AI, reinforcement learning, and modern technological solutions for investment strategies

Hens Steehouwer, Chief Innovation Officer at Ortec Finance, discusses what technological advances mean for investment strategies and operations.

Insurance Investor Promotional Content Monday, Jun 17, 2024

Hens Steehouwer, Chief Innovation Officer at Ortec Finance.

Andrew Putwain: Can you tell us about Ortec Finance?

Hens Steehouwer: Ortec Finance is modelling firm whose roots can be traced back to the world-renowned Econometric Institute of Erasmus University, Rotterdam over three decades ago. Since then, we've grown into a leading provider of investment decision technology for both institutional and private investors. The technology solutions we provide support investors in making their strategic investment decisions, monitoring the risks and suitability of these strategies over time, measuring the performance of these strategies, and attributing it to risk sources and decisions.

Andrew: Ortec is known for scenario modelling, especially around climate scenarios. Can you talk to us about what this means and what it offers to insurers?

Hens: Climate scenario modelling is one of our areas of innovation. The reason that we started building our own in-house climate expertise – as far back as 2017 – is that climate change is an important and complex risk factor that has an impact on every step of the investment decision process. Integrating climate change into this decision process is challenging because climate change is a different type of risk than traditional economic and investment risks.

In the case of climate change, we have little empirical evidence to base forward looking analyses on, and the uncertainty about what could happen and what the economic and investment impact could be is so significant.

Climate change is exposed to what is called *fundamental* or *radical uncertainty*, which means that this uncertainty cannot be 'resolved' with the probabilistic approaches that investors are used to using.

> *"These scenarios translate assumptions about transition risk, physical risk, and financial market responses into potential impacts per asset class."*

In situations of such uncertainty and complexity, classical scenario analysis, which is based on deterministic, narrative-based, climate scenarios has proven to be a powerful approach to explore potential future events and the impacts in a structured way, and they also support decision making and preparing for the future. This approach has been advocated by the Intergovernmental Panel on Climate Change (IPCC) since 2000.

To support this type of climate scenario analysis in terms of impact on investment portfolios and investor goals, we produce our in-house climate scenarios, ClimateMAPS, which is currently in its tenth edition. These scenarios, developed with our partner Cambridge Econometrics, translate assumptions about transition risk, physical risk, and financial market responses into potential impacts per asset class, region, and sector.

ClimateMAPS is designed to be deterministic, narrative-based, scenarios, which can be used on a stand-alone basis but, based on our latest research and innovations, also in a consistent combination with stochastic scenarios and portfolio and balance sheet simulation models to support investment decision-making.

Andrew: Building on this, can you give us more insights into how insurers should be looking at their strategic asset allocation (SAA), for instance – whilst taking into consideration these ideas around modelling and climate scenarios?

Hens: The world in which investors make their investment decisions is uncertain. A stochastic scenario approach is often used to support them in assessing risk-return trade-offs at the level of the strategic asset allocation, or about the broader strategic investment strategy – which can also include instruments like interest rate, inflation, and currency hedging, dynamic asset allocation, or the strategic use of derivatives.

> *"In general, models help us as humans in understanding and managing complexities."*

A key reason for the popularity of this approach is the flexibility it offers – especially in combination with the computing power available today – to simulate the complex dynamics of an investor portfolio or balance sheet in a realistic and accurate way. The dynamics of an insurance balance sheet can be very complex. It typically includes different types of insurance liabilities, possibly with profit sharing and/or return guarantees, regulatory solvency frameworks, different types of balance sheet valuations, and a growing number of asset classes and investment strategies to choose from.

In general, models help us as humans in understanding and managing complexities. Scenario or simulation models are powerful tools to translate potential strategic asset allocations of insurers into metrics for their strategic risk-return objectives, whilst considering all the relevant real-world dynamics in their balance sheets in an integrated way.

Pension funds and providers use stochastic scenario approaches globally already for decades to support their strategic asset allocation decision making and risk monitoring. In the past few years, we have seen this approach increasingly adopted also by insurers globally, as well as the asset managers that serve them. Drivers behind this clear trend include the consolidation and increased transparency in the industry, putting pressure on product margins on the liability side of the balance sheet, while stakeholders are still looking for returns that should then come from the asset side of the balance sheet.

It is fair to say that because of these trends, insurers are rapidly becoming increasingly “asset focused” and are looking to strengthen their capabilities in this field. The global move from defined benefit (DB) to defined contribution (DC) pension schemes and risk transfer to insurance structures is an additional driver here. In terms of technology, insurers may already have ALM models at their disposal. However, we see that these models – often created for actuarial purposes – tend to be ill-suited for the efficient projection of alternative investment strategies, including all the relevant future dynamics of the balance sheet, as needed to support a strategic asset allocation decision making and risk monitoring process.

So, the question is: how do you take climate change and climate scenario modelling into account in such a stochastic scenario approach for strategic asset allocation?

In recent years, climate risk analyses in institutional investors were typically performed by sustainability teams, remaining quite disconnected from the work of traditional investment and risk teams. However, this is starting to change with results and insights from climate risk analysis and from traditional and investment risk analysis being combined and integrated to drive investment decision-making. This is a positive development, but it also brings new challenges for investors.

