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By Nina Mehta

Aaron Brown

Aaron Brown is a master quant with an activist bent. He is currently a vice president in Citigroup's risk architecture group in New York. After receiving a B.S. in mathematics from Harvard University in 1978, he entered the Ph.D. program in finance at the University of Chicago. He left with an MBA in hand in 1982. Back then, he now says, Wall Street was beckoning far too urgently to hang around in the Windy City in a graduate program. Over the years, Brown has been a portfolio manager, research quant and head of mortgage securities. He has taught finance at Yeshiva University and at the Fordham University business school in New York. In 1999, he and Martin Stoller, a marketing

professor at Northwestern University, co-founded eRaider, a shareholder activism firm dedicated to reviving undervalued companies by compelling better corporate governance. With his wife Deborah Paster, Brown also ran Allied Owners Action Fund, the public mutual fund that did the investing for eRaider. He joined Citigroup in 2000.

FEN: Let's cut to the chase. Why is your icon on the Wilmott.com discussion board a squirrel?

Brown: Actually, it's a raccoon. In the old days, when Wilmott first started, users were limited to a very small pixel set and could only use a simple, nonmoving image. People kept asking me what mine was, so I moved to more realistic picture of raccoon. I just like them.

FEN: Fair enough. In just a few decades, risk management has become a mature discipline. Do you think risk management is perceived the way it should be?

Brown: I'm pushing hard for quantitative assessments of the quality of risk management. Given that that's our whole reason for existence, our basic tenet, we should be working on it. This is a profession that's easy to fake. There are a lot of risk minimizers out there, a lot of people who manage the appearance of risk. It's not an easy problem to address—especially if we won't eat our own cooking.

FEN: Banks and other institutions have a lot of models and systems to manage risk. You're saying that's not sufficient?

Brown: Right. It's about, Are we adding shareholder value? If you're doing risk management for a public company, you should be able to say this is how much shareholder value you added and here's how to measure it. If I can say Basel II requires a particular system, it doesn't matter how much it costs—\$10 million or \$100 million. If I say a system will improve our measurement of risk but I can't put a dollar figure on it, well, that's hard to sell at budget time.

I wrote an article for GARP Risk Review recently, in which I ranked the 25 largest U.S. banks based on what appears to be the amount they've added to shareholder value through risk management. Oddly enough, I've had no interest in it from any financial institution but a lot of calls from people in non-financial businesses who want to know if they can use this tool.

I think financial institutions in general tend to be allergic to public measures of value. Whenever you do it, you look bad. If you pit your performance as a mutual fund manager against the market, it always looks embarrassing, not because it's bad but because people have an inflated idea about how good a job you can do. People who avoid being measured can always look better. But businesses don't feel that way—they're used to the idea that every single department, including janitorial services and risk management, has to justify itself and compute its value to the firm.

FEN: Financial institutions are used to managing risks, but the business of risk management hasn't gotten religion.

Brown: In financial institutions there's a segregation between business risk and trading risk. In non-financial firms, all the trading they do is involved with their business risk, so looking at whether risk management helps shareholders is a more natural idea. I think we'll get more research in this area, but it will be from corporate side—and financial institutions will wind up being late adopters.

FEN: You work in Citigroup's risk architecture group. What does that involve on a day-to-day basis?

Brown: Risk architecture is an intermediate group between risk analytics and risk technology. Our client groups are the risk management organizations in the bank—senior management, which is interested in aggregating bank-wide risk, and the front desks, which are interested in measuring their particular exposures. We come up with new analytics, fix problems people identify in existing systems, and figure

out how to measure things better. An analytic fix that risk analytics likes might not make sense to the desk, it might be hard for technology to implement, or it might not fit in with senior management's long-term goals. Most of my work is oriented toward making three-to-six-month improvements.



"In the old days of risk management, you could look at the data and see it, but now there are tens of millions of positions, and hundreds of thousands of market factors. Each position can have hundreds of attributes and each market factor has thousands of market data points. And the market factors themselves are becoming very abstract—we don't just have prices in there anymore, we have implied volatilities and important correlations. It's always a little bit dangerous in the evolution of a system when you get to the point, for example, where you don't really know what effect a change in assumption in how you do correlation will have throughout the firm".

FEN: That's a broad mandate. What elements of Citigroup's technology and systems keeps you up at night worrying?

Brown: I personally don't worry about the actual infrastructure, security and so forth, but I'm glad others are up worrying. I worry about the sheer overwhelming size of the thing. We're asking the system to do more and more things with less and less human intervention—and more and more people are relying on the results. Every time we do an improvement to the system, we increase our data needs or database size by a factor of 10.

