Complexity and Asset Management: Extended Reflections on the Enterprising Investor Podcast

Greg Fisher, PhD, CFA

1 December 2025

Introduction

These notes provide an expanded account of the ideas discussed in my recent appearance on the CFA Institute's *Enterprising Investor* podcast, which was recorded on 24 November 2025. They are based directly on the preparatory material I drafted before the interview and retain the overall structure, tone, and content of those notes. The aim here is simply to develop the material more fully, provide clearer explanations of the themes, and offer a smoother narrative for readers who would like a deeper view of the conversation.

As with my broader body of work, the emphasis is on the relevance of complexity science for asset management, focusing more on the 'fundamentalist' rather than 'quantitative' side of the industry. Specific themes include the distinction between risk and uncertainty, the proper use and interpretation of models, and the evolving landscape in which asset management is practised. Throughout, the intention is to show how the ideas that guided the podcast discussion sit within a wider, coherent framework of thinking.

This document is structured as follows:

1. From Mechanistic Thinking to Complexity
2. Individuals and Organisations Engaging with Complexity Approaches
3. Uncertainty versus Risk
4. Models and Modelling in Finance
5. Systems Investing and the Total Portfolio Approach
6. Complexity in the Age of AI
7. Closing Remarks and Future Research Directions

1 From Mechanistic Thinking to Complexity

To understand why complexity science is so relevant for financial markets and asset management today, it is helpful to reflect briefly on the intellectual history that shaped modern economic (and financial) thought. Much of the dominant worldview in economics and finance can be traced back to the Enlightenment, particularly to the scientific revolution inspired by Newton and others. This worldview is sometimes referred to as the "mechanistic mindset" – an image of the world as a kind of clockwork machine whose functioning is governed by stable laws and linear cause-and-effect relationships.

The Newtonian mechanics element of the mechanistic mindset is also often coupled with the Enlightenment idea of *spontaneous order* (for simplicity I include this idea when I refer to 'mechanistic thinking'). In economics we typically associate this with *Laissez Faire*. However, spontaneous order is the broader idea that social systems can generate patterns of order without central direction, through the interaction of individuals following their own purposes. It reinforces the belief that systems would tend towards stable, orderly outcomes, complementing the more explicitly mechanical metaphors of the period.

This mechanistic worldview has been extraordinarily productive. It has underpinned much of the technological, economic, and social advancement of the past two centuries. It has helped generate dramatic improvements in health, prosperity, and life expectancy. And in many domains, the assumptions of linearity, stability, and reductionism are perfectly appropriate.

Yet in a highly interconnected and fast-evolving world, the limitations of mechanistic thinking become increasingly visible. The COVID-19 pandemic, for example, provided a stark demonstration of how quickly systems can behave in ways that defy expectations grounded in linear, equilibrium-oriented assumptions. Similar lessons emerge from global supply chains, geopolitical shocks, technological disruptions, and other contexts in which interactions and feedback processes matter at least as much as the characteristics of individual components.

It is in response to these limitations that the 'ancestral' fields of study to complexity science emerged from around the 1950s. This intellectual lineage is broad and multidisciplinary, drawing on General Systems Theory, Dynamical Systems Theory, Cybernetics, Complex Systems Theory, and Artificial Intelligence / Information Theory. A helpful visual summary is provided in Castellani and Gerrits (2021) in their Map of the Complexity Sciences 2021 (see Fig. 1 below) which situates complexity within a rich and rigorous ecosystem.

While the field encompasses diverse approaches and definitions, my own interpretation of complexity science is that it is broadly concerned with systems composed of:

- multiple heterogeneous actors or components;

- interdependence among those actors;
- adaptation by the actors; and
- emergent patterns at the system level that cannot be understood by studying parts in isolation.

