

SUMMARY

Columbia University Sustainable Finance Seminar

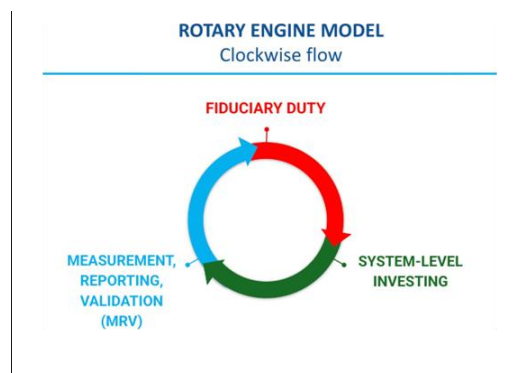
**SFS10: The Impact of AI+ on
Fiduciary Duty, System-level Investing,
and Measurement, Reporting, and Validation (MRV)**

Feb 4, 2026

OVERVIEW

This seminar offered an overview of the powerful impact that AI is having on the key drivers of sustainable investment, particularly fiduciary duty, system-level investing, and sustainability disclosure.

The seminar built on the insights from a two-day convening in June 2025 on “Rewriting the Source Code of Capitalism” organized by the Sustainable Investing Research Initiative (SIRI) and the Rockefeller Brothers Fund (the summary from that meeting is online [here](#)), during which we examined three particularly influential concepts from different domains: fiduciary duty (law), system-level investing (finance), and measurement and disclosure (accounting). While they are often investigated separately, they are locked in a self-reinforcing circle.



Together, they serve as a powerful self-reinforcing “Rotary Engine” of capitalism. Fiduciary duty creates the obligation to consider long-term systemic risks; system-level investing provides the strategies to address those risks; and sustainability measurement and disclosure supplies the information needed to guide decisions and ensure accountability. Within SIRI we have dubbed this dynamic relationship the “Rotary Engine Model” or REM.

Artificial intelligence (AI) constitutes a major technological innovation with disruptive implications for the broader economy, including for the REM. While REM is already contributing to significant developments in sustainable investing, the emergence of “AI+” —the integration of large language models with rapidly expanding datasets derived from remote sensing and other advanced data sources—is likely to accelerate these dynamics, further reshaping, disrupting, and transforming the future trajectory of the field.

The seminar explored the integration of artificial intelligence, machine learning, and advanced sensory technologies, a convergence collectively designated as AI+, and its potential to structurally alter traditional capital market frameworks. In particular, the speakers gave an overview of the powerful impact that AI is having on the Rotary Engine Model—fiduciary duty, system-level investing, and Measurement, Reporting, and Validation (MRV). With a significant influx of forward-looking, highly granular data, AI+ compels capital markets to transition from a reliance on historical metrics toward dynamic, systems-level risk assessments. While AI+ presents potential to align financial returns with planetary health, its novel systemic risks necessitate corresponding innovations in corporate governance, auditing, as well as economic and finance theory.

PART I – KEYNOTE PRESENTATION: AI+ AND THE ROTARY ENGINE OF CAPITALISM

AI+ as a Catalyst

The presentation conceptualized capitalism as a complex system of interconnected frameworks. Historically, experts in each domain have treated the other domains as fixed. Legal experts assume economic rules are canonical, while economists assume the law is immutable. To challenge these entrenched assumptions, the presenters compared them with the scientific community before the discovery of plate tectonics. At that time, the movement of continents was debated but lacked definitive proof. The invention of sonar later mapped the sea floor and provided empirical evidence of continental drift. In a similar way, the advent of AI+ acts as a technological catalyst. It reveals measurable and system level links between planetary health, systemic risk exposure, and long-term financial value creation.