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FEN: More people depend on models to ferret out and manage a host of risks, but there's a lot of guesswork in the models. When I did a Q&A recently with Dan Borge, who used to be at Bankers Trust, he made the point that risk management now runs the risk of becoming an isolated priesthood within banks. How does that sit with you?

Brown: I don't think it's true. If we weren't in there every day with the front desk, I could see that happening. Frankly, the front desk outran senior management 15 years ago. There's no bank executive in

the world who really understands all the trading desks and likely may not understand any of them. There's no way to understand that without computers and sophisticated risk management, so banks need people who can talk to both senior management and the front desk in a real, creative back-and-forth dialogue. That's what keeps us up-to-date and accurate.

FEN: I'd think that would be harder now. Risk management has become more bureaucratized, the models are more complex, and it's harder for people to understand and keep track of the assumptions behind the models.

Brown: You mentioned two things I think of as opposites. It's true that there is increasing bureaucratization, and more emphasis on complying with Basel II, for example, than on getting the right answer. I don't mean people don't want the right answer, but increasingly what's in the Basel Accord is the right answer. That can be very stifling. I think the recent corporate scandals and Sarbanes-Oxley have created an atmosphere where people are more interested in defensible results than the right results. We now need controlled, verifiable, validated, backtested results that satisfy accountants, auditors and regulators. That force is holding us back and working against creativity.

On the other side, the increasing mathematization and ability of analytics to accurately model these risks has dramatically improved our communication. A senior management person can understand the real financial risks an organization is taking without having a deep market feel for every individual trading market. This is the triumph of risk management; this is what we have accomplished.

FEN: What have you learned about risk evaluation or analysis at Citi that didn't know before?

Brown: The biggest thing for me has been the integration of different desks. At Citi not only are we integrating all the desks, but we're integrating market risk with credit risk, operational risk, liquidity risk and all that. I find that higher level of aggregation interesting. Frankly, the market risk problems are solved. You can lose a lot of money, but if you lose more money than expected, you're not following best practices. Credit risk is not there yet; it's still a year or two away.

FEN: Credit risk should be treated like market risk?

Brown: All of these fields have to become more like market risk. Each field has unique problems, but we already know how to tackle those problems. We must look at what we did in market risk and do that in other fields.



"When market risk was invented—the modern kind we did at JP Morgan and Bankers Trust in the early 1990s—there was an awful lot of back and forth. We went to the front desks and asked them how they looked at things and we went to senior management and asked them how they looked at things and we went back and forth, back and forth. Everybody said it's impossible, there's no way to bridge this gap. But it happened and it worked".

FEN: Isn't that difficult with operational risk, which often seems like a



catch-all?

Brown: You need to segregate from operational risk those things you want to just minimize. A lot of things that people call operational risk shouldn't be part of risk management at all. You want to minimize the amount of fraud in an organization—there's not some optimal amount of fraud you want to have. But there are important aspects of operational risk you do want to optimize. If you have too low a level of risk, you choke off innovation in the company. If you allow too much operational risk, you can bankrupt the organization by coming up with unpredictable results and destroying value.

When market risk was invented—the modern kind we did at JP Morgan and Bankers Trust in the early 1990s—there was an awful lot of back and forth. We went to the front desks and asked them how they looked at things and we went to senior management and asked them how they looked at things and we went back and forth, back and forth. Everybody said it's impossible, there's no way to bridge this gap. But it happened and it worked. We've got to do that for operational risk—go back and forth to the front-office people who are making the decisions, who are deciding to approve this innovation or not, and find out what they're looking at, and then go back to senior management who are looking at the whole company on a strategic level and deciding what level of innovation they want. Then we have to design a report that makes sense to both of those groups. Until that happens, we haven't gotten anywhere.

FEN: You mentioned that a company can easily choke off innovation. Broadly speaking, how does innovation occur?

Brown: Innovation is like weeds, it grows all over. To me, it's about how to choose which ideas get fertilized, which ones stay, which ones get capital. That's the interesting thing, and the long-term success of finance depends on it. You can do all the fancy engineering you want with existing things, but if you fail to capture and capitalize the innovation, you're irrelevant.

My insight into this is that however it's capitalized there's a lot of error in the process. You must capitalize a lot of stupid ideas to get one good one. You've got to have a lot of Internet booms and crashes in order to restructure an economy. People overreact to the errors and get too upset about the disasters. The world would be better and progress faster if we learned to evaluate the risk beforehand rather than criticize the failure and over-reward the success afterwards. I've never been at an institution where there wasn't more good innovation than could be accommodated by the institution.