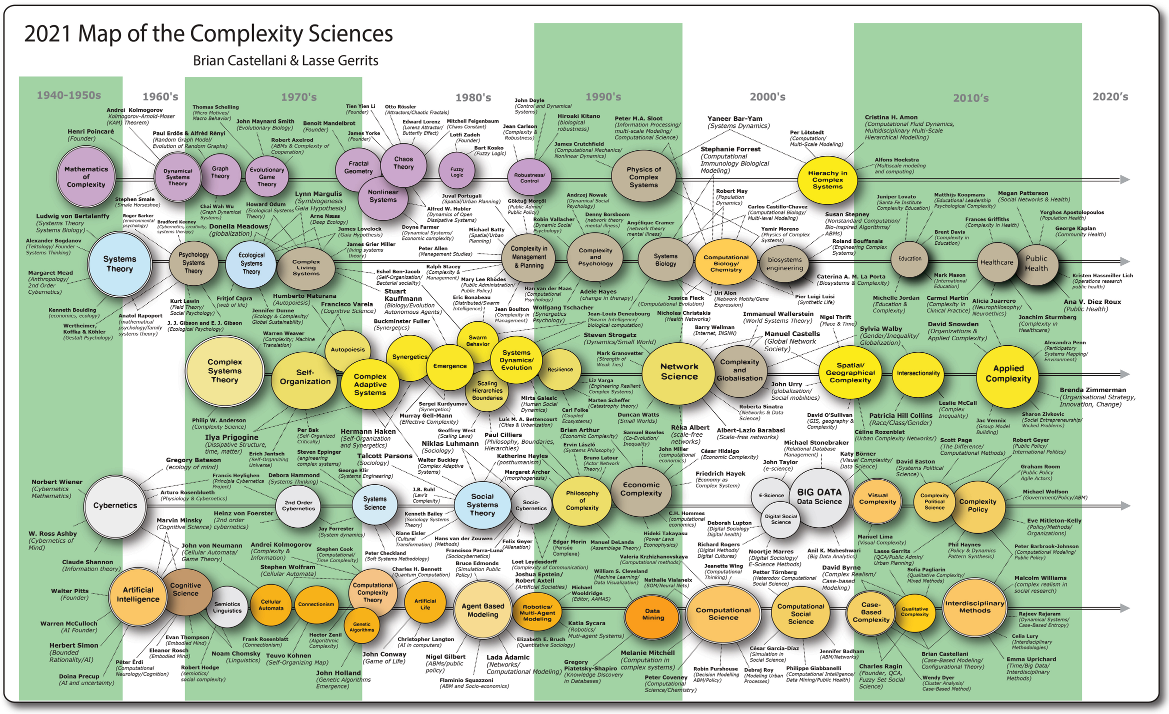

Figure 1: The Map of the Complexity Sciences (2021). Reproduced under a Creative Commons License. Here, the Complexity Sciences are divided into five traditions (approximately from top to bottom): dynamical systems theory (purple), systems theory (blue), complex systems theory (yellow), cybernetics (grey), and artificial intelligence (orange).

A useful synthesis definition (generated by an AI agent) is as follows:

> "Complexity science studies how relationships, interactions, and feedback among diverse components give rise to emergent, adaptive, and often unpredictable behaviour at the system level."

This way of thinking does not reject earlier paradigms; instead, it generalises them. Thomas Kuhn noted that paradigm shifts often involve a broadening of scope rather than an outright replacement. Most notably, and writing in approximate terms, complexity economics can be seen as a generalisation of neoclassical economics. If one imposes a set of strong restrictive assumptions, including representative agents, linear interactions, and equilibrium conditions, complexity economics 'reduces back' to traditional economic analysis.

The distinction between the mechanistic and complexity mindsets plays out in several ways that are particularly relevant for asset management:

- **Reductionism versus systems thinking:** The mechanistic approach decomposes; the complexity approach synthesises.
- **Risk versus uncertainty:** Mechanistic thinking tends to treat uncertainty as measurable risk, whereas complexity recognises the ubiquity – and multiple forms – of uncertainty.
- **Positivism versus realism:** Mechanistic modelling often assumes that key aspects of the world can be formalised in stable, quantitative models; complexity emphasises the limits of formalisation and the need for qualitative insight.

In the interview I noted that the mechanistic mindset is not only prevalent in the standard models sometimes used in finance (and economics and management science) – it is also embedded within our own everyday understanding of the world. I grew up with this mindset but have come to appreciate the wider lens of complexity science.

This leads naturally to one of the ideas I have been developing in my writing: *Complexity Arbitrage*, available on my website here. Asset prices today broadly reflect the prevailing mechanistic worldview because it influences how most participants think, model, and act. A broader, more realistic perspective rooted in complexity science can help asset managers make better decisions across multiple dimensions, including how they frame investment problems, how they respond to uncertainty, how they think about inter-temporal dynamics, and how they integrate environmental, social, and governance considerations.

