Quant X

Dan Tudball looks at the implications of the data industry revolution on the job description of quants

What will a quant finance practitioner's job entail ten years from now? The answer to that question lies at the convergence of two major trends that are evident today. The first comprises advances in data science, the opportunity that 'Big Data' represents in the financial services sector, and the pace of technological advancement. The second involves the aftermath of the global financial crisis: a more conservative attitude toward derivatives and greater regulatory pressure necessitating more sophisticated risk management requirements, which in turn impacts how the enterprise approaches its search for new, more lucrative opportunities.

Ten years hence will see the full dispersal of quantitative personnel throughout the financial services ecosystem – quantitative personnel with skill sets that have had to be redeployed due to this new context, skill sets that have found a new application in an environment where the emphasis on the importance of data will be paramount.

Data science has been catalyzed by the needs of online commerce over the last decade; the results of this are now having a huge impact on how all industries will have to operate in the future. In the finance industry, the most relevant personnel and the most receptive audience to these changes are quant finance practitioners. These trends will bring about a redefinition of what it means to be a quant; adoption by the finance industry of these advances in data science will define the emergent profession of 'Data Scientist.'

In finance, the quant mythos that has evolved over the last 50 years incorporates a number of


χ

archetypes into a narrative that is now the convention. Physicists were brought to Wall Street and the City when the work of pioneers like Markowitz, Thorp, Kassouf and Black, Scholes, and Merton proved impossible to ignore. The analogy to the physical sciences was useful insofar as it described the approach and methodologies applied to studying market events, although it has too often had to be acknowledged that faith in that analogy overstepped the bounds of applicability when the glaring differences between the financial system and the physical world were glossed over.

In a recent article by Attilio Meucci, the author provides a useful summary of what he identifies as "two separate branches of finance that require advanced quantitative techniques", the 'Q' area of derivatives pricing, whose task is to "extrapolate the present;" and the 'P' area of quantitative risk and portfolio management, whose task is to "model the future" (Meucci, 2011). 'Q' and 'P' refer to risk-neutral probability and 'real' probability, respectively. Meucci's article provides a quick run-through of the history of these two branches of quant finance focusing on their differing aims and challenges. Meucci delivers a concise briefing on areas of commonality – "the notion of risk premium; the stochastic processes used, often under different names and assumptions in the Q and in the P world; the numerical methods utilized to simulate those processes; hedging; and statistical arbitrage" (Meucci, 2011).

What we take from this is a convenient classification for two archetypes in the quant doxa: 'Q-type' quants found predominantly on the sell side, "extrapolating the present," working in an environment of risk-neutral probability, applying continuous-time martingales to problems with low dimensionality, deploying Ito calculus and partial differential equations. Then we have 'P-type' quants on the buy side or in risk management anywhere, "modeling the future," working in an environment of 'real' probability, applying discrete-time series processes to problems with large dimensionality, and deploying multivariate statistics as part of their arsenal of tools.

It is the 'Q-type' quant that has come to dominate the popular definition of what a financial quant is over the last two decades. Unsurprising, given the emphasis there has been on complex derivatives over that time span, and also the fact that this particular branch of quant finance has been the best remunerated too! Meucci's classification is particularly apt, in that it accurately reflects the siloed nature of quantitatively skilled personnel in the financial industry.

What we discern is a sea change: a diffusion of quant skills throughout the industry into areas where the profession had previously been thought peripheral. This adoption will come about in a gradual manner, and under the guise of 'data science' as that seems to be a more palatable, more easily understood label than 'quantitative finance.' It will come about as an evolution of Meucci's less glamorous 'P-type' quant's meeting with the frenzied activity afoot under the catchall banner of 'Big Data.'

In this article, we attempt to establish what this new hybrid, adapted to its environment and making full use of the tools available, will look like. In the hunt for 'Quant X' we are joined by Louis Lovas, Director of Solutions at OneMarketData; Brian Sentance, CEO of Xenomorph; and Andrew Sheppard, quant finance consultant, educator, and would-be master plumber.

Evolutionary factors

It's obvious that every moment of our lives is grist to the Big Data mill, "You are always seeing these rewards programs; and if you sign up for any of them, which I think most people have – I'm very guilty of that myself – you get emails on their specials; quite frankly they are doing that for their own benefit more than ours," Louis Lovas chuckles. "They are going to look to try to make more targeted approaches through the collection of data for those purposes. The other side of that, the social media aspect, where most big retail and restaurants have Facebook pages, they have Twitter accounts for the same purpose: to collect and analyze the data content from their patrons to try to look at industry trends within their own business, within their own industry, to try to understand where the next fashion is going to be, where they need to put more inventory for specials or holidays.

