Interview Transcript[[1]](#footnote-1)

Subject 8: Actuary

I: [explaining project]

[2:28]

I: To start off, why don’t you tell me a bit about your job position and what you do.

S: So I’m [name], I am [actuary] at what’s called the [organisation], which is the main prudential regulator for insurers, banks as well, but insurers is what I deal with in the UK. We have, we’re part of [organisation] and the [organisation] as a whole has got responsibilities that encompass financial stability, monetary policy, interest rate setting, and also what’s called micro-prudential regulation, i.e., the regulation of insurance companies and banks. Our statutory objective as the [organisation] are related to the safety and soundness of firms, regulated firms and achieving an appropriate, contributing to an appropriate degree of policy-holder protections. That’s a specific insurance objective we have. Our focus is mainly on considering the risk profiles of insurance companies and the way in which we do that is through what used to be called individual capital assessment scheme or individual capital adequacy standard, I should say. But now with the introduction of what’s called Solvency 2, at the start of this year, 1/1/16. Solvency 2 now defines the regulatory capital requirements of firms. And we look at both at what’s called standard formula approaches to calculating the capital, you know risk buffers, the capital requirements of firms but also we approve alternatives to that standard for which were called internal modellers. And so our focus tends to be in the risk domain but we also get concerned with questions of valuation and for us the relatively trivial level of asset valuation but more importantly challenging is liability valuation and where our interesting natural hazards arises is because insurance is often against things like flood, wind storm, earthquake, and similar. And I guess wildfires as well. And understanding so we’re challenging firms. To be clear, we’re not the ones doing the modeling. Challenging firms to see that they have an adequate risk management system in place that, you know, identifies, assesses, calculates a view of that risk profile of the business that then informs decision-making and allows them to manage risks within the, shall we say, the confines or envelope of their financial resources.

[5:35]

I: Okay, great. So…

S: I was going to say so you can see that risk and uncertainty are critical to the conversations that we’re having with the businesses and central to us achieving our statutory objectives so because, I don’t even need to tell you, but your risk is both unobservable and is also unverifiable. It’s always a forward-looking view of risk. Because historically we’ve tended to be backward looking and relied upon historical data, but through the [organisation] regime and more fully through the Solvency 2 regime, we’ve turned that to be a forward-looking, judgment-based, risk-based, proportionate approach to our supervision. And the team of actuaries I lead, there’s about 40 or so of us, and half of whom are qualified actuaries, the rest are other risk specialists and trainees and our focus is on internal model approval, the appropriateness of the standard formula for those firms who’ve not got an internal model and questions around kind of valuation and then looking at how the firms judge their risk profile and their solvency requirements and then perhaps at a more detailed level, on the liability valuation side, because there’s no mark that you can look to value the liabilities of an insurance company, looking at the adequacy of the reserves, something that’s called technical provisions or now called technical provisions, so the money that’s held in respect to anticipated losses within the businesses.

[7:17]

I: Okay. So with respect to the model work you’re talking about, specifically with natural hazards model, what kind of variables do you look at? We’ll talk about that first.

