



Quants and the future of finance

Why it's time to start taking the real-world applications of machine learning seriously.

Finance is not the same as it was a few years ago. Whereas *The Wolf of Wall Street* epitomised the traits of the successful trader in the 20th century, today things look very different. Computer scientists in sweatpants – quants – design and implement complex mathematical and statistical models that more efficiently price securities, reduce risk and generate profits.

One of these relatively new statistical applications is machine learning. A 2020 paper in the *Review of Financial Studies* by Shihao Gu, Bryan Kelly and Dacheng Xiu uses the Sharpe ratio, a measure of the risk-adjusted return of a financial portfolio, to show the benefits of machine learning: "A portfolio strategy that times the S&P 500 with neural network forecasts enjoys an annualized out-of-sample Sharpe ratio of 0.77 versus the 0.51 Sharpe ratio of a buy-and-hold investor." Machine learning, they find, more than doubles the performance of a leading regression-based strategy from the literature. That's huge!

But is this just an academic artefact – or does it actually have real-world applications? Hudson & Thames is a London-based engineering company that builds machine learning algorithms for financial investors. I asked its South African founder and CEO Jacques Joubert about the benefits of machine learning: "Machine learning's main use is its ability to model non-linear processes. Linear regression remains the primary workhorse for financial modelling. As one of the leading financial machine learning experts, Marcos Lopez de Prado, notes, we live in a strange world where one half of finance believes that markets are efficient and passive investing is the key. The other half are active managers, most of whom believe that a model as simple as linear regressions is capable of harvesting billions worth of dollars of alpha. But it is unrealistic to assume that something as complex as financial markets follows a linear process. This is where machine learning can add value."

Is that where Hudson & Thames comes in?

"We are mainly focused on implementing the research of others. We often comb through the academic literature looking for breakthroughs or applications of important algorithms and then reach out to the original authors and build out the tools with their guidance and support. Since we have such a large collection of algorithms, we are often able to combine them in new ways to unlock additional capability."

I ask Joubert about a nagging critique against quants: While it is much easier to predict the future in a period of relative stability, what happens during a crisis? Are there not

greater risks when low-probability events occur if the models are fine-tuned on historical data which doesn't include such events?

Says Joubert: "It is important to remember that every trader and active fund manager uses historical data to forecast the future. Quants fit models to the data – and sometimes, because of the non-stationary nature of financial markets, there will be a structural break. But its usefulness really depends on the question being asked. As humans, we always look for heuristics. There are quant funds that have done very well in the crisis. It is perhaps too sweeping a statement to say that Covid-19 has changed the market forever: for which strategies, which anomalies, which asset classes and sectors? It is not true for all."

The more I talk with Joubert, the more I realise that his work is firmly rooted in the scientific method, a departure from the 'finance as an artform' approach that the old-school investors often propagate. I ask him about the synergies between academia and industry. "Some people believe that academia lags industry and I can tell you from first-hand experience that this is only true for the world's best funds like Citadel, D.E. Shaw, 2 Sigma, and Renaissance. However, the vast majority of the industry has failed to adopt algorithms and can benefit greatly by reading more of the academic literature. Information is slow to disseminate and I believe that a large advantage can be gained by tracking the literature."

I cannot help but conclude with a question about the future. What can his machine learning tools tell us about what to expect in 2021?

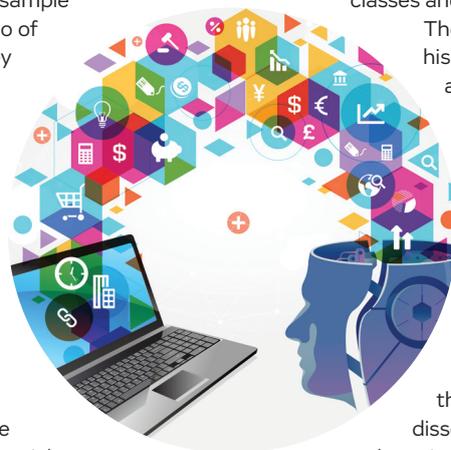
"I wish I had the answers. The tools that we work with do not require us to make forecasts so far out. My personal recommendation is that enthusiasts steer away from using machine learning to forecast the next day's returns. I have yet to see or know anyone to get that right; asset pricing is an unsolved problem. Where I have seen machine learning add value is in portfolio management, lowering market impact, transaction costs, forecasting the limit order book, identifying viable trading pairs, and building long-short portfolios."

In fact, this is exactly the conclusion Gu, Kelly and Xiu also reach: "The overall success of machine learning algorithms for return prediction brings promise for both economic modelling and for practical aspects of portfolio choice." Machine learning in finance is here to stay. But as ever, it will

only be useful if we ask it the right questions. ■

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