

Reprinted from

Risk.net

RISK MANAGEMENT • DERIVATIVES • REGULATION

Risk.net February 2022



Adia wealth fund is building supergroup of quant investing

Adia wealth fund is building supergroup of quant investing

Abu Dhabi Investment Authority wants to turn systematic investing into a 'good science'

What would happen if you put top quant investors from the likes of AQR Capital Management, Citadel, Renaissance Technologies, Goldman Sachs, Capital Fund Management, UBS and Danica Pension in the same room? The Abu Dhabi Investment Authority will soon find out. The sovereign wealth fund has spent the last 18 months orchestrating a brain drain from the world's biggest financial centres to the United Arab Emirates.

The \$698 billion fund has assembled a supergroup of quant investors to run their own money and to help the managers of its actively managed portfolios. It's a setup unlike any other. Seven people have the same job title: global head of quantitative research and development. There is no first among equals. Introductory questions about the team are answered by all of them.

The quants are looking to some of the most storied names in the history of science to provide the blueprint for their new enterprise. "Our inspiration comes from the world of scientific research and organisations like Los Alamos National Lab, Berkeley Lab and Bell Labs," the quants say in a statement, referring to the institutions responsible for the creation of the atomic bomb, the discovery of dark energy and early work on lasers. "This is more like a laboratory that happens to be tackling financial problems, rather than something you might find in a financial institution," they add.

The unit operates as a group of super-specialists who form into "squads" to answer some of the most difficult questions in finance. Ideas are subjected to the scientific method. Theories are tested by endless experiments in an attempt to prove them wrong. Results are subject to peer review.

"We take a problem and break it down into its mathematical abstractions to be tackled by the relevant specialists, which is quite unique to us"

Marcos Lopez de Prado, Adia

Other quants say the idea is captivating. "I find it fascinating; a lot of interesting stuff should come out," says Jean-Philippe Bouchaud, the chairman of Capital Fund Management. If he had the time and the money, he'd try something similar, he says. Adia's recent superstar hires include Charles-Albert Lehalle who worked alongside Bouchaud at the French systematic asset manager.

Adia's supergroup of quants carry out their lab work in an industrial manner: systematising and codifying everything they do. The team curates libraries of algorithms to use when it generates future investing strategies. The quants even subject the process of making strategies to scientific scrutiny, testing their work to find iterative improvements. Their objective is innovating like Bell Labs and executing like Toyota, they say.

Alphabetical order

When asked to list its top quants, Adia does so in alphabetical order. When it received Risk.net's introductory questions, the team shared them out, but responded as one.

Adia's first hire of a superstar quant was Marcos Lopez de Prado, the former head of machine learning at AQR, the hedge fund founded by Cliff Asness. Lopez de Prado moved to the Persian Gulf in the summer of 2020. Alexander Lipton, a former co-lead of the global quant group at Bank of America, joined the unit last month.

The team aims to let code settle arguments. Priorities for research are decided upon systematically. The quants rank ideas based on how different they are from things already in the portfolio, Lopez de Prado says. Research with the greatest chance of success rises to the top of the pile. "In science there is no democracy of people, only a democracy of ideas," says Lipton, who has also worked for Citadel and Credit Suisse. Everyone's views can be "heard and decided on collectively", he adds. "Anybody can originate an idea," Lopez de Prado says.

No single member of the team decides whether a strategy gets approved or whether a line of enquiry continues. Each project must meet defined milestones to proceed. The unit tracks the outcomes of its algorithmic judgments to improve them over time. "Our decisions are made based on improvable processes," says Lopez de Prado. "We track the outcome to improve the process going forward."

Lopez de Prado's musings

Lopez de Prado is a frequent critic of 'bad science' in investing. He has said that many of the strategies developed by quants are simply the result of p-hacking: the quants have tested so many ideas that eventually they find one that works through statistical fluke.