S: Yeah sure. What’s nice about the insurance question is ultimately it’s financial. So insurance companies, as you know, provide protection against unforeseen events, but chance events and the form of that protection is often what’s called on an indemnity basis, so indemnity basis insurance, which basically says that you will return a party who suffered a loss to their original state before that loss has occurred. So indemnity based insurance involves, say you have a house that’s flooded and making good that house, repairing it, you know, restoring the contents or whatever, possibly also allowing for additional living expenses during the period when you can’t be in the house, people should not, by and large, be making a profit out of the fact that they’ve had insurance cover. They should just be protected and that indemnity basis means that there’s quite a bit of uncertainty as to what the costs could be. So it’s not that we say you can buy flood insurance to provide £10,000 if your house gets wet. Instead, we say we will protect you against, we’ll indemnify against that. So that financial, the reason I’m stressing the financial component is that our main focus both as a regulator but also in the insurance companies themselves is on that financial aspect of it and therefore our discussions tend to be framed around the likelihood of loss events measured through, kind of a monetary amount, the likelihood of loss events occurring. So we might talk, we’ll probably get onto this as well, with any sort of discussion about the likelihood of something happening, we recognize the need to frame that, so being specific as to the geographical extent, so we tend to talk about how likely an event is to happen in the context of say the industry as a whole. So you might talk about a 99th percentile, which we kind of use interchangeably with 1 in a hundred, I know that’s not quite strictly correct, but you’ll talk about that as a 1 in a hundred kind of event that could occur and then is that for the industry as a whole or is that for an individual firm in the context of their risk profile. And then the other distinction, which I know you’re going to speak to [name] as well, [name] will go into this into more detail than I will because he’s a specialist in the area, we also talk about occurrence cost so what’s the risk profile of a single event that could happen and what’s the annual expected loss as well. So what’s the annual cost of an event as well. So you could have a 99th percentile for a single occurrence might be for an insurance company could be £100 million, but the annual 1 in 100 for that firm could be £200 million, something like that. Similarly, you might have seen some of the coverage in the context of flooding events where they have as well as geographical constraints on things, they might also have a time constraint as well. So they’ll talk about what’s called an “hours clause” which basically says that to be viewed as a single event, which is important to further contracts of insurance, so reinsurance of insurance companies, the protection that they buy, reinsurance contracts often have what’s called an hours clause, and that could be perhaps 72 hours or longer and that basically says all the losses that came from, say, flooding during a 3 day period, they can all be viewed as a single event from our single catastrophic from the perspective of that reinsurance cover. And that hours clause is quite important. So there’s time, there’s regional, and then you’re looking through this through the lens of financial loss, and therefore now and again brings the consideration of risk and uncertainty into a very kind of specific domain. Is that making sense?

[12:08]

I: Yes. That makes absolute sense. So you run these models based on…based on what is it both historic events as well as a kind of stochastically, statistically induced, Monte Carlo simulation or…?

[12:30]