> *"Unfortunately, attaching probabilities to climate scenarios is problematic because of the fundamental uncertainty of climate change."*

The first of these challenges is that investment decision-making feeds on probabilities and attaching likelihoods to potential ranges of outcomes for making the risk-return trade-offs that are so essential to investing. It is therefore natural to also want to attach probabilities to climate scenarios. Unfortunately, attaching probabilities to climate scenarios is problematic because of the previously discussed *fundamental uncertainty* of climate change.

If investors are to combine traditional risk and return analyses with insights from deterministic climate scenario analyses, then the second challenge is that this also raises questions about consistency between the two. For example, should climate risk be included in traditional risk-return assumptions – and, if so, how? Or, where do climate scenarios fall within the traditional risk-return assumption space represented by the stochastic scenarios, and does this configuration actually make sense?

Andrew: Can you give us more information on the significance of innovation in addressing emerging challenges in this market?

Hens: For every organisation, innovation in a broad sense is key. Especially on longer time frames, the world in which organisations operate is always changing. Think of changes in geopolitics, consumer preferences, and regulatory frameworks – but also of new risks and opportunities because of climate change, and new data and technologies such as Artificial Intelligence (AI). The successful companies and organisations are the ones that are best able to adapt to this changing environment.

Innovation has always been a core value that defines who we are. For instance, the role of Chief Innovation Officer is now an executive position in Ortec Finance. We run our larger and more uncertain innovations through a structured innovation framework that runs from the initial “spark” until, if successful, the actual implementation. This framework consists of an explore, experiment, and implementation phase. In doing so, we are not afraid to “fail fast” on innovations where the underlying assumptions turn out to be false. This innovation framework has been designed to focus on 1) the desirability of the idea (do clients want it?), 2) the feasibility (can we build it?), and 3) the viability (can we deliver it commercially?).

Andrew: Let’s talk more about AI. Can you tell us about the emerging applications of AI in investment? What does it offer?

Hens: At the start of 2024, I took up the role of Chief Innovation Officer – which was designed to provide our clients with the most accurate and relevant investment risk-return analytics available in the market by integrating climate risk more broadly into our solutions and also harnessing the opportunities created by advances in AI.

The goal is to enable our clients to make better investment decisions in the increasingly complex environments in which they operate.

To give us more of an idea of what AI can do in this area, we need to look at it holistically. AI is a term for all kinds of new technologies – or even old technologies offering new possibilities because of easier access to large volumes of data combined with increased computer powers – that will change the investment technology space.

"When trying to optimise portfolios for these criteria, we often find ourselves constrained by the limited capabilities of traditional optimisation methods."

Perhaps somewhat as a surprise, a promising application of AI can also be found in the field of strategic asset allocation, or portfolio optimisation. The combination of stochastic scenarios and portfolio and balance sheet simulation models allows, as discussed before, investors to evaluate alternative asset allocations and broader investment strategies across a wide range of relevant and complex risk-return metrics.

However, when trying to optimise portfolios for these criteria, we often find ourselves constrained by the limited capabilities of traditional optimisation methods, not allowing us to fully exploit these detailed evaluations.

The stochastic scenario approach can be seen as a very sophisticated “trial and error” method in which alternative portfolios are simulated and evaluated by an analyst in the search for more efficient and effective portfolios. Portfolios are evaluated in terms of relevant risk-return metrics that go beyond the traditional expected return and volatility. Examples of risk-return criteria that insurers care about include the risk of insufficient capital in terms of the relevant solvency framework, or the Present Value of Distributable Earnings (PVDE), according to a dynamic and solvency-dependent dividend (and capital injection) policy.

On the other hand, traditional optimisation algorithms like Mean-Variance or Mean-CvaR automatically generate suggested efficient portfolios, so without “trial and error”, but can only do so under the simplifying, and quite unrealistic, assumption that these risk-return metrics are the only ones that investors care about. We have a long history in trying to add automatic optimisation capabilities to the powerful flexibility of the stochastic scenario approach to solve real-world optimal asset allocation problems.

It is fascinating to see the similarities between this problem, on the one hand, and one form of AI, on the other – which is reinforcement learning (RL). Amazon Web Services describes RL as “a machine learning technique that trains software to make decisions to achieve the most optimal results. It mimics the trial-and-error learning process that humans use to achieve their goals. Software actions that work towards your goal are reinforced, while actions that detract from the goal are ignored”.

"With the stochastic scenario approach, we can simulate thousands or millions of synthetic observations of strategic asset allocations."

In the optimal asset allocation problem, an investor decides which weights to assign in the portfolio to each of the available asset classes. The optimal results would depend on the goals that the investor wants to achieve with the investments.

For an insurer, this can, for example, be to maximise the PVDE whilst not exceeding a certain amount of solvency risk. Training an RL algorithm requires a lot of data. It is hard to see where we would find data for the case of our optimal asset allocation problem for an insurer.

The key insight is now that, although we do not have such real-world data, we do have synthetic data readily available, and as much of it as we need to train an RL algorithm on. With the stochastic scenario approach, we can simulate thousands or millions of synthetic observations of strategic asset allocations and how these perform on the complex PVDE and solvency objectives of an insurer.

To make an approach like this work for practical applications is a lot of hard work and a matter of solving many smaller and bigger puzzles along the way. However, we are currently at the stage of running successful pilots with some of our insurer and asset management clients, and we are already preparing to take this novel approach “from the laboratory to the factory”.

Based on the results that I have seen so far, I believe that in the coming years this exciting new application of AI will radically change the way in which investors run their strategic investment processes and as part of that can also generate interesting ideas for new types of (dynamic) strategies.