In a paper last year, he criticised finance quants for their lax statistical testing, saying it



Quants assemble: Adia has built an 'investing supergroup' at its headquarters in Abu Dhabi

has led to false discoveries. Finance today resembles medicine in the 1950s, the paper states, when tobacco companies paid for dubious studies that helped them to continue selling their main product. "A significant portion of the models, funds and strategies employed in the investment world, including many of those marketed to individual investors, may be merely statistical mirages," that paper says.

A graph that Lopez de Prado often refers to, and which he calls "the most important plot in finance", shows the Sharpe ratio threshold that strategies must exceed to be statistically robust. The graph shows that a strategy formulated after 1,000 tests has to beat a Sharpe ratio of 3.26 to be sure it has a better than 50-50 chance of even making money.

Quant research must industrialise to progress because "macroscopic alpha is for the most part exhausted". He cites "extreme competition" as the reason. The complexities in developing a true investment strategy are overwhelming. The collection, curation and

processing of data, the software development, feature analysis, running of simulations, and backtesting must all take place.

Other industries that pursue prizes that get ever harder to find have made the same transition. Early prospectors dug gold out of streams with spades. "Those nuggets are gone," he says. Modern mining is a chemical industrial process. In science too, discoveries depend on bigger teams of expert scientists.

The physicist JJ Thompson proved the existence of electrons in 1897 on his own, using a vacuum tube and a pair of charged electrical plates. The discovery of the Higgs boson by scientists at Cern 115 years later required the work of thousands of people.

"To develop vaccines to treat Covid would have taken years in the past," Lopez de Prado says. "Today these things are accomplished because teams of specialists from different fields work together. The team that works on a vaccine will include doctors who understand the symptoms, biologists and chemists who understand the proteins and the molecules,



Marcos Lopez de Prado, Adia

mathematicians to model the protein folding, and computer scientists to run the simulations. This is what is missing in finance."

Adia's lab of systematic investing aims to apply good science to the raw material of market prices and flows, satellite images, text data, and data from the Internet of Things. It means formulating theories from observation – clearly defined ideas about causal relationships in markets – and testing them in an attempt to show that they are false. The longer a theory survives a barrage of testing, the more likely it is to be true.

A team of peer reviewers separate from the research team must be able to design "experiments" that could prove a proposed theory is false, Lopez de Prado and Lipton explain. Without such empirical backing, strategies won't make it to live trading. "Regardless of how profitable a strategy may appear to be in a backtest, if the empirical evidence does not support the theory, the strategy won't progress," Lipton says.

The convention in quant investing is to hire generalists. Adia wants specialists. "We'll hire someone who is the world expert in natural language processing, or the world expert in stochastic optimisation," Lopez de Prado says.

The quant supergroup

Among quants, the reputations of those who have joined the project so far don't come much bigger. Lopez de Prado teaches machine learning at Cornell University and has worked at Guggenheim Partners, Tudor Investment Corporation and Citadel, as well as AQR.

“We take a problem and break it down into its mathematical abstractions to be tackled by the relevant specialists, which is quite unique to us”

Alexander Lipton, Adia

Lipton held multiple senior quant positions at sell-side firms in the 1990s and early 2000s. Both he and Lopez de Prado are former Risk.net quants of the year. Alexander Belopolsky, a one-time principal at Renaissance Technologies, clashed with Jim Simons after joining Millennium Management. He later launched his own hedge fund.

Alexander Davidovich built software systems at Goldman Sachs, Morgan Stanley and JP Morgan. Alexei Kondratyev, another Risk.net quant of the year, worked at Standard Chartered where he collaborated with Nasa and the Universities Space Research Association in the US to apply quantum computing to portfolio optimisation.

Lehalle headed data analytics at Capital Fund Management. Other hires include New York University professor and theoretical physicist Alexander Migdal, and Alessio Sancetta, the former algorithmic execution chief at UBS. Anders Svennesen was chief investment officer at Danica Pension.

