



# One step beyond

**Elie Ayache** discusses his forthcoming regular column with **Dan Tudball**, exploring the need for a philosophical foundation in quantitative finance.

these equations.’ Neither is it a branch of algebra or partial differential equations or stuff like that. Second of all, you have people who take an a priori stance on all of this like Nassim Taleb, and say that whatever you do in quantitative finance there is a kind of curse attached to this science – which is not a science by the way, because he’s going to show you it’s not a science at all. The curse is that as soon as you set up a framework for thinking a model or theoretical framework and you start computing things like risks, actually the biggest risk is that the framework may be the wrong one. The biggest risk is basically model risk.

assess its own risk of being wrong, of you having the wrong probability distribution to start with. His formula is “How can we be sure that we are gambling with the right dice?” It just says that there’s no way by which you’ll have a science at some point and the situation is one of “utter pessimism. There is no epistemology, there is no theory of knowledge that you can consistently hold in finance and it is a situation of “essential uncertainty” he says.

**Because it can’t be given meaning or ultimately empirically proved it can’t be a science. What is it in his opinion?**

So in his opinion, this is my reading of him in *Fooled By Randomness*, there shouldn’t be any modeling; that doesn’t mean you shouldn’t use models because he is a trader himself and I’m sure he’s using models himself, but you have to be very critical of what you’re doing – it’s pure empiricism that pervades in the end - there is no science.

**Pricing models only have to be consistent with each other. That gives some credence to his viewpoint that there is no ultimate objectivity about it. The framework supports itself.**

This is typically what you feel like answering him with. I’m not sure that he pursues it himself. I hope he does. Risk management by definition is supposed to go behind the model and put into question the assumptions of the model. You can think of risk management as a meta-theory if you want. It’s basically a criticism of the given theory. Now the question becomes how can you have a theory of risk management? Taleb says it’s impossible here, and it is here that I enter into the philosophical debate.

**Where is the material going to come from to develop a grounding for quantitative finance and a response to Taleb?**

Initially, we need to agree with him, forget about the old framework where there’s a person in charge of devising the theory sitting at his desk and thinking about the market, about quantitative finance from a distance and trying to devise the theoretical representation of that, then make some computation work within that framework. This kind of thing does not work. As a matter of fact Taleb exhausts this logic, he stops there, he exits from the game saying there is no science, there is no philosophy, there is nothing.

I’d rather think of it as a limit that calls for going a step further. You need basically a broader, bigger philosophy that embraces the science. We are definitely lacking a piece in the edifice, that the old framework was missing anyway, and the piece is the actual trader. This is what I think, that a tool by itself like Black-Scholes or any sophisticated model by itself is not sufficient. It only becomes complete when you attach it to a living trader who is going to use it in a real trading situation, this has been recognized by Espen Haug where he looks at Black-Scholes and argues that the formula is better than any other model you can think of because it is intuitive, people like it etc. His metaphor is that it’s like a weapon. It can be a rudimentary one but it can only be useful if someone knows its ins and outs and he has really become skilled in using it. This person is of course the trader. Haug is not asking from the trader that he know about mathematics, he says in his article that it is not addressed to nerdy quants. He wants the trader to have

**Why is quantitative finance in need of a philosophy?**

First of all it’s to ground the science itself. There are a lot of people around who are not convinced it is a science to start with. We are definitely convinced that it is not just a branch of stochastic calculus, ‘this is only mathematics and it’s not really interesting, although we technically require these tools to solve

**So this is an a priori situation and his concern is that the basis of quantitative finance is wrong.**

Taleb says that the worst thing there is that the whole edifice may be lying on something that is questionable to start with and that is that you have no way almost by definition of what you’re doing, if you are building a framework to assess risk, the framework cannot look at itself and

## "I think this sequential model is wrong; 'Model first then trader takes it and breaks it' "

the kind of knowledge one has when you forget something is a tool and it's as if it's part of your body. You start swimming then forget that you are swimming.