For those wishing to dive more deeply into the above materiel, I have written a paper titled *Introduction to Complexity Science for Asset Managers* which is available on my website here. For those wanting an even deeper (non-finance) dive into complexity science I would recommend the book *The Dao of Complexity* by Jean Boulton (Boulton, 2024).

2 Individuals and Organisations Engaging with Complexity Approaches

In the podcast interview, I highlighted that I am not alone in exploring ways of thinking that align with a complexity perspective. Although it is always difficult to draw precise boundaries, there are few individuals and organisations whose work resonates with themes such as emergence, interdependence, uncertainty, adaptation, and the limitations of purely mechanistic approaches. The examples below are selective rather than exhaustive, but they illustrate the breadth of engagement across academia, practice, and the space that bridges the two.

Academics and Research Institutions

Santa Fe Institute (SFI). SFI (www.santafe.edu) has been central to the development of complexity science. Within finance, one notable strand of work is the Artificial Stock Market project, originally associated with W. Brian Arthur (Arthur et al., 1996), which explores how interacting, adaptive actors generate emergent market dynamics.

The London Mathematical Laboratory (LML). Ole Peters, Alex Adamou, Colm Connaughton, and their colleagues at the London Mathematical Laboratory (lml.org.uk/) have advanced the study of ergodicity economics, focusing particularly on non-ergodicity – a theme directly relevant to the broader ideas in this paper.

Colleagues at Sant'Anna. I also noted in the interview that several colleagues at the Sant'Anna School of Advanced Studies (www.santannapisa.it) work on themes related to system dynamics, innovation, economic complexity, and evolutionary finance. All of these have implications for how financial actors understand and manage complex terrains.

INET @ Oxford. At the Institute for New Economic Thinking (INET) at Oxford (www.inet.ox.ac.uk), J. Doyne Farmer, Eric Beinhocker, and colleagues have been influential in developing complexity-related approaches to economics and financial systems.

Practitioners and 'Fundamentalist' Firms

Baillie Gifford (www.bailliegifford.com) has for many years adopted an investment philosophy that acknowledges complexity, non-linearity, and long-term structural uncertainty. Their attention to technological and societal change, and their willingness to embrace unpredictable dynamics, sits comfortably within a complexity-informed mindset. They have also invested in this area, e.g., J. Doyne Farmer is Baillie Gifford Professor of Complex Systems Science, and Ole Peters' work in non-ergodicity is funded by the company.

NZS Capital is another example of a firm that explicitly uses concepts closely aligned with complex systems thinking, led by Brinton Johns and Brad Slingerlend. Their emphasis on adaptability, optionality, and evolution reflects an understanding of markets as dynamic ecosystems rather than static optimisation problems. They have a white paper (Johns and Slingerland, 2021) which can be found on their website www.nzscapital.com.

Bridging Figures

Rick Bookstaber is notable for having worked extensively at the intersection of theory and practice. His experience across asset-management institutions and his writing – particularly his book *The End of Theory* (Bookstaber, 2017) – reflect an understanding of markets as complex systems.

CFA Institute researchers. Genevieve Hayman and Raymond Pang (the latter being the podcast interviewer), recently co-authored a paper considering finance through a complexity lens (Hayman and Pang, 2025). Their work reflects the growing recognition that complexity-informed thinking can provide valuable guidance for practitioners.

Evolutesix. Graham Boyd is attempting to operationalise ideas related to non-ergodicity within organisational and entrepreneurial settings, through the organisation he leads, Evolutesix. His work draws on themes that complement the discussions in this paper.

Capital Fund Management (CFM). Jean-Philippe Bouchaud and colleagues at CFM (www.cfm.com) are associated with a complexity science approach to financial markets. They have contributed both to theoretical research and to practical quantitative strategies that recognise adaptation, feedback loops, and emergent market phenomena. My own orientation is more toward the fundamental side of asset management.

These individuals and organisations demonstrate that interest in complexity-aligned approaches is not confined to academic theory. Across verious domains – within asset management, quantitative research, economics, and organisational design – there is an increased recognition that the mechanistic mindset is often too narrow for making sense of the world as it actually is. Although the approaches differ, they collectively reinforce the idea that embracing the world through a complexity lens can enrich both understanding and practice within financial markets.