"The focus has been around a very broad notion of a data scientist within commercial industries primarily focusing on retail; this has led to a broadening out into the academic space, as well as to try to bring new people into the industry really focusing on the idea of what I would characterize as demographic profiling for targeted advertising, all to look at the science of data management for those purposes, even inventory management, to bring it back to a classic use of data. If you were to ask somebody on the street about what a data scientist is, that's what you are going to find, I think," says Lovas.

The Internet; bandwidth; social media; cheaper, larger, faster storage technologies; more powerful processors; and a greater willingness, perhaps, to fill out forms have all served to take search, social networking, and online businesses to the forefront of data technology.

"One of the numbers I always quote is that for $600 you can buy a hard disk drive on which you can store all of mankind's music ... from the year dot," says Andrew Sheppard. "Gathering that data would be a huge undertaking, and actually making it into a corpus of knowledge that you could actually index and access would be another huge effort in itself, but the mere fact that we have the capability on a $600 drive to store all of mankind's music across all genres is phenomenal, considering that ten years ago that would have been a challenge for a national-level agency; now, an individual can achieve that on their desktop. That is a radical change in the technology, so it's push–shove or push–pull between business need – people seeing value in these large data sets – and the mere fact that you can now store these things and actually make use of them, that's the technological capability."

Lovas picks up the thread: "What compute power and storage have enabled is what I would call interactive investigation, the analysis of all this massive store of data. This interactive investigation plus the visual tools have allowed deeper analysis where in the past you would have had to create some analytical model for, say, alpha discovery, and then you'd run it and you'd come back tomorrow. You lose spontaneity of that drill-down, of that deeper analysis, because essentially that continuity of thought is lost. You

have to come back tomorrow, so in the meantime you've gone off and done other things. Now, these queries, this analysis, can be much more interactive. You get 'in the zone,' so to speak, it's sort of like how you can write as an author or, if you're a programmer, you get 'in the zone' where you can keep drilling and drilling, but now with the advent of much more powerful visual tools you can keep drilling deeper into this data. With greater compute power and leveraging huge multicore machines and multithreaded solutions on those multicore machines, you get this very interactive investigation on this massive storage, big data solutions, big data platforms."

Phylogenetics

It has been remarked upon that 'Q-type' quants, who are more inclined to numerical methods, are psychologically more likely to prefer a deterministically correct answer than 'P-type' quants, whose work, utilizing statistical or econometric approaches, supports a mindset that is more likely to accept that there is no correct answer until retrospect affords it. Whatever it is, the definitions of the term 'quant' "are largely uniform," says Lovas, mulling over the definition of a quant as it stands now. "Quants use an empirically tested, rules-based approach to explore market inefficiencies. Those can be classified under three things: human behavior, geopolitical events, and market structure. Now, the easiest of those is market structure. That's a stable, rarely changing feature. There's fragmentation within the equities market, there's fragmentation within the currencies market, and there's none within the futures market; for example, the CME has pretty much a lock on futures, so strategies and models can take advantage of what that means. Relative to human behavior, some of that can be baked into prices, but a lot of that is a reaction to news; geopolitical events obviously relate to things that nations are doing, rogue nations, or just policy decisions coming out of nations. These are all very difficult to try to bake into models, but that's their job. That's the job of a quant, to try to figure this out."

The inkling that leads to the writing of this article is that, in the context of the finance industry, quants have been data scientists all along. There is an ambiguity to the term 'data scientist' when you hear it bandied about in a variety of situations, especially with the increasingly common job titles of 'Chief Data Scientist' or 'Chief Data Officer' cropping up in various industries. What 'data scientist' means in academia could be significantly different from someone with the same tag in social networks. Again, the role of that 'data scientist' in social networks could be quite divorced from the role such a person performs at a data aggregation service. The conflating of the two ideas of 'quant' and 'data scientist' provides a stickier, more fundamental meaning to the latter term than has been afforded it so far in the industrial context.

The conflating of the two ideas of 'quant' and 'data scientist' provides a stickier, more fundamental meaning to the latter term than has been afforded it so far in the industrial context

We'll return to that idea shortly, but in the meantime, as far as the appellation 'data scientist' is concerned, "most people take the definition more along the lines of the tools or the skills," says Sheppard. "They should know R, and they should know Hadoop, and they should be able to do this, that, and the other, but the tools are going to change."

The job specifications of chief data officers seem to revolve around logistical considerations rather than final use. "What it translates to is a person who is really in charge of all aspects of data management within the organization," Lovas surmises. "That sort of covers what it means from the IT side all the way to the business side, where they are collecting data, how they manage the scale of data, the IT infrastructure to manage that data, store that data. From the business side, one has to consider all the different silos of data usage and try to eliminate duplication of data. Because it's not only a lot of organizations from the front office to the mid-office to the back office that have a use for the data, but you can also see that there would be a lot of duplication or redundancy in cost controls and cost management. That's where a chief data officer really comes into play, to try to bring that all together."