**Marx proposed 'praxis' as the synthesis of theory and practice, this idea of the separation of the quant as theory and the trader as practice aiming towards a culmination in which the functions are combined, is that an ideal?**

Sure, here you cannot go round the fact that trader and quant cannot be separated. People usually think of it in another way. The quant designs a model which is self-consistent on paper because it is a nice mathematical model that works, produces numbers etc and then when you submit that model to the trader and reality it becomes inconsistent. Of course all the parameters of the model become stochastic in reality, thereby contradicting the model etc. I think this sequential model is wrong; 'model first then trader takes it and breaks it'. You have to take a step above this and think about what's going on both including what those two people are doing, and to do that I'm not just talking philosophy and smoking philosophy and not doing anything in practice. It really has consequences for the kind of model you should be using.

So Black-Scholes is not good because it locks itself completely into the complete market paradigm. You need to have models that are self-critical so you go to the theory of incomplete markets where you know that the model you are using is not perfect the model knows that it's based on that. I think it's a fundamental step outside the matrix, in fact you're waking up to reality,

you should always be careful not to complete the model because we have mathematical ways to complete the model and fall back into the Black-Scholes sleep. You have always to be self-critical of the models so the models become only relative; it knows that it is incomplete so that is robust enough. So then you will move forward to another stage. Yes, we have to propose new models not just theory.

**What sort of applications will you be introducing in the forthcoming column. A way to encapsulate that would be to look for a school of philosophy. It seems very pragmatic, the test of whether a proposition is true or tending towards the truth is that when you act upon that proposition it yields satisfactory results.**

Surely there is some kind of modesty attached to pragmatism, as opposed to taking a stand from God's point of view? Of course this kind of modesty has to be part of what we're doing. But nevertheless it shouldn't feel as if we're living in some disenchantment, thinking we are very modest, all we have to do in retrospect is prove that something we have done worked. Because that would open the door to saying anything works really.

No, I think there should be some *a priori* thinking about what you are doing, we should take a stand and say in quantitative finance there is something completely new. In a sense quantitative finance is a science completely different from other sciences. It's not physics; we'll never have a philosophy for quantitative finance that is the same as the philosophy for physics. So perhaps quantitative finance will offer philosophy the opportunity to think of

it as a science but knowing quite well that you cannot have the model detached from the trader and usage. The big scandal of the philosophy here is, if we refer to Taleb, that before people are involved in probability, modeling, and probability distributions and so on to develop the more sophisticated model the question is whether they are gambling with the wrong dice. How do they know that they are the right dice?

**Doesn't his saying 'we're playing with the wrong dice' imply that there is a right set of dice?**

You're right in pointing that out, in fact when Taleb says that, he might be implying there's a right set, only it might never be known in a finite lifetime. So he may be living in a world where you think there's something only you can't get it. I say, even that isn't available; there is no debate about right and wrong dice. The whole thing is different; this in philosophy is called abandoning the representational framework. You mentioned pragmatism, you could also say performativity. It's by using it that you create your own truth.

Why do I say that in quantitative finance it's maybe the first opportunity offered for this kind of philosophy? Again the problem is not whether I am observing the world, whether probabilities are right or wrong, because in finance you're not even sure that the world is stable when you look at it. Models assume states of the world are given; you are just putting probabilities on them. You are pricing the option as the expectation. As you price the option the option itself is going to come alive on its own later in the market and will itself expand the states of the world you started with. It starts to contradict the picture

that you used to price it. It's the same as saying 'we are using Black-Scholes but it became stochastic as soon as we traded the options.' So there's kind of a bigger scandal here in that every model will fail because in a sense we want it to fail. It fails because there is a curse. Everything generates further stochasticity and states of the world.

**In quantum theory the act of observation alters the result of the experiment. Various states exist but one becomes immanent at observation. A powerful response to the hyper-pessimism that you describe.**

Yes, exactly. But it's not an easy answer, it's more difficult than Taleb imagines because Taleb in the end is resting in skepticism, so it's okay. As a matter of fact there are now papers in decision theory that are attempting to go beyond uncertainty, because essential uncertainty is what Taleb is pointing to at the end. They attempt to go beyond that by saying the whole framework that we think of as stable first of all, then we say 'we'll know' or 'we don't know' the whole thing is not stable to begin with because as we proceed we are recreating ourselves as new actors and creating new choices and new states of the world

**So what will you be discussing in your first column?**

In the first installment I will be talking about how to really think about Black-Scholes in order then to think after Black-Scholes. In the second I will be talking about how to apply philosophy and the tool to a situation that we know.

● *Elie Ayache's first article will appear in the March 2004 issue of Wilmott*