3 Uncertainty versus Risk

A central theme in my work, and one that we discussed in detail during the podcast interview, is the need to distinguish between *risk* and *uncertainty*. This distinction is foundational for asset management, yet it is frequently blurred in both theory and practice.

As I emphasised in the interview, it is not necessary to be an expert in complexity science to grasp this material, although the framework does help when considering the 'stronger' forms of uncertainty. Furthermore, many experienced risk and investment managers already understand this distinction, so I am not claiming originality. Rather, my intention is to highlight how the mechanistic mindset can steer us away from the real world by encouraging us to think that it is more certain and more controllable than it actually is.

In the interview I emphasised that understanding the distinction between risk and uncertainty begins by identifying two things: the possible *outcomes* in the context of interest and their associated *probabilities*. Risk applies when both outcomes and probabilities are known. Uncertainty applies when neither are known.

A simple two-by-two framing makes the point, shown in Fig. 2 below – note how *ambiguity* constitutes a third category, when outcomes are known but probabilities are not.

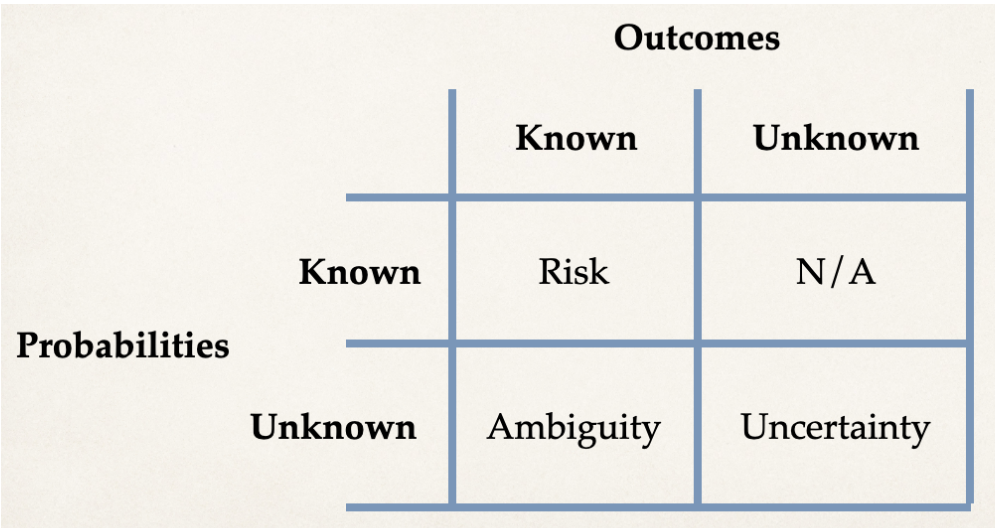

Figure 2: Risk, Uncertainty, and Ambiguity

This framing is useful because it clarifies why the standard tools of risk management – which operate within the "risk" quadrant – cannot by themselves cope with the full range of challenges faced by asset managers. Much of what asset managers confront sits squarely in the domain of uncertainty. The world does not present itself as a closed set of known possibilities with stable probabilities. Instead, it evolves, sometimes slowly and sometimes abruptly, in ways that can reshape the relevant context.

In the interview, I identified five 'sources' of uncertainty, which were taken from various literatures, moving from "weaker" to "stronger" forms:

1. **Data limitations.** This is the most straightforward source of uncertainty: information may be noisy, incomplete, or lagging. However, while more or better data can help, it does not eliminate deeper forms of uncertainty.

2. **Knowledge of patterns.** Even with good data, the underlying patterns may be poorly understood or may shift over time. Consistent with the philosophy and complexity literatures, here I align 'knowledge' with how systems are 'patterned' or 'structured', i.e., how the parts of a system are inter-related.

3. **Limited human cognition.** Constraints on attention, memory, and computational capacity limit our ability to process information and recognise patterns.

4. **Mutual contingency in expectations formation.** In many scenarios, multiple actors must simultaneously form expectations about other actors' behaviour before they each can act. This interdependence generates endogenous uncertainty that cannot be resolved by better data or knowledge. In extremis, this source of uncertainty leads to paralysis and/or worse outcomes than can be achieved by coordinating or cooperating. Consider driving on roads without any 'rules of the road' (including which side to drive on): each time we come across another car we would have to form expectation about their movement in order to drive safely and efficiently.