"The chief data officer is really being appointed from the point of view of the sheer cost elements and problems of the more operational things, reconciliations, duplications," says Brian Sentance. "I think that you are quite right to say that for some of them, they are very limited in scope; for the brightest among them, they are starting to play around with how the potential of the data could change the organization, working with the CTO and the business people."

It's that potential, to move from the idea of a glorified warehouseman to expertise in the use of that data that finds a fit with the 'P-type' quant practitioner skill set in finance. A working definition of a 'data scientist' is needed that reflects that potential.

"I'm a very practical guy; I'm an experimental physicist by training, I have very simple, reasonable ways of looking at the world – not theoretical but born from a lot of practice in the trenches," says Sheppard, by way of a preamble to recounting how he arrived at a very workable definition for the term 'data scientist.' "We were banging around a few ideas as to how we would describe a data scientist, so my working definition now is as follows: someone who has knowledge, experience (and domain experience, specifically), can take a large data set and from it develop both an interesting and coherent story. The whole idea is to have the

data tell you a story – what is it telling you? It's almost analogous to what makes a good accountant. When I was doing my MBA, this crotchety old guy stood up and said that, essentially, good accountants look at the numbers and they tell them a story, a story that they can explain to others. So, the idea is that a data scientist can take some questions to a data set, or sometimes you needn't have questions at all, the data scientist can draw the story out of the data set."

A data scientist ought to be someone who not only has the technical skills, but also the domain knowledge to actually take that data and tell the story.

Sheppard goes on to describe a good data scientist in terms that combine the best qualities of the savant and the psychic medium. "After a short period of time, they will tell you a story about the data, or the data will be telling you a story through them, and you become more and more convinced, it makes sense, you would have coherence, you can do some quick sanity checks. To my mind, you focus more on the outcome than on how you get there; most of the definitions are about how you get there, and really what you want is the outcome. Someone who has three PhDs from MIT, is a great programmer, but can't actually communicate what the data is telling him is actually pretty useless. It's a waste of my time, in fact. The definitions are focused on the tools that allow you to get there; I think that's the wrong approach."

Sentance echoes the view: "The best people that I've ever come across in the quant area in the markets are really people who have had good knowledge of data, good knowledge of financial theory, but also very pragmatic knowledge of market behavior as well. I oftentimes think that finding someone with a balanced knowledge of all three is a very rare thing, perhaps rarer than it should be, but maybe it takes someone with a particular set of skills to have knowledge of all three aspects."

Someone who has knowledge, experience (and domain experience, specifically), can take a large data set and from it develop both an interesting and coherent story. The whole idea is to have the data tell you a story – what is it telling you?

"I think we should be looking at what a quant should be able to do," says Sheppard. "Take a data set and tell me a story that makes sense, is verifiable, on which we can do sanity checks. I'd go as far as to say that if he arrived at that result with a hamster running a wheel under his desk, I don't care what tools he used! Whether it's R or Matlab, or what. If you fixate on the tools, I think you have a working definition that is kind of narrow and will age pretty quickly because the tools have changed."

Punctuated equilibrium

At first glance, it's easy to come to the conclusion that although everyone is talking about Big Data, there is a level of hype and a lack of consensus that we have to be wary of. Louis Lovas tracks the Big Data space fairly closely as part of his work and observes that the bulk of what you see from the industry on Big Data, in terms of the solutions touted, the technology advanced, and the 'noise' from media coverage, is mostly from outside of finance. "I think it's clearly running in the 'Hype Cycle'," Lovas says. "If you use Gartner's Hype Cycle curve you will see that they are on the upswing of that, they haven't hit the trough of disillusionment yet. That's coming ... that's coming."

But finance, in case you didn't realize, is peculiar. "It's ironic that the financial markets have supposedly been the home of big data problems, however you wish to define that," says Brian Sentance, "and yet the scale of the Internet has passed it by, to some extent and so financial markets are actually playing catchup with their web-based, retail-focused B2C IT systems. That's an interesting change in terms of where things were ten or 20 years ago."

An opportunity presents itself here. Finance as an industry finds itself at a point where an evolved approach to data is sorely needed; both external pressures from regulatory requirements and internal demands of the bottom line intersect at a sweet spot. Finance has the luxury of not having had to pioneer the work that has been done in B2C, and can now make smart choices about what approaches from the plethora available will work best. Finance also benefits from a quantitative human resource that is well qualified to understand and implement the changes. Market conditions mean quants have to be more statistically focused, more in touch with their inner 'P-type', than ever before.

So much for the positives; challenges exist that have to be more than acknowledged. Finance is also peculiar in the demands it places on its data. Levels of sophistication among users, aggregators, vendors, and so on are not uniform. The potential for dangerous levels of complacency is vast.

