# ELICITATION RECORD – Part 3

# Elicitation by Extension

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| Elicitation title | New product sales (Extension Example 1) |
| Session | Day 1 |
| **Date** | 15 May 2019 |
| **Quantities** | Target quantity S2 is the value of sales in the second year after launch. Extension variable S1 is the value of sales in the first year. |
| **Anonymity** | Experts are denoted here by the letters A, B. C and D. The facilitator is denoted by Z. Use of “he” or “his” should not be taken as implying male gender. |
| **Start time** | 13:51 |

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| **Definition** | S2 and S1 are defined to be the income received for sales in millions of pounds sterling (£M) in the second and first years after the date of launch. |
| **Evidence** | The evidence dossier was reviewed with particular reference to evidence of total sector demand, likely market share for the new product and planned promotional activity. |
| **Extension variable distribution** | The experts have already considered S1 and their elicited distribution is Gamma with parameters 0.694 and 5.19. See attached SHELF 2 record. |
| **Conditioning points** | Y1 = 3 (5th percentile), Y2 = 5 (lower quartile), Y3 = 7 (median), Y4 = 9.5 (upper quartile), Y5 = 13.5 (95th percentile). |
| **Target quantity distributions** | Outer medians. Experts made individual median judgements for S2 conditional of S1 = 3 and S1 = 13.5. These were revealed as   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Expert | A | B | C | D | | m1 | 1 | 4 | 2.5 | 1 | | m5 | 14 | 20 | 18 | 27 |   Z asked experts to explain their reasoning for their m1 judgements, beginning with B, who said that a first year figure of 3 would not be encouraging and suggested growth would be slow in the second year. D responded that B was being too optimistic – such poor sales in year 1 suggested the product was likely to die. A agreed, saying that sales of 3 or 4 in year 2 might still be possible, and might then pick up, but the more likely scenario was that year 2 would be even worse – the company should actually consider withdrawing it after S1 = 3. C pointed to the evidence dossier, where market analysts suggested the market would start to grow rapidly in a year or so, and so even poor year 1 sales should hold up in year 2. There was some discussion around these judgements, but without a clear resolution, and no further opinions were raised.  Z then asked experts to explain their reasoning for their m5 judgements. First, A said that he could understand the other experts’ enthusiasm, but the evidence dossier gave little reason to suppose the company could capitalise very much on a good launch. D emphatically disagreed – sales of 13.5 in year 1 would be so impressive that he was sure it would “go viral”. B and C urged caution – “going viral” was unlikely, such phenomena being highly unpredictable. A repeated that it would not be easy to keep cutting into the market share of the established products, and he felt there was a ceiling around £15M that would be hard to breach.  Z reminded them of the notion of a Rational Impartial Observer (RIO) and asked the experts to consider what median RIO might give if S1 = 3 and if S1 = 13.5. The experts readily agreed on m1 = 2. They also judged m5 = 20, with A saying that although he felt this was highly unrealistic he could accept that RIO’s opinion could be different.  Y3-distribution. The experts then elicited a distribution for S2 conditional on first year sales being S1 = 7. See the attached SHELF 2 record. The elicited distribution is lognormal with parameters 2.2 and 0.724, with median m3 = 9.  Inner medians. The experts felt that it was not necessary, after all the preceding discussion, to start with individual judgements of the median of S2 given Y = 5 (m2) and given Y = 9.5 (m4). After some further discussion, they agreed on RIO judgements m2 = 6.5 and m4 = 13.  Median model. Z explained the idea of a median model and said that, since sales were necessarily positive, the model would be built using a log transformation. C countered that if year 1 sales were sufficiently bad a negative figure in the next year was technically feasible if returns were counted in, but the experts agreed to ignore this possibility. The fitted median model (below) was shown to the experts, who were content that it represented how RIO might view the dependence of S2 on S1. They thought the prediction beyond S1 = 15 was unreasonably optimistic but accepted that they had given such low probability to values of S1 this high that it would make negligible difference to the elicitation.    Link. Z explained the notion of a link function and showed its effect under the log transformation with the conditional distribution of S2 for several S1 values plotted below. The experts thought the plot showed very reasonable distributions, and particularly expressed an appropriate level of predictive uncertainty for all plausible S1 values. |
| **Feedback** | Z explained that the resulting marginal distribution for S2 could not be derived mathematically but it could be computed by simulation (provided that values of S1 for which the median model gave a negative median were excluded). He sampled 10,000 pairs of (S2, S1) values, the S2 sample then being shown as the estimated distribution below.  Z also gave the following summaries of the S2 distribution.  5th percentile 1.4, lower quartile 4.4, median 8.5, upper quartile 16.1, 95th percentile 38.1.  B expressed concern that the tail of this distribution allowed for S2 being more than 50, perhaps even as high as 100, which he felt would be completely implausible. Z said that values above 50 had less than 2% probability under this distribution, and D thought it would be wrong to discount completely the chance of the product “going viral”. The experts agreed the above marginal distribution, provided a caveat were inserted that there was some disagreement about the possibility of year 2 sales above £50M.  N.B. The simulated (S2, S1) pairs were retained by the recorder, so that they could be used in the next elicitation session where the distribution of third year sales, S3, would be elicited. The above summary values would also be used as conditioning points in that elicitation. |
| **Chosen distribution** | The implicit joint distribution of S2 and S1 presented above was accepted, on the understanding that the possibility of year 2 sales above £50M should not be relied upon. |
| **Discussion** | The experts felt that the process was surprisingly intense, even exhausting, but extremely interesting. They volunteered that the process was rigorous and challenging but well explained throughout, and they looked forward to the elicitation of S3 tomorrow. |

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| **End time** | 17:25 |
| **Attachments** | “SHELF 2 Year 1” and “SHELF 2 Year 2 given median” |