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**SPECIAL REPORT**

## Outsmarting The Market

Behind Barclay's quest to build a world-class team of academic quants that systematically does the impossible

It came as no great surprise that Richard G. Sloan took a leave from his tenured position at the University of Michigan's business school last summer to join an investment firm. Wall Street has stepped up its hiring of academics in recent years, and the 42-year-old Sloan is one of accounting's bona fide stars. But Sloan's explanation of why he left academia for Barclays Global Investors (BGI) is startling. "I just felt that BGI was getting ahead of me," he says. "I came here because this is where the leading edge in my area of research is now."

As one of more than 100 PhDs in BGI's employ, Sloan reinforces a cadre of highly credentialed brainpower that no university finance or economics department in the land can match. San Francisco-based BGI is descended from a firm founded in the 1960s, but it has parlayed its prowess in the field of quantitative investing into an astounding recent growth spurt. bgi has added \$877 billion in funds since 2002, boosting its assets under management to \$1.62 trillion and enthroning it above State Street ([SST](#)), Fidelity, and Vanguard as America's largest money manager.

Barclays Global Investors' original claim to fame was inventing the index fund, so it is fitting that the bulk of the wealth this prototypical "quant" shop manages—nearly \$1.1 trillion—is invested in vehicles that replicate the Standard & Poor's 500-Stock index and other indexes. However, Sloan and the other brainiacs that BGI continues to hire away from elite institutions around the world are not preoccupied with devising clever new ways to match market returns. Rather, they seek to do something that the efficient-market theories on which the firm was founded held to be impossible: to systematically beat the market.

**HARD DATA VS. HEROICS**

In its own quietly methodical fashion, BGI has indeed topped many indexes with remarkable consistency by overweighting its investment in certain of their component securities—a conservative quant technique known as "tilting" or "enhancing." In fact, every one of BGI's 19 principal stock market tilt strategies has outpaced its benchmark over periods ranging from 4 to 20 years. Add the

gains produced by more aggressive vehicles such as hedge funds, and over the last five years BGI has generated a colossal \$19.9 billion above the market return—or "alpha," in investment parlance—for the 2,800 pension funds and other institutional investors that are its clients.

Long dismissed on Wall Street as a think tank that runs money on the side, the firm and its eggheads have also engineered a tenfold rise in profits since 2001. BGI, a subsidiary of British bank Barclays PLC ([BCS](#)), is likely to take in more than \$1.6 billion in pretax profits this year, contributing to its parent company's much promoted allure as a takeover target. BGI, which began as the investment arm of Wells Fargo Bank ([WFC](#)), was acquired by Barclays in 1995 for \$443 million—a great bargain, as it has turned out.

"When we first started, we were a bunch of guys who stared at our shoes at cocktail parties," says Richard C. Grinold, a former University of California at Berkeley finance professor who is BGI's senior research guru. "But now the rest of the world has to react to us."

BGI's ascendance highlights the coming of age of quantitative investing, which seeks to purge money management of human fallibility through the rigorous application of the scientific method. "The goal is to replace heroic personalities contending in an atmosphere of greed and fear with compelling hypotheses subjected to hard data," declared Grinold and longtime colleague Ronald N. Kahn in a recent manifesto.

Fine, but how exactly does Barclays go about outsmarting the markets on such a scale? To find out, *BusinessWeek* interviewed scores of BGI's alpha-seeking males and females, sat in on a brainstorming session of its Asian equities research group, and huddled with a portfolio manager on its trading desk as she put the firm's "portfolio optimizer" smoothly through its high-tech paces.

This deep look into the workings of the planet's largest quant shop abounds with informative lessons for the average investor. Unfortunately, though, they add up to this simple, humbling imperative: Get thee to an index fund. Now.

You and I can no more hope to do what BGI does than we can to rival such famously heroic stockpicking personalities as Warren Buffett and Peter Lynch. Quant investing BGI-style requires fluency in applied mathematics as well as access to the prodigious computing power needed to continuously crunch the numbers for 10,000 stocks and 2,500 debt issues and execute thousands of trades a day. With 2,640 employees spread among 11 offices around the world, BGI is the largest quant manager by a wide margin.

Much ink has been spilled over the rapid growth of hedge funds and their increasingly aggressive alpha-seeking tactics. Meanwhile, a less publicized but equally telling shift is taking place at the opposite end of the risk-reward

spectrum, as the soaring popularity of exchange-traded funds (ETFs) breathes new life into indexing, BGI's original forte. In the U.S. alone, ETF assets under management topped \$450 billion in 2006, up from \$102 billion in 2002. BGI dominates the ETF business with a 60% market share, according to Morgan Stanley.

