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Quant Firm's \$1 Billion Code Is Focus of Rare Criminal Case

Bloomberg Law

Chris Dolmetsch

June 8, 2025

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To Headlands Technologies LLC, “atoms” and “alphas” were its crown jewels, the top-secret building blocks of source code the quantitative trading firm spent more than \$1 billion to develop.

And then they were stolen.

That's the allegation that US prosecutors made in January when they charged former Headlands trader Richard Ho with theft of trade secrets. The 36-year-old Cambridge University computer science graduate, who has pleaded not guilty, faces a maximum of 10 years in prison if convicted.

Ho's prosecution could have a major impact on Wall Street's war for quant talent, laying down a marker for when trading algorithms and strategies become stolen property. Until now, that's mostly been an issue raised in civil litigation involving firms like Jane Street Group, Millennium Management and Citadel Securities. But lawsuits are often quietly settled or arbitrated. A criminal conviction would raise the stakes much higher for potential career moves.

“Quants will treat intellectual property much more seriously and be less cavalier about taking them to another firm,” said Ernest Chan, a veteran quantitative trader who founded QTS Capital Management.

Chan said that allegations that Ho directly stole code were particularly egregious. “Often quants will just take the concept,” he said, adding, “You can't stop people from using the concept that is in their mind.”

The case against Ho, for which a trial date has yet to be set, promises to shed new light on the secretive world of quant firms and the fierce competition among them.

While still working at Headlands, Ho allegedly partnered with one of its major rivals. Neither Headlands nor the competitor was identified in the indictment, though Headlands named itself in court filings. The rival wasn't accused of wrongdoing in the criminal case, but Headlands alleges in a separate lawsuit against Ho that he colluded with New York-based Tower Research Capital, one of the first high-frequency trading firms.

David Meister, a defense lawyer for Ho, said prosecutors had “repackaged” Headlands' suit into a criminal case and that his legal team was looking forward to his day in court.

"Mr. Ho, a talented Cambridge-educated computer scientist who has written trading code for more than a decade, has been unfairly targeted by Headlands in litigation for the past two years, following his decision to leave his job there and set up his own shop in New York," the lawyer said.

Headlands Chief Executive Officer Matthew Andresen and the Manhattan US attorney's office, which is prosecuting Ho, both declined to comment. Tower didn't respond to multiple requests for comment, and a lawyer for the firm declined to comment.

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At Headlands, alphas are models that predict prices based on real-time data, while atoms are more specific functions combined to build those models. They're deployed globally.

Headlands has said Ho played a key role in its "China initiative" to expand trading in that and other markets. He arranged connectivity with international exchanges and brokerages, knowledge he later used for his own gain, Headlands claims.

Ho's defense team plans to argue that atoms and alphas were not, in fact, trade secrets. Meister also suggested in a court filing that any value the code might have had was ephemeral, comparing it with perhaps the most famous trade secret of all time.

"Algorithmic trading code is not static like the secret recipe for Coca-Cola; rather, like an open can of Coke, it quickly goes stale," he wrote.

Headlands was founded in 2010 by Andresen, Jason Lehman and Neil Fitzpatrick, all former executives in Ken Griffin's Citadel financial empire. Chicago-based Headlands now has five other offices including London and Singapore.

'Gold Mine'

The criminal case follows a lawsuit Headlands first filed against Ho in Chicago in 2023. In its complaint, Headlands, referring to itself as HT, offered a hypothetical example of how atoms and alphas power automated trading strategies it says have generated billions of dollars in profit.

"An HT Alpha might draw on a group of HT Atoms to conclude that the price of contracts for precious metals futures beginning with the letter 'P' usually dropped on Tuesdays at 2:30 p.m. before rising again at 2:32 p.m., and thus direct HT's ATS to sell contracts for platinum and palladium at 2:29 p.m. and purchase them back at 2:31 p.m.," Headlands said.

Chan, the veteran quant, said a properly built source code, backed by the right infrastructure, was essentially a "gold mine" because it "automatically makes money no matter what."