Let's look at some of those peculiarities that present challenges first. Brian Sentance finds it ironic that "when it comes to data management, a lot of the data vendors, maybe even people involved in some of the market data acquisition and contract negotiations, have very little context for what the data mean or how they're used."

This situation is somewhat compounded when flipping things over to the quant end-user side. Sentance observes that data here are considered a little like water out of the faucet: "you know that you need it, you know roughly where to get it from (i.e., the tap), but you don't know where it comes from and you are not sure if you are leaking any anywhere, whether there are any

hidden problems that way; you are not really sure whether it's good – you take that on trust; it's just something that is always assumed. But it's a bit like dealing with the water utilities: it's essential but when you look at the fundamentals of 'where did it come from?', 'how is it made?', 'what does it cost you?', people get more opaque."

According to Sheppard, finance also has another problem when it comes to data more than any other industry: data's 'half-life.' "In petrochemicals or the oil and gas industry, if you have a geographic data set from seismic soundings from some underground reservoir, in 20 years that data will still be kind of useful; the actual underlying structure might change slightly because you pump oil out but the overall picture will probably remain the same and that data set is still valuable. Now, how much do you think the stock price data of IBM 20 years ago is worth now?"

It's worthless, according to Sheppard; the firm has gone through two or three corporate reinventions, so the half-life of financial data is intrinsically very short. "I'm going to give you two choices: do you want the stock price for IBM yesterday or do you want the stock price for IBM tomorrow? Which is the most valuable piece of information for you? Well, obviously, tomorrow's price, but what is important is that the passing of one day makes yesterday's price almost worthless except as part of a time-series. Financial markets move so quickly and companies are changing so quickly that the half-life of financial data is particularly short, so when someone comes to you and says they need an answer to a question, they need it in a very short period of time, especially if you are actually using it to make money, and it's a useful competitive advantage if you can actually use and analyze and get to the answer more quickly than anyone else."

As trading functions in the pre-crisis banking world approached the speed of light, the middle and back office remained a secondary priority. The result was a classic case of the finance industry being caught with its pants down; the subsequent regulatory changes have demanded a complete cultural overhaul as focus in the enterprise was painfully shifted away from the front office. The upshot is that where data was artificially compartmentalized according to its 'end use,' where the amount of technological firepower available based on a superficial difference in time sensitivity demands was ill-apportioned, the demands of Dodd Frank, the European Market Infrastructure Regulation (EMIR), the Markets in Financial Instruments Directive II and related regulation (MiFID II and MIFIR), the new Capital Requirements Directive and Regulation (CRD IV), Solvency II for the insurance business, and numerous other sets of rules mean that there is now no room for the partiality and distension that heretofore informed the distribution of technological and human resources.

Sheppard describes the situation: "I'll say this about risk: in the future, if risk isn't almost in real time, it's not worth anything at all. To a large degree, risk, overnight risk – even now – is rather like driving and looking in your rearview mirror: it doesn't give you very much signal as to what's ahead of you on the road. I actually know one bank whose overnight risk process takes 20 hours; what happens when that becomes 30 hours? It means you never catch up, and there's a big emphasis in risk to make it real time. Finance is the poster child for real time, really; whether it's mobile banking on your phone or risk management, everything is pushing toward real time. The example I want to give is counterparty valuation adjustments (CVAs), not just for individual trades but also for whole bank-wide entities, enterprise-wide CVA. Unless you have that number intraday, it's not going to be very valuable; if it's delivered 24 hours after the disaster ... a reasonable analogy would be if the Titanic had had radar, it's unlikely it would have run into an iceberg. What people are looking for in finance is the next equivalent of radar; the way we will get that is moving toward real-time risk that we will have at our fingertips. But for now we are driving and looking in that rearview mirror."

Lovas opines that: "Risk and compliance need accurate pricing data, as does the front office, so they both need accurate high-quality pricing data, whether it's in risk and compliance or whether they're doing quantitative research for alpha discovery. Well, why should that be duplicated? To me, you need someone to say 'you can't have your own little fiefdom for that' ... it's really within the authoritative role to say we're going to share data space and infrastructure for that."

Lovas points to larger firms – be they brokerages, asset managers, or investment banks – that have siloed organizations in comparison to small quant firms, where everyone wears multiple hats. He points out that in a mid-size firm under regulatory restriction there are requirements to have these individual siloes – functional business units. "But, still, there are common requirements at the data level, especially as the front office looks to do more cross-broker/cross-asset trading. They are looking to trade futures and options and equities, so they are collecting more and more data. There's this huge requirement to get data pipes in that cross all these different asset classes, not just from a single source provider. In the US alone there are 13 exchanges, but a lot of the firms also want to trade

The best people that I've ever come across in the quant area in the markets are really people who have had good knowledge of data, good knowledge of financial theory, but also very pragmatic knowledge of market behavior as well

on alternate trading systems; the dark pools. That means they are collecting enormous amounts of data. The middle office has to deal with all the clearing and the settlement and all the portfolio risk management of that; they need all the overlapping data requirements of that and then the front office again needs to do transaction cost analysis against that, so they are capturing all the executions and orders as well, which just has an enormous requirement for data."