The Rotary Engine Model

The presenters introduced the Rotary Engine Model. Just as a physical rotary engine generates power through continuous circular motion where fuel and air inject at different points to reinforce each other, the capitalist system operates on a similar, self-reinforcing loop:

- **Fiduciary Duty** (rooted in law) dictates the mandate and time horizons for the allocation of investment capital.
- This mandate drives the parameters of **System-Level Investing** (rooted in finance and economics).
- Investors then demand **Measurement, Reporting, and Validation (MRV)** (rooted in accounting) to assess impacts and risks.
- The resulting MRV data feed back into (and currently constrains) the legal awareness of fiduciaries, restarting the cycle.

Defining AI+

Before analyzing its impacts on the Rotary Engine of capitalism, the presenters defined AI+ not simply as artificial intelligence, but as a comprehensive bundle of technologies applied to sustainability and systems analysis. This bundle consists of three distinct layers:

- **Sensors and Data Collection:** A rapidly expanding network of satellites, terrestrial sensors, drones, LIDAR, and bioacoustics gathering biophysical and social data.
- **Modeling and Infrastructure:** Advanced AI and machine learning capabilities, including autonomous AI agents, used to manage and model massive data infrastructures.
- **Decision-Useful Interfaces:** Dashboards and software readouts that embed AI protocols and decision rules directly into the user interface, making voluminous datasets comprehensible for immediate action.

When combined, these three layers can create a continuous feedback loop. Raw, unstructured planetary data is captured by the sensors, synthesized into predictable risk models by the infrastructure, and ultimately delivered to asset managers as clear, quantifiable metrics, which have the potential to bridge the gap between ecological reality and capital allocation.

The Impact of AI+ on the Rotary Engine of Capitalism

Intensifying Fiduciary Duty

A persistent debate in finance is whether fiduciary law, particularly governed by ERISA in the U.S., must be rewritten to permit the consideration of sustainability and systemic risks. The presenters argued that the law does not need to be rewritten; existing duties already demand it.

Specifically, they argued that the duty of loyalty (and impartiality) prohibits fiduciaries from maximizing returns for today's beneficiaries at the expense of tomorrow's. The duty of prudence requires trustees to employ a robust, dynamic, traceable **process** of risk assessment. AI+ acts as a primary catalyst here. By providing predictive data regarding systemic collapse (e.g., climate change impacts on whole industries), AI+ eliminates information asymmetry as a viable defense. Fiduciaries who fail to utilize these forward-looking AI tools to assess long-term risk may soon find themselves in breach of their existing legal duties.

Instead of dictating specific investment outcomes, these duties mandate a highly traceable, defensible process of consideration. As AI+ technology matures, it actively raises the standard of care. Relying strictly on past financial metrics while ignoring dynamic, the speakers predict that AI-driven forecasts of systemic vulnerabilities will likely become legally precarious. As a result, sustainability will no longer be an optional preference, but an unavoidable material reality.

Advancing Measurement, Reporting, and Validation (MRV)

The MRV landscape is currently characterized by a proliferation of competing standards, fragmented protocols, and overlapping disclosure regimes, which can be expensive and is the result of complex normative choices made about the relevance of different kinds of information. However, according to the speakers, AI+ is generating substantial cost efficiencies, with some estimates indicating up to a 95 percent reduction, while vastly expanding the breadth and frequency of perceptible planetary information. What once required periodic sampling and manual verification can now be monitored continuously across supply chains, ecosystems, and infrastructure networks. Accordingly, the speakers contend that the European Union's conclusion that sustainability disclosure costs were prohibitively high and anti-competitive—prompting policymakers to dilute legislation that had positioned the European economy for global leadership—is flawed, as these costs have declined substantially due to AI, in some cases by as much as 80%.

AI+ actively solves interoperability challenges across standards and platforms by harmonizing data streams and automating complex ESG report drafting. It also embeds real-time planetary intelligence directly into corporate ERP systems, such as SAP. Furthermore, Digital MRV is being

deployed to verify nature-based solutions. In the field of emissions, this replaces expensive human audits with continuously validated, automated carbon remediation data. Ultimately, this significantly improves transparency, trust, and scalability across global sustainability markets. This shift also transforms MRV from a retrospective compliance exercise into a dynamic decision infrastructure, enabling capital allocation, risk pricing, and regulatory oversight to be informed by near real time environmental performance signals.