The explosive emergence of both risk-intensive hedge funds and risk-averse ETFs can be explained by a single concept that is transforming the big-money world of institutional investing: alpha-beta separation. The basic idea is to lock in a market return (the beta part) on one end with low-cost index funds of one sort or another. On the other, pay up to put money into "alternative strategies" run by managers with a proven ability to beat the market (the alpha part).

A recent study by McKinsey & Co. found that by the end of 2005, "higher alpha and cheap beta products" accounted for 50% of all institutional assets under management, double the figure in 2003. "The warning bells have already begun to toll for many traditional firms not willing to depart from their business-as-usual approach," McKinsey noted. Investment management consultant Casey, Quirk & Associates concurs, predicting that nearly half of the world's 50 largest money management firms "are not going to be around in their present form for much longer."

As the inventor of indexing, BGI has been separating alpha and beta since its founding. "The world has come BGI's way," says John F. Casey, Casey Quirk's chairman and a longtime BGI champion. "I don't think a lot of clients consciously decided that they wanted to shift to quants so much as they wanted to go with someone who knows exactly what risks they are taking and will do what they say they will do. And that's BGI."

In traditional circles, quant has been derided as "black box" investing for its reliance on computer models comprehensible only to the double-domes who created them. The black box survives today in the more mystifying form of investing techniques derived from fuzzy logic, neural networks, Markov chains, and other nonlinear probability models.

As epitomized by BGI, though, modern quant investing is grounded in the same economic fundamentals that preoccupy mainstream analysts, though quants amass much more data and massage it more systematically than anyone else does. Another key difference is that quants ignore the story behind the numbers. The whole sprawling human drama of business is of no interest to Barclays researchers, who never venture out to call on a company or tour a store or a factory. If a thing cannot be measured and factored into an investment hypothesis for testing against historical data, BGI has no use for it.

Quants also are far more mindful of risk, as measured mainly by price volatility. Traditional portfolio managers tend to heighten risk by concentrating their

investments in a relative handful of companies that they believe will beat the market averages over the long run. Instead of angling to get in early on the next Wal-Mart ([WMT](#)) or Microsoft ([MSFT](#)), BGI spreads its bets across a broad market swath, frequently trading in and out to exploit small pricing anomalies. The firm's \$19.9 billion in alpha represents just 1.64% above the market return, on average.

Quant is no investing panacea, however. Historically, its practitioners have fared better in periods when value trumps growth and have tended to flounder at the fringes of the markets, where data tend to be spotty. Quant's by-the-book formalism and dependence on historical data also leave its devotees particularly vulnerable to the manias and panics that disrupt markets at irregular intervals. The classic example is Long-Term Capital Management, a fixed-income superstar that boasted two Nobel Prize winners on its board. Highly levered LTCM imploded in 1998 under losses of \$4.6 billion after the Russian government defaulted on a bond issue, disrupting credit markets worldwide.

It was another catastrophe—the pricking of the tech bubble in 2000—that marked the beginning of quant's rise. A trickle of new funds from safety-minded institutional investors grew into a torrent as BGI, LSV Asset Management, Enhanced Investment Technologies, AQR Capital Management, and other top quant firms posted stellar returns in the buoyant, value-tilted markets of recent years. Each of the three firms that sit atop the latest hedge-fund rankings is a quant master of long standing: Goldman Sachs ([GS](#)), Bridgewater Associates, and D.E. Shaw. (BGI ranks fifth, with \$17 billion in hedge fund money.)

By contrast, the typical active money manager has struggled. Over the last five years the s&p 500-stock index has outperformed 71% of large-cap funds, the s&p MidCap 400 has topped 83.6% of mid-cap funds, and the s&p SmallCap 600 has bested 80.5% of small-cap funds, according to Standard & Poor's, a unit of The McGraw-Hill Companies ([MHP](#)), which also owns *BusinessWeek*.

#### STUDENT UNION CHIC

BGI goes to great lengths to limit its exposure to human error by using computer technology to automate every investment process it can, including trading. And yet the ambiance at BGI's headquarters, in an office tower a block south of Market Street in downtown San Francisco, is much more coffee-stained grad school seminar room than antiseptic computer lab. For if the only investment ideas that count at BGI are those that can be expressed in software code, they usually begin as a flash of insight in the mind of someone like Xiaowei Li, one of BGI's 140 research officers.

Nov. 17, 2006, saw a milestone in Li's nascent career as an alpha hunter: her first presentation to BGI's Asia equities research group. The China-born Li brought impeccable credentials to the task, including degrees from Princeton University (a master's in economics and public policy) and Stanford University (a

PhD in economics).