"Big Data is really about managing scale, so that sort of translates to the underlying functional compute power and the underlying infrastructure to manage and collect or store that," says Lovas. "But it's not just about the hardware and the IT infrastructure, although that is the enormous enabler to the second part. That second part is the purpose, solutions, and applications that make Big Data a reality. Firstly, [there are] very fluid solutions that demand what I would call time-sensitive data quality – things like alpha discovery for new trade models, optimization, back-testing of those new trade models, performance metrics, and trade performance metrics to transaction cost analysis, and secondly, [there] would be risk compliance, to create silver and gold snapshots for risk compliance. They all depend on a very high quality of data and creating a very high quality of data in finance. It's about taking all of the market data that you take from all of those different sources and scrubbing it clean – meaning you have the tick data management solution to apply cancels, corrections, and corporate actions which are your splits and dividends, to manage all your symbologies across that, and if it's talking about futures, to handle rolling futures contracts; if you're talking about equities, just managing all the unique symbologies across the global market place, you've got to have a way to map and manage all that symbology. The quality also applies when you want to do risk and compliance, to be able to create accurate snaps; what does it mean to take a price at 4:30 in the afternoon that you can make sure that you have cleaning algorithms to say that at 4:30 pm the price was actually valid, in that that price is within the range that your cleaning algorithms say is not outside of two standard deviations of the last hour or the last two hours. All these features or capabilities that you really don't want to write within application code, you want your Big Data solution to be able to manage, and these are all unique to finance. Firstly, it's about managing all that scale, that fire hose of financial data across all asset classes, and, secondly, it's fit-to-purpose applications to ensure time-sensitive data quality."

Xenomorph, Sentance's company, provides some useful indicators as to where this all might go, beginning with the idea of what data goes into models, specifically dealing with model data that has to be handled in a multitude of spreadsheets. "The Big Data management vendors tend to be involved in the back office, and reference data, with people involved in the higher-frequency tick data, the simple numeric stuff. The Xenomorph solution looks at curves and volatility surfaces and all of the data that feed those analytics; I think it's underinvested in. I do think the regulators are driving the interest in data; we've been getting a few enquiries on something we're looking at in terms of bitemporal data. It's not a Big Data problem but it involves large amounts of data being able to rewind in time; even if you've since corrected some of the prices and some of the data, you can easily get back to the original set of data that you used to create a report or price an instrument, or do whatever you did, so you've got that kind of rapid audit trail of justifying the assumptions that were made, made on this date, and this is why. But what is occurring is being forced through by the regulators."

Sentance remarks on the sheer drudgery of making the transitions, the digital dotting of i's and crossing of t's that defines this transition: "issues that are in direct contrast to intellectually interesting, perhaps potentially commercially very profitable means of actually looking at re-engineering how you do your data analysis, what information you are trying to get from it. It's a bit of a yin and yang situation. The whole subject of data is vital to the success of financial services, but also one must be able to see how margins can widen, given all the new capital requirements. I think it's an opportunity both in terms of reducing cost and making more money. I do think there are two sides to it, one where it is more operational and one where it's more exciting aspects of the Big Data science; I think the two will eventually come together."

Come together they must. The external pressures, regulation, and market conditions call for statistical analysis and the datafication of the entire financial enterprise. Internally, the enterprise will allocate these same personnel with the aim of achieving compliance, reducing costs, and ultimately identifying and developing new opportunities to generate business through the effective analysis of data.

Lovas agrees with that view: "I do think quants are more statistically inclined; I think the market place is forcing them to be more analytical in their analysis to create proof points. Given your analogy of people with a physics background or an applied mathematics background moved into being a quant, to draw a parallel going back quite a few years, people with similar backgrounds moved into computer science with no real formal training in programming. They moved into those fields because of that need for analytical thinking. Eventually, just through time, universities and the academic world started to shape and mold their curricula to focus more on computer science, programming and languages, and data structures to fit the needs of industry. That's what occurred there, and I sense that the same thing is occurring now for quants. The simple example there is that there are very strong degree programs in financial engineering, and the bulk of those curricula are about applied mathematics, data science, and computer analysis. We have a very strong relationship with quite a few universities because they use our products – Columbia University, Stevens Institute, Stony Brook University, Oxford University, and we're just now engaging with University of California at Berkley, all within their financial engineering programs. We get to see their curricula and we've hired quite a few from these Masters programs who are now on staff with us; this is already happening. A lot of the firms – quantitative trading, proprietary trading firms, or the desks within the investment banks – are no longer just hiring the