5. **Genuine novelty.** Sometimes the world presents truly new situations which are unpredictable by nature and for which there are no precedents. Examples include deep learning breakthroughs due to neural networks, and the emergence of decentralised trustless computation like blockchains.

This categorisation is not intended to be exhaustive, but it serves to illustrate the variety of ways in which uncertainty manifests. It also points to different types of responses. For example:

- In the case of data limitations, the obvious response is to acquire more or better data.

- With limited knowledge of patterns, further research, continuous learning, and improved modelling may help. I noted in the interview that the mechanistic mindset tends to lead us to believe learning is a 'once and for all' process (because contexts do not change in terms of underlying patterns) whereas the complexity view emphasises that learning is a continuous process: contexts always (eventually) re-pattern themselves, often unpredictably.

- When human cognition is the binding constraint, assisted cognition – e.g., using computational tools, including simulations – can support better judgement. Unassisted cognition includes using multiple experts to make sense of larger, more complex terrains like trying to identify the likely outcomes of the war in Ukraine.

- Where mutual contingency drives uncertainty, expectations stabilisers (such as social norms, conventions, and some laws) are appropriate. More generally, processes that enable coordination and cooperation are key here, including corporate strategies and business processes. A good example was Steve Jobs who once referred to himself as the 'conductor of the orchestra' in Apple, when he was criticised for not being a coder.
- When novelty is at play, resilience and agility become key.

Understanding which source of uncertainty is relevant in a given situation is therefore highly practical. A one-size-fits-all response is rarely appropriate. Instead, the underlying source guides the type of intervention likely to be effective.

When we look at the wider financial systems, I would argue – and writing in very broad brush strokes – that risk is mostly relevant for the insurance industry (actuarial calculations have to be based on stable probability distributions) whereas the asset management is much more concerned with uncertainty.

A broader lesson, which shaped much of the podcast discussion, is the value of humility which, for me, is the first lesson in complexity science. The distinction between risk and uncertainty encourages asset managers to recognise the limits of knowledge and prediction. This does not mean that quantitative models and risk tools have no role. Rather, it means that they operate within a context of uncertainty and should be used with appropriate caution. They are aids to judgement, not substitutes for it.

4 Models and Modelling in Finance

In the interview I also addressed the role of models in asset management. Here, the mechanistic mindset exerts a strong influence. This mindset encourages a 'positivist' view of modelling in which the goal is to represent the world accurately within a structured, formal system. It assumes that all relevant elements can, in principle, be formalised; that patterns are stable or fixed; and that contexts are sufficiently similar to justify a reusable modelling template.

These assumptions can be highly productive in some domains. But in financial markets – which are characterised by interdependence, adaptation, and reflexivity – they often fall short. In practice, they have contributed to significant mistakes. Value at Risk (VAR) models, for example, rely on variance and covariance estimates that are assumed to remain stable into the future (a view supported by the *Efficient Market Hypothesis* and which is essentially a glorified form of extrapolation). When volatility regimes shift or correlations spike, the numbers that risk managers rely on can mislead.

The limitation of VAR models are well known in the industry but we again see a problem noted earlier: the mechanistic mindset and its associated models pull us in a direction that denies the messiness and complexity of the real world, offering a seductive but inaccurate view. The classic retort to this is that "All models are wrong but some are useful", a phrase associated with George Box. In the interview I said that my response to this is to paraphrase Animal Farm: *all models are wrong but some models are more wrong than others.*

From a complexity perspective, several points follow naturally:

- Not everything relevant to markets can be captured or formalised in a model.
- Patterns change because systems re-pattern themselves over time.
- Context matters: what works in one situation may not work in another.

In addition, there are deeper conceptual issues that influence how models should be used:

- **Clarity about aims.** Modelling is purpose-driven. What can be simplified depends on what the model is meant to achieve.
- **Qualitative insight.** Qualitative understanding complements formal modelling. Not everything valuable can be quantified.
- **Instrumentalism.** The idea that "if it predicts, it's fine" may work in stable systems. In adaptive systems, predictive success can be temporary as actors change their behaviour in response to the success.