Li is the leader of a project analyzing non-Japanese Asian banks. The object is to identify statistical factors—or "signals," in quant speak—to help BGI determine which of the many banks traded in Hong Kong, South Korea, Indonesia, India, and other countries are undervalued in the stock market and which are overvalued. A signal highlights a market inefficiency; good ones are rare and often prove a juicy source of alpha.

Li, who had just returned from a swing through southeast Asia that included stops in Hong Kong and Macao, began her presentation by passing around a list of 25 potential signals. Li's ideas were sketchily annotated, but that was to be expected at this early stage. The meeting was just an inaugural brainstorming session, not a PhD thesis defense.

Gathered around a table in a small conference room on the 28th floor of BGI headquarters were a half-dozen of Li's peers, plus her manager and the co-heads of the overall Asian research effort, Ernie Chow and Jonathan Howe, both of whom joined BGI in 1999 and were the fortysomething graybeards of the group. Everyone in the room had either a PhD or a master's degree in financial engineering. The disciplines represented included physics, applied mathematics, and operations research, as well as finance and economics.

Li stood throughout most of the two-hour meeting, the better to scrawl phrases and formulas on the floor-to-ceiling whiteboard behind her. The discussion was highly technical and surprisingly lively. Who knew pre-provision operating expenses could be such a hoot? Chow and Howe took the lead in questioning Li, raising their voices only to talk over subordinates who on occasion were a bit overeager to comment.

Li held her own throughout, demonstrating impressive command of Asian banking arcana even as she acknowledged the limits of her knowledge, and smilingly accepted suggestions for further research. Afterward, Howe described the session as "pretty productive," even though the group hadn't even made it halfway through Li's list.

Li's bank study is one of a dozen projects in Asian equities alone. At any given time, 50 to 60 more alpha quests are in the works across BGI's other research areas: U.S. and European equities, fixed income, and global macro, which handles cross-border investing, currencies, and commodities. In 2006, Barclays spent \$120 million—10% of its total budget—on research. In the scale of its commitment to commercial innovation through research and development, BGI is the Bell Labs of high finance.

"What's really distinctive about BGI is the research effort. They throw a lot of resources at getting the best people and the best systems they can," says David

F. Deutsch, chief investment officer at the San Diego County Employees Retirement Assn., a BGI client that ranks as one of the U.S.'s top-performing public pension funds. "What they do has to work, and it also has to speak to guys like me, who think about this stuff but who are not in the trading pits every day."

Like other quants, BGI regards its investment signals as trade secrets and guards them accordingly. Here, the traditional academic imperative of publish or perish has been turned on its head: If you publish (or otherwise spill the beans), you will perish.

BGI comes up with scores of new signals every year, most of which are refinements of existing strategies rather than brand new, market-thumping ideas. The global macro group came up with a notable example of the latter by devising a set of signals that can pinpoint the timing of an economy's pivot from recession to expansion. By buying a country's stocks and shorting its bonds before its recovery was generally recognized, BGI's Global Ascent fund was able to generate total alpha of 4% in 2005 and 2006. To date, BGI has used this strategy in 15 countries and plans to apply it to perhaps 10 more.

BGI's researchers seek inspiration indiscriminately. "We will beg, borrow, or steal ideas from wherever we can," says Kenneth F. Kroner, a 12-year veteran who heads BGI's global macro area. "Richard [Grinold] likes to say that we have no pride whatsoever."

BGI has a line or two into every top research university and makes determined use of its connections to get the most promising academic research before it starts to circulate. Every year, BGI brings in a couple dozen leading scholars to present their latest work in the sort of disputatious seminars that are a staple of campus life. Professors are generally flattered by the attention and open to remunerative arrangements, including paid consulting gigs. Of course, the best way to propertize an academic's leading-edge insights is to pay his salary.

Richard Sloan's hiring was the culmination of an 11-year relationship with BGI. He was an unknown assistant professor at the Wharton School when he made his breakthrough discovery of the so-called accruals anomaly in the early 1990s. The investment implications of Sloan's findings were so momentous that they were generally presumed to be erroneous. The young professor was unable to persuade an academic journal to publish his findings until 1996, about a year after BGI invited him to San Francisco for a private seminar. "BGI was the first place to really pick up on my work," Sloan says.

What he found was that the stock market is slow to differentiate between good old cash flow and noncash accruals, such as changes in reserves for inventory levels and bad debts. By buying stocks of companies with the highest-quality earnings and shorting those most dependent on accruals, an investor could lock in 12% alpha. Analytical refinements noted in a second paper that was presented

first at BGI in 2000 (and finally published in 2005) boosted the excess return to a gaudy 20%.