S: Yeah. So there’s absolutely a range of…so if we kind of talk to the kind of extremes in terms of our modeling challenge so if I, at one level I’m being kind of arbitrary when I say that these are extremes of a spectrum. So on one level, you may have a physical risk model where the hazard is being modeled both through rainfall footprints and the terrain, the hydrology of that event occurring, which would then imply certain levels of inundation or flood or whatever, which could then be fed through, so you could have a hazard that’s modeled quite detailed with a hydrological flooding model, which then leads to, as I say, inundation and to get the flood water, which is then translated through hazard functions, given a particular level of hazard through, sorry vulnerability functions, through that vulnerability function for a given depth of flood water over a given duration, here’s the level of damage for a given property we’d expect to see, which then creates a financial output because ultimately everything’s got to be, from our insurance perspective, has got to be described as a monetary loss. Now that’s what you might say is a physical model, exposure based model. That’s almost like that, that’s about as good as we can get, and [name], he’s an expert in that area, mainly on the earthquake side. He could probably talk you through that in great detail. So if you’ve got an exposure-based physical model, then at the other extreme is a stochastic model, which is purely numerical. And there we might say, and again you’d have to kind of create a frame, a box within which you are looking at things so you might have a single peril, so you might say my flood loss as an insurance company in the next year can be described by a log-normal distribution with the following parameters applied to the volume of business that I know I’m rating. So there’s not even really much of an exposure measure there, just the volume of business. And we do have insurance companies, and we’re happy for them to do that because as long as it’s kind of appropriate, proportionate, appropriate, sufficiently kind of accurate, it really describes the risk. You could do just purely a numerical representation of that uncertain future outcomes from the point of view of a loss so that kind of numerical extreme might well be based off of past financial results, perhaps uplifted for known increases in inflation and known increases or changes in exposure in the business. If I go back to the more detailed, physically-based model, to answer your question, is it based off of an actual event or computer simulated stochastic ones, the main catastrophe modeling companies who are [organisation], [unintelligible], and [organisation]. So [organisation] and [organisation] are the dominant players in the catastrophe modeling space. They will have stochastic event sets, which are populated hazard events, you know, storms, earthquakes, which include both historical, but also simulated, you know, stochastic events as well, which are then played through the modeling process with these vulnerability functions applied to exposure, which then drives a numerical result. Now where uncertainty comes into play, I think it quite quickly becomes technical, very technical, so the best person to be speaking to you on this one is going to be [name], but I know that the modeling companies have used concepts or ideas like secondary uncertainty, where they say that given a particular hazard event was to happen, its’ not a single loss number that we can derive. It’s going to be itself it’s going to have a distribution of potential outcomes. If you had a kind of effect footprint of, you know, rainfall or whatever, then that could drive a range of possible outcomes. So certainly, we recognize that because when an actual event occurs, often we are cautious in the way that we look at estimates of the cost because at one level you’re saying, “oh it’s 50,000 houses, there was this level of inundation,” or whatever you call it, we can be pretty confident the model’s allowing [unintelligible] and it’s going to play out, it is just a case that it does vary, variable often. There’s not really much confidence in that modeling. It’s right to an order of magnitude, but when I used to work at [organisation], where we did quite a lot of scenario modeling, the realistic disaster scenarios they use at [organisation], I used to be involved in that area, we kind of did some, if I’m completely honest, blue sky thinking where we thought that plus or minus 50% was not an unreasonable band of uncertainty to put around a signal and end modeled loss. Never mind questions as to the return period or likelihood of the hazards themselves because actually then…So I think kind of when we’re making decisions, I think it’s fair to say that because insurance is about taking risks, and it is about, sorry it’s providing protection against these unknown or unforeseeable, well I guess on one level they’re foreseeable, the rain does fall out of the sky, these kind of unforeseeable events. Because risk in many ways is the stock and trade of insurers, I think that they have a better feel than most as to what risk and uncertainty actually look like. When I say risk and uncertainty, I’m using it as a catch all, I’m not using it as risk as a card game, uncertainty as a speculative unknown. I’m saying just more risk and uncertainty as sort of that’s what they’re protecting their customers against. So I think that they’re relatively articulate and have an intuitive understanding of risk and uncertainty. Having said that, within businesses themselves, it’s quite difficult to make specific business decisions absent somebody just having a single view of a likely outcome. By which I mean that we might have a discussion amongst actuaries and the senior management of a firm about what the liabilities might be of that business and, but that tends to only move forward if we fix a number to those liabilities, as you’d see in a balance sheet, at an appointed time. So even though this is an industry which is steeped in risk and uncertainty, even they need to have a number, an arbitrary single point estimate, well it’s not arbitrary, but best estimate that allows discussion, shared views, decision making to take place. So I’m slightly concerned I may be moving too much into the sort of financial domain here to be relevant to what you’re looking at?

[20:30]

I: Yeah that’s fair enough. This has been really helpful so far so I’m curious again about the hazard modeling and what kind of outputs you would receive for those and how those are formatted. Are they graphical? Are they numbers? Are they maps? What do they look like?

[20:48]

