artificial intelligence: On the past, present, and future of artificial intelligence. California Management Review, 61(4), 5-14.

Markowitz, H. (1952). Portfolio Selection. The Journal of Finance, 7(1), 77-91.

McCulloch, W. S., & Pitts, W. (1943). A logical calculus of the ideas immanent in nervous activity. The Bulletin of Mathematical Biophysics, 5, 115-133.

Mgammal, M. (2024). The influence of artificial intelligence as a tool for future economies on accounting procedures: empirical evidence from saudi arabia. Discov Computing, 27(1). https://doi.org/10.1007/s10791-024-09452-7

Miller, M. H. (1999). The history of finance. The Journal of Portfolio Management, 25(4), 95-101.

Peng, Y., Ahmad, S., Ahmad, A., Shaikh, M., Daoud, M., & Alhamdi, F. (2023). Riding the waves of artificial intelligence in advancing accounting and its implications for sustainable development goals. Sustainability, 15(19), 14165. https://doi.org/10.3390/su151914165

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. The Journal of Finance, 19(3), 425-442.

Tandiono, R. (2023). The impact of artificial intelligence on accounting education: a review of literature. E3s Web of Conferences, 426, 02016. https://doi.org/10.1051/e3sconf/202342602016