physics majors and the math majors; they are hiring people coming out of these curricula. Now, they don't necessarily have a degree program as a data scientist, maybe moving into that chief data officer role, but they are definitely looking at and hiring these people who have a degree in financial engineering, which involves a strong focus on understanding data and the science of data as it pertains to finance. Most of them are looking for jobs in firms or, in the case of working for us, a vendor of financial technology. They'll have an undergrad degree in computer science, a Masters in financial engineering; that's a perfect combination for us as a vendor. To me, that's the kind of direction I see this going in. Equating it back to the way the industry morphed 20 years ago, the same evolution that occurred in computer science is now occurring in data science – it's the same sort of parallel."

Biased mutation

What permutations does this environment lead to? What, then, does the quant of the future look like? Andrew Sheppard suggests that there will be some comforting familiarities to compensate for any fumbling that might precede the next genus. "We're in finance, it's all about greed and fear." Thank goodness for that! He elaborates: "The greed aspect; we've been focused on that for quite some time. Quants have been on the trading desks, trying to do something quicker, better, faster than the guy next door and they want to be creative; we've got the greed part pretty well covered by the quants. What's changed since the crisis is the fear part; well, gee, if you look at some of these new laws it's not just civil law, it's criminal law. If you're deemed to have done something wrong with the data, you are going to jail, you're losing your liberty, and so the fear part kicks in and there's going to be a natural migration of quants to other parts of the enterprise." Where will this diaspora take them? "Things like real-time CVA, that's a real big data challenge, a real big computational challenge – you need quants to do that; you need quants to help you solve that. On the greed side of things, senior management can say we can add $500 million to our bottom line, by doing nothing different from what we do today except ensuring through data that we can convince the regulators we have real control over risk. That $500 million a year this year, next year, and all years going forward buys an awful lot of technology too!"

If you can convince those regulators that you have a handle on your risk, that 10 percent translates to $500 million a year straight to your bottom line. That to me is a quant finance role, where they would almost be in something like strategic planning; you need to have a handle on these big data sets and deal with them very quickly

Sentance shares the vision that the opportunities are exciting: "Somebody who has those data skills might find themselves working on some very very interesting, statistically and mathematically challenging problems in the back office about the ways in which processing is handled, or in the middle office in terms of intraday and counterparty-related data. There are lots of different ways, if the premise is correct, that almost unlimited data storage and processing capacity provides new things to do and new ways in which you can look at the data to see new opportunities."

Sentance also sounds a note of caution: "The risk is hubris isn't it? It's the same thing as credit derivatives and all correlations leading to one. Looking back at your questions, one of the thoughts that come to mind is that statistics and mathematics continue to be important because, really, what they are trying to do is a translation job into things that humans can understand. As a result, it's a bit like the J.P. Morgan 415 risk report; senior executives wanted one number to represent the risk of the whole firm. Well, that's laudable and on one level probably quite useful but, if you think that the entire risk of the whole firm can be captured in one number, God! You're simplifying things down aren't you?"

"I think there's a danger always with mathematicians and with anything new, that it gets overhyped," Sentance goes on to say, "and Big Data has been overhyped by a lot of the journalists and it's absolutely everywhere. Its adoption is very much coming, it will make a lot of changes, but, as with anything in systems, it's going to have a few hiccups along the way. People are going to have to get a lot more experience of how best to use it, and what works and what doesn't. It has an awful lot of potential; the biggest danger to its use is that people get overconfident about what it can do without necessarily applying good judgment over what they observe quantitatively. The aspect of, let's justify it by using lots of data. Perhaps you just come back to 'Lies, damned lies, and statistics' then! The thing I come back to all the time is, let's be pragmatic, let's remember context, and let's not get too arrogant about what can be done quickly. There are lots of opportunities for it but it must be judiciously used. Those opportunities are there, they are coming, but let's make sure that everyone is grounded as to why they are doing something, why it's perceived to have some value."

The forces that conspire to mold the fate of quants, to wax lyrical

for a moment, are, in the words of Andrew Sheppard, the "capability to actually do it and the business need because they actually see value in these data sets. The character and nature of quant finance has changed; for example, regulation I see as one of the big drivers of Big Data – you just have to collect a lot more of this stuff because, guess what, the regulators demand it. I think that you can make a pretty sound case that Big Data is definitely impacting quant finance, and the role of the quant is going to have to change to accommodate that."