Upgrading System-Level Investing

System-level investing operates on the premise that long-term financial outcomes are intrinsically contingent on planetary and social health. AI+ provides a step-change in this domain by integrating previously siloed biophysical, social, and financial data into near-real-time models.

The presenters highlighted Climate Trace as a prime example. By aggregating data from over 300 satellites, this system tracks seven different pollutants from over 745 million individual facilities worldwide. This level of granularity allows investors to supplement or bypass self-reported, often incomplete corporate data. Instead, they can reprice sovereign bonds and assess portfolio risks based on objective, third-party planetary health signals. For instance, sovereign wealth funds are already utilizing AI-enabled stress tests to forecast severe negative impacts (e.g., 25% portfolio drops) due to climate-related changes.

Notably, the voluminous predictive data generated by AI+ will likely compel capital markets to transition from a reliance on historical metrics toward dynamic, systems-level risk assessments. The speakers expect that the traditional concept of material risk will likely expand, shifting the focus of value creation away from alpha toward sustainable, long-term systemic prosperity.

PART II – OPEN DISCUSSION

The participants in the discussion were highly energized and raised many important points.

AI as a Systemic Risk and the "Black Box" Dilemma

A critical point of debate centered on the inherent opacity of AI models. Given that these systems process voluminous datasets beyond the threshold of human cognitive capacity, fiduciaries face an opacity issue, often referred to as the "black box" dilemma. Participants questioned whether relying on an opaque algorithm can ever truly satisfy the legal duty of prudence, especially when traditional due diligence on the underlying data becomes practically impossible. Furthermore, AI itself constitutes an unknown risk through substantial energy consumption, algorithmic bias, and the potential for social contagion.

Participants warned against viewing AI merely as a neutral data provider, noting that agentic systems make countless hidden decisions during the actual production of that data, compounding the risk of systemic errors. Presenters emphasized that if fiduciaries magnify a fundamentally flawed financial assumption with AI, the resulting damage could be immediate and consequential. The lack of transparency means that even well-intentioned capital allocations could inadvertently amplify underlying biases found in the training data, scaling up localized errors into market-wide systemic failures.

Human Intelligence (HI) vs. Artificial Intelligence (AI)

Building on these black box concerns, participants argued that AI should never act as an autonomous decision-maker or an excuse to avoid making difficult ethical choices. Participants drew parallels to the early days of computerized investing, where people trusted outputs due to perceived mathematical precision. They cautioned against repeating this with a modern iteration of algorithmic dependency on data quality (i.e., flawed inputs yielding flawed outputs). AI models are entirely dependent on how they are programmed and prompted, meaning their outputs are never entirely objective.

To combat this, participants proposed a Human-in-the-Loop (or HI + AI) framework. This ensures that human subjectivity, ethical reasoning, and qualitative risk mitigation strategies remain the ultimate arbiters of capital allocation. Technology serves as a tool to illuminate options, but the ethical responsibility of evaluating extractive versus regenerative investments must remain firmly with human decision-makers. While AI is exceptional at pushing the boundaries of forward-looking forecasting, it cannot independently formulate risk mitigation strategies. Participants stressed that the ultimate goal should not merely be to predict the future, but to actively shape and improve it. Therefore, ultimate stewardship and authority must reside with human professionals.

Fiduciary Liability and the Paradox of Trust

The regulatory lag regarding AI usage sparked a vigorous debate on legal liability. Concerns were raised about the currently unregulated environment of AI development, with participants questioning how fiduciaries can validate AI outputs in the absence of established regulatory bodies or independent benchmarking frameworks. Could a fiduciary face litigation for relying on a flawed AI forecast? Given the previously discussed legal exposures associated with omitting predictive analytics, the conversation centered on a paradox of trust: fiduciaries are increasingly compelled to utilize these tools, yet they lack formal oversight mechanisms to verify them. To resolve this, participants indicated that traditional auditing firms, operating under a public service

mandate to ensure market trust, must expand their scope to develop robust assurance protocols for AI data integrity.