These and Adia’s other experts work to crack each piece of the investing puzzle separately. Individuals may focus only on the identification of structural breaks in markets, say, or ways to reduce dimensionality, or on portfolio optimisation. Lopez de Prado says the division of labour speeds up research, compensating for the time spent on peer review. Other quant investors say peer review can slow efforts to make strategies live before market opportunities are missed.

When “discoveries” are made, the unit aims to make the most of them. A new optimisation algorithm, for example, would be added to the team’s code libraries and might later be used to solve an estimation problem, a portfolio construction problem or an execution problem, Lopez de Prado explains. “Every discovery is codified into libraries that can be deployed in many different use cases.”

‘Key discoveries’

It is “difficult if not impossible to run experiments” in finance, Lopez de Prado acknowledges. Markets deliver only one stream of observations – a single version of history – making it difficult to objectively measure what would have happened had events panned out differently. The firm has found mechanisms to address the difficulty, he says, though he’s guarded in describing exactly how. “This is a key insight we have made – a series of key discoveries.”

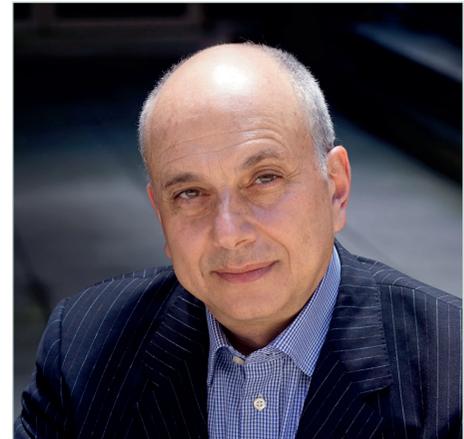
Lopez de Prado returns to the importance of formulating clear and testable theories. “Our approach is driven by building investment theories, and that requires an in-depth analysis of what’s driving markets,” he says. “We take a problem and break it down into its mathematical abstractions to be tackled by the relevant specialists, which is quite unique to us.”

Lipton has spoken in the past about rooting out data specifically to test and refine hypotheses. He once used data from Europe in the 1940s to help figure out how bonds might trade during periods of military occupation. Lopez de Prado has written before about backtesting strategies using synthetic datasets – data formulated to represent specific conditions that could test a given strategy or hypothesis to the max.

Quant ethos

For Adia, the construction of the new unit should be seen as neither a quant takeover nor an isolated experiment. The team is at pains to say the wealth fund will still use outside quant managers.

Adia has a strategic initiative that it described in its last annual review as a “multi-year focus” to incorporate more systematic investment processes into its activities, and to leverage “advances in computing power, data analysis and artificial



Alexander Lipton, Adia

intelligence”. The group of quants is part of the wealth fund’s strategy and planning department.

Like other big investors, Adia is adapting to a world of lower returns. The fund only publishes annualised rates of return over 20 and 30 years. The compound annual growth rate at the end of 2020 – from its most recent annual review – is 6% over 20 years and 7.2% over 30 years.

The quant group’s work will inform all of Adia’s investments with “lots of the ethos described permeating the organisation over time”, according to the team. Adia’s investing horizon allows the fund to build up its quant capability for the long term, while others might face pressure to show quicker results.

Right now, the quant team stands at 50. Lopez de Prado expects it to grow to a “multiple of that”. New hires are as likely to come from outside as inside finance. “We divide the problem of developing investment strategies into abstract mathematical problems in the sense that their solution does not require financial experience,” Lipton says. “That happens to open our pool of candidates to the entire scientific community, not only people with experience in finance but people who are experienced in any of these abstract mathematical problems.”

This isn’t so new, Lipton points out. Investment banks hired their first quants from physics labs in the 1970s. Lipton’s own background was in thermonuclear fusion and hydrodynamics when he joined Bankers Trust in the late 1990s.

Rob Mannix