- **Reflexivity.** Widely-used models can influence behaviour and thus alter the system they describe, thereby rendering the model obsolete. This is related to Goodhart's Law.
- **Heterogeneous models.** Using multiple models with different assumptions can improve robustness through 'requisite variety' (a term taken from Cybernetics).
- **Simple models.** Simple, transparent models can be powerful, provided their limitations are understood by the end user. There can an inherent tension here: making sure models accurately reflect the real world while being tractable.
- **Models as tools.** Models should be 'held lightly' (to quote my friend Richard Carter) and used as aids to sense-making, not as definitive representations.

Complexity science does not fully reject modelling although some researchers are a little allergic in light of the mistakes made with models of complex systems in the past. I should note, however, that some complexity researchers tend to orientate their research around models.

My framing is that if we take a broad enough view of models, we can appreciate that model all of the time in the form of the cognitive patterns we form that correspond to our environments. Moreover, formal models can be helpful in – for example – providing transparency about or own thinking, when co-creating a model within a group of people, and running simulations about the future.

It is perhaps worth noting a point that the slow shift toward complexity-like thinking has come with a broad and similarly slow shift away from closed-form mathematics to the deployment of computational models, notably agent-based models. This is not to say 'math' is unhelpful. To paraphrase W. Brian Arthur, they can be helpful as first-order approximations of complex systems. Often, however, it is necessary to use computational models to reflect the deeper, intricate patterns of complex systems.

This perspective aligns models more closely with the actual needs of asset managers, who must navigate uncertainty, evolving contexts, and adaptive behaviour. It encourages a mature use of models that recognises both their strengths and their limitations.

5 Systems Investing and the Total Portfolio Approach

Another theme in the podcast interview concerned the growing prominence of *systems investing.* This has gained traction in recent years, particularly among asset owners and institutions focused on long-term sustainability and resilience. While systems investing draws on ideas that are closely related to complexity science, it has emerged from a slightly different lineage, with strong roots in systems science, sustainability studies, and the work of scholars such as Jay Forrester and Donella Meadows.

In the interview, I highlighted that systems investing tends to come with a particular and commendable orientation towards planetary boundaries, ecological resilience, and broader societal well-being. It is not simply a set of analytic tools; it often incorporates a normative view about the role of investors in shaping system-level outcomes. Much of the literature emphasises environmental sustainability, responsible stewardship, and the idea that investors are active participants in, and stewards of, the systems in which they operate.

There is, therefore, both overlap and distinction between systems investing and the complexity perspective I have developed above. The overlap lies in the shared appreciation for:

- interdependence and feedback loops;
- the importance of system-level behaviour; and
- the need to think beyond isolated components.

While I am a passionate supporter of these aims, my work proceeds from a different starting point. It is deliberately more neutral and focused on both real-world economic patterns <u>and</u> *internal market dynamics*: emergence, non-ergodicity, adaptation, narratives, and patterns arising endogenously from interactions among market participants. In other words, systems investing is more focused outward at the broader systems within which markets are embedded whereas I am also focused on how market systems themselves function.

One of the reasons for this value-neutrality is that I want to support a wide number of asset managers, many of whom are constrained by mandates to be fully return-focused, i.e., I want to start from where they are now, rather than where they *ought* to be in the longer term (however important this question is).

The two perspectives are highly complementary. Indeed, as I noted in the interview, many asset managers are increasingly drawn to systems-oriented ideas precisely because traditional, mechanistic framings no longer capture the full picture. But it remains important to recognise that, strictly speaking, complexity science does not require any particular value commitments. It simply offers a more realistic and useful conceptual framework for understanding how markets behave.

Often associated with systems investing is the *Total Portfolio Approach* (TPA). In the interview, I described TPA as a governance approach that treats the portfolio as a single integrated system aimed at achieving a set of goals, rather than as a collection of asset-class silos (see, for example, The Thinking Ahead Institute (2020)). Instead of relying on benchmark-driven strategic asset allocation, TPA encourages asset owners to consider the portfolio holistically, guided by their overarching objectives.

Several features of TPA make it more compatible with a complexity perspective than traditional approaches:

- it recognises interdependencies among assets;
- it allows for more adaptive allocation processes;
- and it is less anchored in fixed, equilibrium-based views of long-term returns.

