View from the Edge

Investment Management in the age of Artificial Intelligence and Machine Learning - - *We do that!*

Artificial Intelligence and machine learning are *white hot* topics in the investment management industry and there can be little doubt that our industry will be transformed by this technology.

Artificial Intelligence (AI) can be seen as the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. At 3EDGE Asset Management, AI and machine learning are foundational to our investment approach. However, we believe that the argument over human vs. machine is a false choice, and that the best way forward is *human plus machine*. We view the relationship between human intelligence and machine intelligence as one of cooperation rather than competition.

To date, work on AI has focused primarily on two different approaches, expert systems and machine learning. Expert systems seek to capture the rules humans use to solve specific problems. They also provide the added benefit of enabling the model's human collaborators to intuitively understand why the model's output is what it is. However, they may be limited in terms of scale since as problems grow larger and more complex, the ability for any intuitive understanding of the model grows increasingly more challenging. Machine learning, on the other hand, attempts to directly model the neural connectivity of the human brain. The underlying algorithms are independent of the specific problem domain and must be trained using extensive data sets from the domain. However, unlike the expert systems approach, machine learning models cannot explain the logic behind the results.

How we use AI and machine learning at 3EDGE

At 3EDGE our investment approach combines aspects of both traditional expert systems and machine learning. We utilize AI tools and techniques to leverage the combination of causal relationships and behavioral logic in our model in order to provide the 3EDGE Investment Committee with the insights necessary to reach our investment objective, which is to seek to generate attractive risk-adjusted returns on behalf of our clients. A logical framework is built using principals of system dynamics to understand the forces that drive the flow of capital through the global markets as a collection of nonlinear differential equations where each force component is derived from market-based data. This logical framework produces forward-looking risk-adjusted projections for each asset class and geography that we model. In addition to the casual relationships, we also capture a linked set of classical expert system style, conditional rules that define behavioral market characteristics. Next, we determine the relative weights for each of the causal forces and the parameters and thresholds associated with the behavioral characteristics and we use a machine learning approach to establish the weights, parameters and thresholds. Our model optimization process uses machine learning algorithms combining Genetic and Steepest Descent to search the parameter space. The resulting model has the advantage of using a very large training dataset for precision and the *explain-ability* of an expert system since at its core ours is a causal model. Importantly, model optimization should not be confused with portfolio optimization.

Caveat Emptor

When applying AI and machine learning tools to investment management, it is critical to understand that these tools can be very good at certain tasks, while they may not be so good at others. In particular, AI and machine learning tools are quite good at analyzing massive amounts of data and detecting patterns. However, they are often *not yet* good at being able to differentiate between correlation and causation, and in investment management that can be particularly problematic. Another potential issue is that these quantitative tools come mostly in the form of quantitative black boxes, wherein the models are almost entirely data-driven. This means that it is entirely possible to assign causation to results that turn out to be nothing more than statistical coincidences from the past. Further, once a black box algorithmic model has reached a certain conclusion it cannot express the reasoning behind its decision, that is why it is called a black box--you cannot see inside of it. For these reasons, AI and machine learning tools applied to investment management can be problematic. We believe that understanding the reasons behind the predictions from an AI based model is critical in order to be able to trust the output and feel comfortable making actual investment decisions based upon the model output. In the nonlinear, complex world of the global capital markets understanding *why* models reach the conclusions they do is critical. Therefore, in our estimation the most effective quantitative models require the best of both worlds, i.e. human plus machine.

Summary

There can be no doubt that Artificial Intelligence and machine learning are powerful tools that will change the world we live in, well beyond what we can presently imagine, and well beyond the investment management industry. At 3EDGE, we utilize the power of both Artificial Intelligence and machine learning as foundational constructs of our investment research and portfolio management process. We believe that in the eco-system that is the global capital markets, the concept of human vs. machine is a false choice and that it is the combination of human plus machine, deductive plus inductive that provides 3EDGE with a competitive advantage over the more common *black box* quantitative models that are now so prevalent in the investment world.

DeFred G Folts III
Chief Investment Strategist
3EDGE Asset Management
July 2018