S: So the main outputs that we are used to discussing with firms in the context of what we’d call catastrophe modeling is the exceedence probability terms, which will either be the single event occurrence one or it’ll be the annual expected cost, you know annual loss cost distribution and that will show what the modeling suggests is the distribution of outcomes either for an event to happen during the year or the distribution for losses over the year. And again, that tends to have, on the, well I’ll say on the Y axis it’s got the monetary amount on the X axis it’s go the return period or you could have it the other way around you could have the loss on the X axis and the Y axis would be the [unintelligible] percentile perhaps on the Y axis. So we get these sort of distributions, which don’t, which may be with or without secondary uncertainty, but as far as I know, that tends to be represented as just a slightly more skewed distribution of the secondary uncertainty because it’s basically saying you’ve got a wider range of outcomes. I certainly know that people have spoken about making the, in some way representing, say you’ve got a probability density function, actually shading, creating a band, a kind of broad band around that PDF that represents the, shall we say, the model and parameter uncertainty around that distribution as a way of conceptually, if not graphically to support decision making way of saying oh and by the way this model’s PDF is highly uncertain and here’s a representation of that uncertainty. So I’ve seen people do that and in terms of, so unfortunately, in the regulatory context, we require them to come up again with a single number. We’re a bit like those business men having to run a business. We do have to look at a single number and the solvency 2 as it was with the [organisation] regime before it, we operate on 99.5th or what we call the 1 in 200 level of certainty to keep stuff like that. That’s over a one year period, although that again, there’s variations in practice around whether it’s always a one-year view. We’ve also adopted a view where it’s 1 in 100 or 1 in 200 over the time frame for which the entirety of the insurance claims would be paid which is what they call runoff. So we’ll apply the standard. So you’re asking quite an extreme probability of what’s already quite difficult to model distribution. So uncertainty is definitely in there and I think we’ve sort of tended to ask and expect firms to do a sort of best endeavors where the, so rather than kind of throwing every source of uncertainty in there, just almost not taking all the parameter risk, but to just say okay what do you think the distribution is, and given that, then calculate the 1 in 200 and then what we try to do is to look at quality of data, completeness of data, we even require similar to what the modeling companies do with their stochastic event sets, we similarly even require firms to add additional data, so actually to add additional events and we have a concept called events not in data which people call about kind of sampling risk, but we actually ask them to prove [unintelligible] back into their data in order that it generates kind of a fuller distribution, particularly in the tail. Sorry I’m getting off the how is it represented piece. So yeah the event loss table and the probability curves. They tend to be the main, more specialized on the physical modeling end of that spectrum, that tends to be the common way to represent it. If you go more into the purely numerical, I think practice is generally pretty straightforward, if not space and people say, “look, we have no idea what this number is.” But you know most of us don’t get too offended by them being 100% loss ratio plus and minus 20%, something like that. And if that allows a firm to have a discussion about the level of uncertainty in the business and to derive a…I mean I’m being glib, [unintelligible]. And then that’s good. Now the area where, so this is not necessarily common practice, or even observed practice, but we are, certainly in the working groups I’m involved with, through the actuarial profession, we are attracted by the Bayesian framework and have examples of an almost Bayesian/credibility approach that’s use in various areas, whether that’s pricing or it’s reserving, you calculate those technical provisions where we take this kind of prior beliefs and then put that within a framework in which we can update those if [unintelligble] data. And also we were talking about kind of robo-time machine learning as well which might replace this all anyway where we sort of feel there should be some sort of Bayesian kind of belief framework around things, but the problem we have is the maths just gets almost immediately impossible it’s just not worth it from a commercial perspective to chase down the solutions that would allow you to use a Bayesian framework within the data and to remain consistent. Particularly with updates the emerging data came through, that’s one of the problems that presents itself that we struggle to keep the posterior closely linked to the actual data and consistent with that tends to be a sort of problem we have. And like I say, there’s no unlimited or limitless time and financial resources to throw at the problem so therefore we tend to go with the oh it’s almost good enough solution and in industry practice, if I’m completely honest tends to be in that sort of domain. It’s kind of, it’s useful, but it’s definitely not what you regard as a, you know, ideal or kind of rigorous. Obviously now that more data’s coming into the industry so we’re starting to see a step up in the volume of data that’s available. Perhaps that will bring in due course, good benefits.

[28:19]

I: Well this has been really, really helpful. I don’t want to take too much more of your time, but if we have any further questions or once we have this survey ready to send out, do you mind if we send it to you, is that alright if we contact you in the future?

[28:34]

S: You might need to do a gentle reminder to me to fill it in, but please feel free to do that if you need to kind of follow me up on it. Is that okay?

I: Yes, that’s perfect. Thank you so much for all your help. It’s been very informative and very useful.

S: You’re welcome. Okay.

I: Have a good day. Thank you.

S: Have a great weekend. Bye.

I: Bye.

1. The interviewer is denoted by “I” and the subject as “S” [↑](#footnote-ref-1)