Importantly, however, my interpretation is that TPA is conceptually agnostic. It does not presume a complexity worldview. Rather, it provides an organisational structure within which a complexity-informed perspective can operate more effectively. In traditional benchmark-driven frameworks, where asset-class silos dominate, the ability to take a holistic, adaptive, or systems-oriented view is constrained. TPA removes these constraints.

As I discussed in the podcast interview, TPA gives asset managers more freedom to think systemically. It enables them to focus on how the whole portfolio interacts with the external environment and how its components interact with one another. This is not itself a complexity paradigm, but it is well aligned with one.

6 Complexity in the Age of AI

A further topic we covered in the podcast was the intersection between complexity and artificial intelligence. I made clear in the discussion that I am not an AI specialist. Nonetheless, there are several important connections between AI and complexity that follow directly from the ideas already outlined, and these were the points I prepared before the interview.

First, complexity science provides a helpful overarching framing for understanding intelligence in general. Intelligence, whether human or artificial, arises from interactions, learning, feedback, and adaptation – it is understood in the literature to be 'socially constructed'. Thinking in complexity terms therefore encourages us to consider how human and artificial forms of intelligence might complement each other, a point emphasised in Richard Carter's book *Cognitive Advantage* (Carter, 2021). It also encourages us to reflect on the kinds of problems for which each is best suited. Human judgement, with its capacity for contextual interpretation and narrative understanding, remains essential. AI, by contrast, excels at processing large quantities of data, identifying patterns, and supporting cognition. Neither is fully superior to the other.

Second, there are important questions of responsibility and accountability. As AI systems take on a larger role in decision-making, particularly in contexts involving risk or conflict, it becomes crucial that responsibility remains aligned with those deploying it. This is not unique to finance, but the asset management industry must nonetheless engage with these questions carefully. These reflections were present in my notes and relate directly to the broader themes of uncertainty and judgement.

Third, AI has already begun to support new forms of knowledge creation. For example, in areas such as drug discovery, AI has been instrumental in helping researchers identify promising candidates for further study. This illustrates one way in which AI can serve as a kind of *cognitive annex* – a phrase I use to convey the idea that AI can extend human capabilities without replacing them.

Fourth, I discussed the acceleration of reflexive processes in markets due to AI. The interview included a reflection on fast quantitative strategies and the shrinking time frames between pattern recognition, action, and the subsequent re-patterning of the market. These feedback loops might lead to greater endogenous volatility, as market participants respond rapidly to patterns that they themselves help to create or dissolve. In the interview, we touched on examples such as shorting stampedes or other self-reinforcing dynamics that can arise when multiple actors act on each other's signals.

This links to another idea of what is referred to as "model collapse", by analogy with the AI context in which models trained on each other's outputs gradually lose grounding in reality. In finance, there ought to be a similar concern when too many actors rely on similar models or similar algorithmic strategies. If model outputs feed into market behaviour, and market behaviour feeds back into models, the system can become increasingly self-referential. Diversity of models and approaches thus becomes important for maintaining overall system resilience. This ought to be a worry to all of us, not only to regulators.

Finally, I re-emphasised that complexity science provides a unifying frame for thinking about how AI interacts with both markets and the humans who participate in them. Complexity emphasises adaptability, emergence, and the co-evolution between actors and their environment. AI systems, which learn and adapt based on data that are themselves shaped by human and algorithmic behaviour, fit naturally into this perspective. Understanding AI within a complexity frame can therefore help asset managers appreciate both its potential and its limitations.

7 Closing Remarks and Future Research Directions

In the closing part of the interview, I reflected on the broader position of complexity science today and its relevance for the asset management industry. Complexity science is now a major, well-established field with substantial foundations across many scientific disciplines. It offers a profound shift in how we understand systems, including economic and financial systems. What it provides is not a narrow set of tools, but a broader and more realistic conceptual framework through which to interpret the world.

The financial sector has, in many ways, been slower to absorb the implications of complexity science than other fields – with some honourable exceptions (noted earlier), asset management is 'behind the curve'. Complexity economics, for example, is now a significant area of research with dedicated journals, conferences, and institutional support. Management science, organisational studies, ecology, and even areas of public policy have integrated complexity-informed thinking to some degree. Asset management, by contrast, has tended to rely more heavily on the mechanistic mindset and on a relatively small set of canonical models and methods.

