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Me, Myself and AI

The inevitable machine learning revolution of investing

Much has been made of AlphaGo beating Lee Sedol at the notoriously complex 3,000 year-old game Go in March last year. And for good reason. It represents a step change in computing intelligence. The comparisons with Deep Blue's famous chess victory over chess grandmaster Gary Kasparov nearly 20 years ago are stark. More importantly, the implications are profound.

In a recent interview with the Financial Times, co-founder and CEO of DeepMind Demis Hassabis described how Deep Blue's victory was "more a testament to the brilliance of its team of programmers and grandmasters, as well as to the computational power of the hardware, than to any inherent intelligence in the programme itself". AlphaGo, on the other hand, had to adopt and master deep learning techniques in order to win its contest. You could even, albeit controversially, say that it had to 'think' for itself. And, while critics will point out that Go's playing field is limited and therefore 'controllable' in a mathematical sense due to the finite number of board locations, the direction of travel is clear.

Finance is no stranger to the powers of computing, either. Analysis of complex financial data has been aided by technological advancement and larger data sets. And the industry has benefitted from greater brainpower. Cuts to US space programme funding and a severe loosening of regulations both in the US and UK during the 1980s led to large swathes of mathematicians and physicists entering the world of finance. Their presence brought product innovation, such as the derivative market, along with an increasing focus on quantitative models. Active quant investing really started to take hold.

Unlike fundamental active investors, who seek to gain an insight advantage by meeting company management and poring over their accounts, active quant investors seek out the largest available data sets, either of the highest quality or the most relevance, and then look to crunch through the numbers quickly and analyse this larger opportunity set on a systematic basis. The output of this approach comprises signals or trading strategies that could be exploited before being uncovered by others without access to the requisite technology to identify and exploit these strategies.

Often, though, quant managers were actively harvesting well-documented 'factor premia' – such as value, quality, momentum, small size and low volatility – that provided persistent risk-adjusted outperformance over the medium to long-term.

More recently, due to a confluence of factors such as: a lower-return environment that drove asset owners to focus on lower-cost products; an increasing recognition of the flaws of capitalisation weighting; and increasing end-user sophistication, quant managers have repurposed their capabilities to systematically harvest the very same factor premia in a more simplified and transparent manner for the rapidly growing smart beta segment.

Smart beta is increasingly being adopted by investors as a 'third approach' to investing that combines the best features of both active management (i.e. the potential to outperform a capitalisation weighted index) and passive management (i.e. simplicity, objectivity, transparency, scalability and relatively low costs). Today, the industry is increasingly recognising that blending these factor premia together into a multi-factor approach can enhance risk-adjusted returns.

All this plays into the central tenet of investor needs: obtaining the best possible risk-adjusted outcome, given investors' unique requirements, at the lowest price. And this is where artificial intelligence (AI) also fits into quant investing.

In the same way that Jack Bogle's firm, The Vanguard Group, democratised access to the stock markets in the 1970s with the launch of low cost (cap weighted) index funds, AI has the potential to democratise sophisticated active quant approaches for the benefit of the masses. By accessing and processing huge amounts

"It is not the strongest of the species that survives, not the most intelligent that survives. It is the one that is the most adaptable to change."

Charles Darwin

of data, both structured and unstructured (so-called 'big data'), and using machines with speech and vision capabilities, AI investment approaches will be able to recognise patterns in markets that were previously unknown. And, as 'yesterday's alpha is tomorrow's smart beta', what gets developed in the active quant space – whether it be new data sources, more unstructured data, greater analytical prowess, more insightful pattern recognition and prediction, or dynamic factor timing – will have a trickle-down effect and, in the future, be incorporated into smart beta approaches. Perhaps space travel is a good analogy – the propulsion and avionic technologies and materials needed to land a man on the moon in 1969 had a subsequent trickle-down impact on commercial aviation, resulting in smarter, more fuel efficient materials and engines, faster travel times, improved safety, and lower pricing through competition which has enabled travel and tourism for the masses.

However, much like the AI achievements in the board game arena, efforts so far on the quant side of finance have been restricted to quite narrow, controllable frames of reference (e.g. a specific factor or combination thereof). The trouble is that dynamic systems and structures, such as economics and finance, have a far greater number of inputs and variables than those found in board games. Their inputs are more complex too. Environments that involve human behaviour are inherently more unpredictable than the closed physical world with which physicists had previously been obsessed. As a result, their typically static models have proven to be limited due to a lack of careful application and failure to understand those models' limitations. Or rather, the models 'work' until suddenly they don't. They can struggle to spot structural shifts (also known as regime changes) or rare 'black swan' events.

A far broader understanding of the world is required, and needs to be incorporated into investment models. Finance, in other words, has been waiting for its 'AlphaGo moment'. Or put another way, the leap from machine learning to deeper learning techniques, whereby neural network frameworks allow data to be layered and positioned relative to its interconnectedness, appears to be the next frontier of quantitative investing. Powerfully, over time, the machine learns by recognising correctly or from its failures – something that is, at times, beyond human capability!

Views of where we ultimately go from here can be divided into two camps: either we harness computing power and machine learning techniques, or robots will take over completely. Unsurprisingly, we side with the former view and note that humans have benefited from harnessing innovation since the Stone Age. We have spoken before of the power of blending humans with cutting-edge technology, referring to this phenomenon as bionic. Serial entrepreneur and leading innovator Elon Musk sees a clear blurring of roles and responsibilities between humans and machines, proclaiming that if we don't embrace it we, as humans, will become irrelevant. His Neuralink venture to merge the human brain with AI through devices implanted into the human brain (the so called 'neural lace') attempts to bring science fiction into the present day.

But those who subscribe to such 'rise of the machines' thinking should bear in mind that, while leadership and management, deep critical thinking and more creative tasks can all benefit from technological advances, they also require the human touch. Bank of England Chief Economist Andy Haldane's infamous analogy of the Dog and the Frisbee springs to mind. The subtlety and complexity of a dog's movement when successfully catching a flying Frisbee is well out of reach of any robot, and will be for some time to come. The process cannot be easily reduced to an algorithm. Similarly, running a company is beyond complex; and perhaps more relevant for this discussion, so is interpreting and interrogating certain data sets.

Anyone who has worked with data for more than five minutes knows that it can be frustratingly messy – the garbage in, garbage out notion. Cleaning it usually takes a huge amount of time and energy. And even when you are satisfied that the information is clean, it needs to be accurately interpreted, which is far easier said than done. Relationships are not stable. Correlations can be misleading, or simply break down. What was true yesterday is not necessarily true today. Machines, or algorithms, can overcome these issues by using deep-learning techniques but we return to the 'breadth of understanding' issue. While algorithms that learn dynamically could analyse and even identify new data sources that were previously overlooked or unavailable (such as satellite imagery offering clues to retail footfall), the question remains whether machines can be taught to intuitively understand the whole picture. Can we have confidence that they won't ultimately be fooled?

And herein lies the real challenge for AI and investing. Data is not information, and information is not insight. The transition between these distinct states is fraught with dark alleys and dead ends – and potentially expensive ones at that. Sifting through the noise and identifying the correct signals, whether by hand or by machine, remains the true quest. Humans and machines can help one another, but alone they are doomed to failure.
While all this may seem quite futuristic, the pace of change is so rapid that none of us can afford to sit back and be complacent. We all need to adapt. As they say: if you can't beat 'em, join 'em.

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