Sloan's assertion that BGI now sets the pace in earnings-quality research annoys many academics in the field. They include Russell J. Lundholm, who chairs the accounting department at the University of Michigan at Ann Arbor's Ross School of Business, from which Sloan is on leave. "I can't believe the cutting edge is at BGI or any other firm," says Lundholm, who still jogs with Sloan when he's in town.

Of course, Lundholm doesn't know exactly what BGI knows, because not even Sloan was allowed a glimpse inside the firm's quality "bucket" until he became an employee. Inside he found 15 specific signals, including "a bunch of things that were new to me," Sloan says. Even as individual signals have come and gone, earnings quality has been BGI's single richest source of alpha over the last decade.

One of Sloan's closest academic colleagues, fellow Aussie Scott Richardson, joined BGI about the same time. Richardson took a leave from Wharton, where he is an assistant professor of accounting, to be BGI's director of U.S. credit research. In his first weeks there, he compiled a long list of highly specific research ideas for his boss, fixed income chief Peter J. Knez. "These are just things I see because I'm coming in from the outside and am closer to current academic research," he says.

Whatever a new idea's provenance, as a rule, BGI will not deem it portfolio-worthy unless it first passes four tests. In BGI speak, they are collectively known as SPCA, for Sensible, Predictive, Consistent, and Additive.

To start, a researcher must construct a hypothesis that makes basic economic sense. For Xiaowei Li, this means converting her list into a one-page "sensibility document" capable of persuading the firm to authorize the expense of empirical testing. Evidence must be assembled showing that the signal not only outperformed in the past but that it can predict future above-market returns. The opportunity to realize these returns must be consistently available, even in volatile markets. Finally, the idea cannot be an old notion repackaged to seem new but must add insight that is truly fresh.

Surprisingly, it is the initial criterion—sensibility—that is hardest to meet, with 40% to 50% of proposals failing to make the grade. "The key is the S factor," says Kahn, who has a PhD in physics from Harvard. "It's so easy to be fooled by the data into mistaking patterns in the data for a sensible hypothesis."

Sponsors of proposals authorized for testing usually spend a few months sifting data and assembling a so-called SPCA report of 20 to 25 pages. It is reviewed both by a group of senior research colleagues and a third-party referee. About a

third of all refereed proposals are rejected.

Once approved, a new signal is added to one or more of the computer models BGI uses to forecast returns (or expected alphas) for each of the 12,500 stocks and bonds it tracks. BGI portfolio managers turn such strategies into investment portfolios for clients by running its return forecasts through an "optimization engine" that takes into account numerous risk factors as well as trading costs and spits out a trade list in the form of an Excel spreadsheet. The whole process takes 10 minutes or less.

How much bigger can BGI get? The short answer: a whole lot—and therein lies the danger.

As the world's largest indexer, BGI appears unassailable on the beta side of the great divide that is transforming institutional investing. Remarkably, the firm's iShares brand has taken a growing share of the ETF business even as it has grown by leaps and bounds.

But if the index business is congenial to scale, the history of active management is littered with the corpses of firms that let their market-beating prowess attract more money than they could handle. Within quantdom, the question of whether alpha exists as a finite market commodity is a topic of debate. Unquestionably, though, the shift of vast sums into quant hands is making alpha more elusive. "The fact that there are more and more quants chasing the same sort of factors will shrink the alphas from those factors gradually," acknowledges Robert C. Jones, who runs Goldman's equity quant effort.

BGI's top executives seem acutely aware that galloping growth could undermine the rigor and integrity of the firm's investment methods. Having more than tripled assets under active management, to \$370 billion, over the past three years, BGI has closed many of its market-beating strategies to new investment, at least temporarily.

This doesn't mean, though, that Barclays is backing away from its pursuit of advantage through research. BGI's capital spending rose 30% in 2006 and "will only slacken if we run out of new ideas," says CEO Blake Grossman, who started at the firm in 1985 as a portfolio manager. "A half-dozen years ago, a couple of guys could make a difference. Now it takes dozens of people and terabytes of data to be competitive."

Recently, Duke University's David A. Hsieh, a leading hedge fund scholar, theorized that only \$30 billion in alpha is realizable annually from the \$30 trillion market value of all stock and bond markets worldwide. It was intended as a very rough estimate, but if BGI is extracting \$4 billion to \$5 billion a year, what chance do the rest of us have to top the averages?

Think of Barclays Global Investors as the Wall Street equivalent of one of those giant factory trawlers that have revolutionized commercial fishing. This super-quant methodically cruises global markets, sucking alpha from the depths while everyone else drifts about in rowboats, corks bobbing pathetically atop waters that are nearly fished out.

By Anthony Bianco

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