So, what does Quant X look like – heavy of brow and loping along on the plains of finance hence? Sheppard looks at what needs to be avoided now and the subsequent ideal that will have to be put in its place: "If you give me a well-trained data scientist, that's useful but the reality is that without the domain experience you could give him a large data set for high-frequency trading and it's going to take him a long time to actually be able to tell a coherent story because he doesn't actually know what level 2 market data is, he doesn't know about the conventions of the order book, order crossing, so maybe you can combine data scientists with data experts and get a lot of value. However, the true stellar quant of the future will be someone who has the technical skills and also the domain knowledge to actually tell a story from the data and tell that story quickly.

"The perfect quant is someone who has all those data science tools, but also understands things like the microstructure of the markets and has the domain experience. So, I think, just having data science is not enough, just being a quant or just understanding the market structure is not enough, but if you put those two people together you can imagine that it's a very powerful combination. To me, it would be that data scientist who can tell that story, communicate it very quickly, and ideally program some tools around it, that also has that domain experience to get them there that much quicker plus all the other 'old' quant things; they should be able to write pricing code very quickly, they should be able to build systems and risk checks and balances very quickly as well."

The quant role will spill ever more over into compliance, into risk, and even, Sheppard suggests, into things like capital budgeting for the bank. As he points out, above, one of the big sales pitches for enterprise-wide CVA is if you get that right and convince the regulators that you have a good handle on risk, particularly credit risk, they'll give you a break on your capital requirement. "You do your mental math calculations here and if you can provide enterprise-wide CVA numbers for intraday and convince regulators that you have a real handle on risk and stuff like that, instead, just for example, of needing to have $20 billion to support your business, you only need to have $15 billion – a $5 billion break on your capital margin requirement. The cost of capital for a bank, equity capital, is massive – it needs to be at least 10 percent. So, essentially, with $5 billion less capital to hold in reserve, if you can convince those regulators that you have a handle on your risk, that 10 percent translates to $500 million a year straight to your bottom line. That to me is a quant finance role, where they would almost be in something like strategic planning; you need to have a handle on these big data sets and deal with them very quickly. In some ways you could argue that it would change the quant role, but it might even expand the role to other areas of the bank because they are just going to need more and more data, and more and more analysis."

There is a version of the future where quants will not just be working on the trading desk, they will be working for senior management, building models of the bank, and making sure that all of the trades and activities for the whole bank will be in a system that gives them answers. There has been a natural migration of quants away from the trading desks into other business areas, and, once again, you have areas like compliance and risk where new mandates from the regulators mean that if you can't get risk numbers in a reasonable timeframe that is going to get shorter and shorter, they will potentially stop you from trading.

"If we can solve some of these problems like real-time risk and real-time compliance, you are going to find that you need quants in those areas," says Sheppard. "Knowing the business side of things and the technology side of things, you will see quants somewhat more pervasive and there will be an effect on the trading desks as well because the regulators will be trying to stop the trading desks from doing what they did in the past. So, they will have much narrower choices, certainly in the US; again, it is push and pull, greed and fear. But the net result is that you will see quants in a wider range of roles throughout financial institutions. CVA is one where you need quants to help you solve it, because the question is really interesting to senior management and that's a long way away from the trading desk."

CVA is one where you need quants to help you solve it, because the question is really interesting to senior management and that's a long way away from the trading desk

REFERENCE

Meucci, A. 2011. "P" versus "Q": Differences and commonalities between the two areas of quantitative finance. The Quant Classroom by Attilio Meucci. *GARP Risk Professional,* February 2011, 47–50.

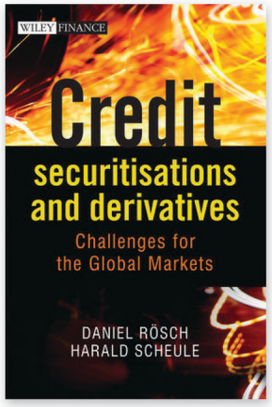
Book Club

Share our passion for great writing – with Wiley's list of titles for independent thinkers ...

Credit Securitisations and Derivatives

Challenges for the Global Markets

Daniel Rösch & Harald Scheule



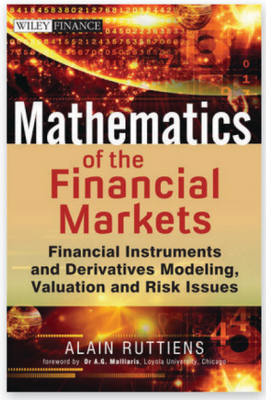
The book aims to prioritise what needs mastering and presents the content in the most understandable, concise and pedagogical way illustrated by real market examples. Given the variety and the complexity of the materials the book covers, the authors sort through a vast array of topics in a subjective way, relying upon more than twenty years of experience as a market practitioner. The book only requires the reader to be knowledgeable in the basics of algebra and statistics.