This is not a criticism of the industry; rather, it is a reflection of its history and operating environment. The challenges of portfolio construction, risk (and uncertainty) measurement, and performance evaluation have often encouraged the use of models that assume stability, linearity, and known distributions. These assumptions are understandable and have practical utility. But as the world becomes more interconnected and as financial markets exhibit increasingly complex and adaptive behaviour, the limitations of traditional approaches become clearer.

In my paper *Complexity Arbitrage*, I argued that asset prices today largely reflect the mechanistic mindset because that is how most market participants think and act. This creates an opportunity for asset managers who adopt a broader, complexity-informed perspective. Such a perspective does not reject the tools of modern finance, but it situates them within a wider understanding of uncertainty, emergence, adaptation, and system-level behaviour. It encourages the use of diverse models, the value of qualitative insight, the importance of judgement, and the need for continuous learning.

As I noted in the interview, I can imagine that the practical implications of integrating complexity science into asset management may unfold in two waves. The first wave involves the immediate value of adopting the existing research in complexity science. This includes better framing of problems, more realistic expectations about uncertainty, more thoughtful use of models, and a richer appreciation of how market dynamics evolve. My paper Complexity Arbitrage reflects this first wave.

The second wave, which I expect to unfold in the future, involves deeper integration between the 'theory' of asset management and complexity science. Here we may see the emergence of new conceptual equivalents to the traditional pillars of financial theory: modern portfolio theory (MPT), the arbitrage pricing theory (APT), and the efficient market hypothesis (EMH). I imagine this new thinking would extend and generalise these frameworks, providing a more realistic foundation for investment decision-making in a complex world.

My current research at the Sant'Anna School of Advanced Studies is part of a longer-term mission that I envisage taking ten to fifteen years. The mission has three strands:

- to catalyse further research within academia, particularly around the intersection of complexity science and asset management;
- to develop practical tools and insights that can support asset managers in real-world contexts; and
- to build bridges between academic research and the investment community through dialogue, collaboration, and shared learning.

A specific near-term focus of this programme involves conducting a series of in-depth interviews with experienced asset managers. The aim is to understand their domains of practice through a complexity lens, identifying patterns, challenges, heuristics, and insights that are often not captured in formal models or academic papers. This bottom-up orientation is essential for ensuring that the ideas subsequently developed are grounded in the realities of the industry.

As I mentioned in the interview, I am interested in hearing from asset managers who would like to take part in this initiative. Anyone who would be willing to share their experience and perspectives can contact me at greg@gregfisher.net. Their contributions will help shape a research agenda that is both academically rigorous and practically relevant.

Acknowledgements

These expanded notes draw directly from the preparatory material I wrote ahead of the podcast interview. I am grateful to the CFA Institute's complexity science experts, Genevieve Hayman and Raymond Pang, and the *Enterprising Investor* team for the opportunity to discuss these themes, and I hope that these reflections provide a useful complement to the conversation.

References

Arthur, W. B., Holland, J. H., LeBaron, B., Palmer, R. and Taylor, P. (1996), *Asset pricing under endogenous expectations in an artificial stock market*, tech. rep., URL: www.santafe.edu/research/results/working-papers/asset-pricing-under-endogenous-expectations-in-an- (visited on 04/05/2023).

Bookstaber, R. (2017), *The end of theory: Financial crises, the failure of economics, and the sweep of human interaction*, Princeton University Press.

Boulton, J. (2024), 'The Dao of complexity: making sense and making waves in turbulent times', *The Dao of Complexity*, De Gruyter.

Carter, R. (2021), *Cognitive Advantage, How Artificial Intelligence Is Changing The Rules For Winning In Business And Government*, May Hill Publishing.

Castellani, B. and Gerrits, L. (2021), *2021 Map of the complexity sciences*, URL: www.art-sciencefactory.com/MAP2021Sharing.pdf.

Hayman, G. and Pang, R. K.-K. (2025), 'Reframing Financial Markets as Complex Systems'.

Johns, B. and Slingerland, B. (2021), *Complexity Investing*, version 9, part 2, URL: www.nzscapital.com/news/complexity (visited on 04/05/2023).

The Thinking Ahead Institute (2020), 'Total Portfolio Approach: A Global Asset Owner Study into Current and Future Asset Allocation Practices', *London, UK: The Thinking Ahead Institute*.