The amount of money at stake would have drawn the interest of the Manhattan US attorney's office, which typically handles the nation's biggest white-collar crime cases, said Aloke

Chakravarty, a former federal prosecutor and cybersecurity expert at Saul Ewing LLP.

“The particular industry here, and the type of code, is incredibly valuable, obviously, in term of its profit potential,” he said. “Both HT and the defendant’s company are alleged to have been capable of making billions of dollars off of it.”

Chakravarty said the number of lawsuits between Wall Street firms may have also spurred prosecutors to try to establish “clear criminal lines” for quants.

‘On a Massive Scale’

According to Headlands’ lawsuit, Ho joined the firm in July 2019 as a quantitative researcher and developer with a compensation package of more than \$1 million a year. While working there, he secretly started his own quantitative trading firm, One R Squared, in the spring of 2021 and proceeded to steal Headlands’ atoms and alphas “on a massive scale,” the firm alleges.

One R Squared wasn’t identified as Ho’s firm in the indictment, but his lawyer Meister acknowledged that it was in a March 17 letter to the court. The firm was also named in the deal under which Ho was released on a \$1 million bond. He agreed that One R Squared wouldn’t trade any financial products while his case remains pending.

In statistics, an R-squared value of one indicates a model that perfectly predicts an outcome based on certain data.

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Both the government and Headlands allege that Ho directly copied code that he then incorporated into his own firm’s, covering his tracks by making various cosmetic and formatting changes. According to the firm’s lawsuit, he left Headlands in August 2021 and also recruited a number of other employees to join One R Squared. Prosecutors said Ho’s firm began trading in Chinese markets in spring 2022 before moving to the CME and ICE exchanges.

In its lawsuit, Headlands accuses Tower of injecting \$15 million into One R Squared in exchange for a commitment to develop automated trading strategies that it “knew or should have known would be derived from HT intellectual property.”

Ho’s firm ultimately acted “as an internal trading pod within Tower,” Headlands claims.

Tower wasn’t named as a defendant in Headlands’ suit. The Chicago firm has said in court filings that both firms are members of the CME, which requires disputes to be resolved through arbitration.

According to the suit, Ho worked at Tower from 2012 to 2015 and had a deal with his former employer prior to launching One R Squared. Headlands claims Tower agreed to handle trades for Ho’s firm, which exacerbated the harm from his theft.

'Exceptional Speed'

"Tower's trading platform allows it to execute trades with exceptional speed and precision," Headlands said. That meant One R Squared could make the same trades using the same alphas before Headlands could. The result, it claims, is that Ho began usurping Headlands' commodities and foreign exchange futures trades, costing it tens of millions of dollars a month in profit.

In a March 2024 filing in Headlands' case against Ho, Tower called One R Squared a "third-party service provider" that had seconded two employees to Tower between 2021 and 2023. It asked the judge to throw out a subpoena sent to those two employees seeking information about their trading. Tower said Headlands had put forth "no evidence" that Tower's source code contained any from the Chicago firm.

The high-frequency firm also expressed concerns about its own trade secrets being exposed. "Should one of Tower's competitors gain knowledge of or access to the documents and information requested by plaintiffs, the value created by Tower's years of design, development, and refinement of these trade secrets would dissipate almost instantly," it said.

Headlands' suit, including the dispute over the subpoena, has been put on hold pending the outcome of the criminal case.

An earlier version of the lawsuit was partially dismissed last year, but Headlands was allowed to file a revised complaint.

Former federal prosecutor Keri Axel, now at Los Angeles' Waymaker law firm, said the government's case against Ho seems strong. But she said prosecutors still face challenges.

"It is hard to prove a highly technical case," she said. Jurors could well agree that atoms and alphas are not trade secrets.

An attempt by federal prosecutors to convict a Wall Street figure for code theft more than 15 years ago illustrates the challenge. Goldman Sachs Group Inc. programmer Sergey Aleynikov, who featured prominently in Michael Lewis' Flash Boys, was found guilty in 2010 of stealing the bank's high-frequency trading code and sentenced to eight years in prison.

But Aleynikov had served only a year behind bars when a federal appeals court threw out the verdict. He was subsequently convicted on similar charges in New York state court but got no additional jail time.