978-1-1199-6396-7 • Hardback • 464 pages
March 2013 • ~~£70.00 / €84.00~~ £42.00 / €50.40

Mathematics of the Financial Markets

Financial Instruments and Derivatives Modelling, Valuation and Risk Issues

Alain Ruttiens



Anyone concerned with financial markets have to be aware of what is happening, quantitatively speaking, behind the financial instruments behaviours. This book presents the quantitative aspects of financial market instruments and their derivatives in a generic and accessible fashion.

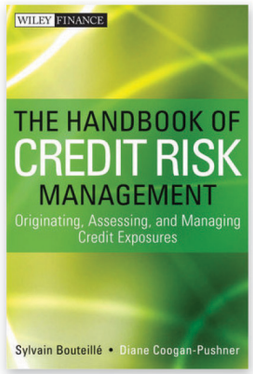
This book equips the reader with the mathematical knowledge needed to explain the valuation and behaviour of financial products, from traditional spot instruments to complex derivatives, in the whole set of markets, from currencies and stocks to interest rates and credit underlyings.

978-1-1185-1345-3 • Hardback • 352 pages
March 2013 • ~~£60.00 / €72.00~~ £36.00 / €43.20

The Handbook of Credit Risk Management

Originating, Assessing, and Managing Credit Exposures

Sylvain Bouteille & Diane Coogan-Pushner



The Handbook of Credit Risk Management presents a comprehensive overview of the practice of credit risk management for a large institution. It is a guide for professionals and students wanting a deeper understanding of how to manage credit exposures. The Handbook provides a detailed roadmap for managing beyond the financial analysis of individual transactions and counterparties. Written in a straightforward and accessible style, the authors outline how to manage a portfolio of credit exposures--from origination and assessment of credit fundamentals to hedging and pricing.

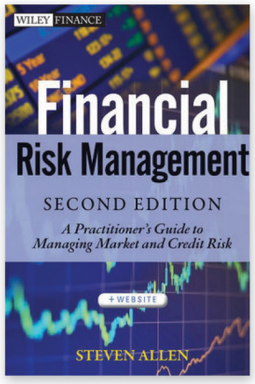
978-1-1183-0020-6 • Hardback • 352 pages
February 2013 • ~~£65.00 / €76.00~~ £39.00 / €45.60

Financial Risk Management

A Practitioner's Guide to Managing Market and Credit Risk

2nd Edition

Steve L. Allen



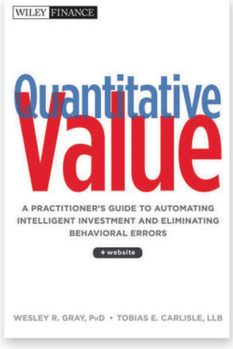
Market risk expert Steve Allen offers an insider's view of this discipline and covers the strategies, principles, and measurement techniques necessary to manage and measure financial risk. Fully revised to reflect today's dynamic environment and the lessons to be learned from the 2008 global financial crisis, this reliable resource provides a comprehensive overview of the entire field of risk management.

978-1-1181-7545-3 • Hardback • 579 pages
February 2013 • ~~£85.00 / €100.00~~ £51.00 / €60.00

Quantitative Value

A Practitioner's Guide to Automating Intelligent Investment and Eliminating Behavioral Errors

Wes Gray & Tobias Carlisle



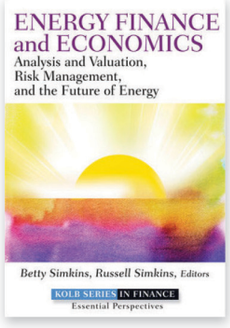
Quantitative Value provides practical insights into an investment strategy that links the fundamental value investing philosophy of Warren Buffett with the quantitative value approach of Ed Thorp. It skilfully combines the best of Buffett and Ed Thorp—weaving their investment philosophies into a winning, market-beating investment strategy.

978-1-1183-2807-1 • Hardback • 288 pages
February 2013 • ~~£57.50 / €68.00~~ £35.50 / €40.80

Energy Finance and Economics

Analysis and Valuation, Risk Management, and the Future of Energy

Betty Simkins & Russell Simkins



This new book offers the most up-to-date information and compelling insights into the finance and economics of energy. With contributions from today's thought leaders who are experts in various areas of energy finance and economics, the book provides an overview of the energy industry and addresses issues concerning energy finance and economics.

978-1-1180-1712-8 • Hardback • 624 pages
March 2013 • ~~£85.00 / €100.00~~ £51.00 / €60.00

SAVE 40%

When you subscribe to *WILMOTT magazine* you will automatically become a member of the **Wilmott Book Club** and you'll be eligible to receive 40% discount on specially selected books in each issue when you order direct from **www.wiley.com** - just quote promotion code **WBC40** when you order. The titles will range from finance to narrative non-fiction.
For further information, call our **Customer Services Department on 44 (0)1243 843294**, or visit *www.wileyeurope.com/go/wilmott*