Democratization of Financial Power

A notable positive externality of AI discussed was the leveling of the informational playing field. Up to 50% of the UK population is now using generative AI chatbots for financial advice, empowering everyday beneficiaries to ask highly informed, system-level questions of their pension funds. This is particularly vital because the median public pension fund trustee in the UK, America, and elsewhere is often a dedicated teacher or firefighter, not a financial theorist versed in complex capital asset pricing models. By translating a large volume of raw data into actionable information, AI bridges the gap between layperson trustees and Wall Street consultants. To manage this, participants proposed innovative governance structures, such as introducing a non-voting AI board member to instantly synthesize complex planetary data during trustee meetings.

Macroeconomic and Societal Impacts

The discussion broadened to the significant macroeconomic implications of rapid AI adoption. Participants cited industry predictions suggesting AI could drive substantial GDP growth (5% to 10% annually) while simultaneously causing 10% to 20% global unemployment. This paradox highlights a systemic vulnerability: if unemployment spikes dramatically, consumer consumption will likely contract, negatively impacting the broader market and depriving pension funds of future beneficiaries. Participants emphasized the fragility of macro-forecasting. To survive this transition, there were strong calls for radical innovations in corporate governance. Specifically, participants advocated for "pre-distribution" models of shared equity that compensate the workers and communities who actually take risks and create value, ensuring the economy remains sustainable.

PART III – CONCLUSION AND ACTION-ORIENTED PRIORITIES

Paradigm Shift for 21st-Century Capitalism

The integration of AI+ represents a fundamental structural paradigm shift. The financial sector is experiencing an acceleration far more profound than the transition to early computers. In addition, capital markets need to consider biological and ecological systems sustaining our planet. While AI+ introduces risks, such as algorithmic bias and macroeconomic destabilization, it offers unprecedented capabilities to track, price, and mitigate systemic externalities. Ultimately, this transition poses an important question:

Do fiduciaries possess the institutional capacity and strategic willingness to harness these tools for long-term systemic health, or will they default to extracting short-term financial advantages?

To navigate this complex transition, participants outlined the following strategic imperatives:

Establish Robust AI Auditing and Assurance Frameworks

Participants suggested that traditional auditing firms expand their public service mandate to include AI assurance. The financial sector urgently needs standardized mechanisms for independent technological benchmarking and assurance. These frameworks must rigorously verify AI-generated systemic data, evaluate algorithmic bias, and validate the integrity of nature-based solutions.

Clarify Legal Precedents and Fiduciary Obligations

Legal and financial scholars should take an active role in delineating the evolving contours of fiduciary prudence in the age of AI+. As the standard of care shifts rapidly, it becomes imperative for industry leaders to establish clear guidelines outlining when relying on AI constitutes sound and responsible due diligence, and when it may instead amount to an abdication of fiduciary responsibility. Importantly, these principles should be formalized to ensure that emerging legal precedents appropriately reflect this evolving technological standard of care.

Implement Board-Level Education and "AI Co-Pilots"

A substantial knowledge gap persists at the board level, who may not possess traditional quantitative finance training. To mitigate the risk of information overload arising from increasingly expansive and granular datasets, institutions (particularly public pension funds) should make sustained investments in specialized education and capacity-building. In addition, boards may consider adopting innovative governance structures, including the integration of AI-assisted analytical and synthesis tools at the executive level to facilitate the real-time processing of multidimensional environmental performance metrics.

Develop Macroeconomic Resilience and Shared Equity Models

In light of the aforementioned macroeconomic projections concerning workforce displacement and potential declines in aggregate global consumption, researchers and investors should rigorously model the long-term downstream macroeconomic implications of AI adoption. To mitigate the risk of systemic market destabilization, participants emphasized the importance of examining pre-distribution frameworks. This includes the development of shared corporate equity structures and more inclusive governance models designed to allocate the economic gains from AI more equitably among foundational stakeholders, thereby strengthening long-term macroeconomic resilience and stability.