FEN: Let me go back to credit risk. What risks aren't currently being priced in the credit derivatives market?

Brown: The credit derivatives market is robust and efficient and reduces more fears than it gives. But credit correlation still is a big unsolved problem. The market is finally addressing it, but we've got to have a disaster or two before people take it seriously and start treating it right. I think the credit derivatives market will see disasters caused by misestimating credit correlation. That was an economic danger that was always there; it's just that the credit derivatives market allows someone to take a pure bet and therefore go spectacularly bankrupt, whereas before it was something sitting in dark that hurt a lot of people a little bit.

FEN: There's been a lot of consolidation in the credit area, such as Moody's buying KMV Corp. Is there a downside to this kind of consolidation? Are there too few ratings agencies? Is there more risk with ratings agencies than there used to be?

Brown: I have strong feelings about ratings agencies. There is no excuse today for specific ratings agencies to have statutory protection. We should have a more open and competitive market in ratings agencies. Moody's would like to be the one-stop-shopping destination for any type of credit information, and I don't think that's healthy. I always thought of KMV as a major counterpoint to Moody's. It's not healthy for them to share a parent. Fortunately there are a lot of structural and hybrid models out there, and

you can always build your own.

Second, it's a mystery to me that ratings agencies escaped any broad public censure for their behavior in recent corporate bankruptcies. Auditing firms and investment banks got savaged, including Citigroup, of course. If we're going to completely reform investment banking and accounting, we ought to give thought to conflicts of interest at ratings agencies. They do a spectacularly good job of not giving in to these conflicts, but they're still there. A ratings agency shouldn't be both a general financial company that takes fees from companies and one that provides the ratings that allow pension funds and other institutional investors to legally hold securities. They're working for too many people, and the conflicts are too tangled.

FEN: You've worked in trading, investment banking and portfolio management. You've collaborated with other investment activists to bring together shareholders to hold management's feet to the fire. Where would you go now if you were starting over?

Brown: Realistically I'd probably start a hedge fund or join up with one where I could get a partnership role. But I don't think that's the most intellectually interesting place.

I think capital structure modeling is really interesting. Another thing that would tempt me is correlation. Correlation has been a major, major unsolved problem in finance since the Stone Age. For the first time in history we have some good data on it. Tight, liquid two-way markets in correlation products go back about a year.

FEN: What correlation products are you talking about?

Brown: There are straight correlation swaps, basket options, rainbow options, credit correlation products, credit baskets, first-to-default swaps, and a lot of structured tranche products. All of them crucially depend on correlation.

FEN: Doesn't data on correlation already exist? For scenario analysis and models of tail risk?

Brown: Correlation can be looked at historically, but we've never seen the unobserved, market-implied correlation before. It's like the first time we had implied volatility data—it completely changed everybody's idea of what volatility was. It was amazing to people, but it finally sank in that there is a volatility structure: a consistent and predictable skew and smile to volatility. You could never tell that from observing the data. You had to know the unobservable implied volatility, and you didn't know that until there were liquid trading markets in volatility. That revolutionized virtually every part of finance.

Correlation is a much more interesting financial problem than volatility. We always knew things went up and down. And we knew there were fat tails. We also knew rare events were more highly correlated than more common events. If you look at things that seem to be unrelated, when a crisis occurs all kinds of relations that you never saw before suddenly appear. But rare events are by definition hard to get data for, so there's imperfect understanding of the problem. Once there's a liquid price history of implied correlations, people can start to sort out why things happen. There are at least 10 different major theoretical approaches to dealing with this, but none are based on data.

FEN: A lot of smart people are heading into credit derivatives. How should a young quant nowadays figure out where to go?

Brown: My advice to young people is to forget about what's most interesting to you at the moment and to look at where innovation and creativity are rewarded. You'll have fun, make money, and in any case meet a lot of people who are bright and interesting. If you go where they're paying a lot of money, where greedy people go, where the innovation is done and now it's time for people to come in and consolidate and do the easy work, you'll meet a lot of dull people. Maybe you'll make a lot of money but that's all you'll get out of it.

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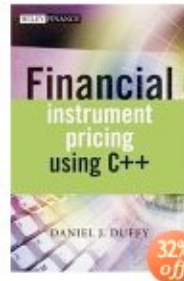
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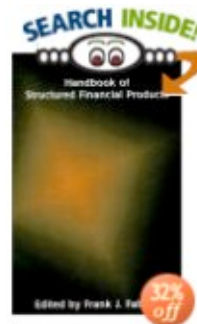
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