OVER-ESTIMATION IN MARKET SIMULATIONS: AN IMPROVED SOLUTION TO THE PROBLEM WITH PARTICULAR REFERENCE TO THE PHARMACEUTICAL INDUSTRY

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INTRODUCTION

The tendency of discrete choice simulations to over-estimate market share is a well-recognized problem within the pharmaceutical industry. It is proposed that these over-estimations are due in part to over-simplifying the decision process of a physician of whether to prescribe a new drug or not (see Figure 1). Physicians make individual prescription decisions for a number of patients and there is a consequent interest of third party payors and formularies which in turn can lead to limitations on the total prescribing of a particular product. The method described in this paper uses a follow-up question to the choice exercise in order to find out from the physician what impact they perceive external effects such as formularies *etc.* have on prescribing levels for a new drug. These answers are then built into simulations at the level of individual patient/physician consultations to create realistic share estimates for new drugs.

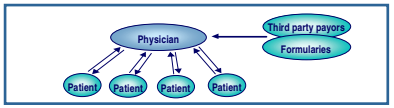

Figure 1: Diagram showing the external influences on the physician when prescribing treatments

OBJECTIVES

The objectives of the study were to build into discrete choice simulations any reluctance a physician might have about prescribing a new treatment, such as satisfaction with current treatments, and also to model the impact of external effects at the individual level to obtain much more informative and realistic market simulations.

METHODOLGY

- Three discrete choice designs were generated using Sawtooth's Choice Based Conjoint (CBC) system, each consisting of 16 - 20 tasks where respondents were asked to pick their preferred profile out of three alternatives. Physicians were asked to consider particular recent patients that belonged to predefined patient groups.
- Partial profiles were used where there were a large number of attributes to avoid over-loading respondents, which can result in respondents only reading a small number of attributes which would subsequently dominate the results.
- The data collected were analyzed by Sawtooth Software's CBC/HB for Hierarchical Bayes estimation and the individual parameter estimates generated.
- A number of further questions were asked, where respondents were shown full profile descriptions for new products and asked whether they would have definitely prescribed the new product to that patient if it was available. The physicians were asked to make a number of assumptions (they already had experience of using the product and agreed with its claims, that specialists had already endorsed the product). Where price was not stated they were asked to assume price was comparable to a new product of that type.
- A patient allocation question was asked in order to be able to incorporate the external effects. A full profile description of a new product was shown to the physician. This profile had the best possible levels from the attribute and levels grid. Physicians were asked what percentage of each patient group would receive the new product. Unlike the previous questions which were all specific to a particular patient, this new question addresses the whole patient population for each physician.

- We have observed that patient allocation exercises tend to result in higher share estimates than corresponding discrete choice derived estimates for relatively inferior product offers, and lower share estimates for relatively superior product offers. We believe that the observed higher share estimates for relatively inferior product offers from the patient allocation exercise reflect a reluctance to suggest no product use, coupled with a tendency to allocate a minimum 5 - 10% share 'units' in research exercises. Conversely, the higher discrete choice derived estimates for the relatively superior profiles reflect inadequate accounting for the external effects that would result from the higher volume prescribing. Our contention is that the discrete choice derived estimates provide a more sensitive means to obtain share estimates for the relatively inferior product offer range as it is not susceptible to the minimum 'unit' allocation effect. However, for relatively superior product offers, an external effect adjustment is required for the discrete choice derived estimates which the allocation question we have adopted delivers. A number of possible ways of applying this restriction are shown in Figure 2.

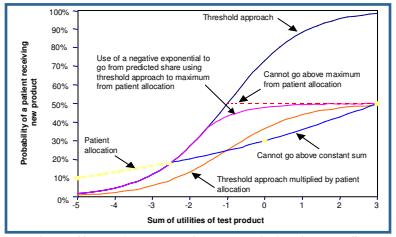

Figure 2: Possible ways of incorporating the maximum value from the patient allocation exercise to limit the predicted uptake

- Our preferred option was to use the threshold approach multiplied by the patient allocation, as this applies an element of external effect consideration at a constant proportional level. We believe this most accurately reflects the external pressure under which prescribers operate.
- The assumptions of our new model are summarized in Figure 3. Under the new model physicians will be aware of the limits that are likely to be imposed upon them by third parties from the first time they prescribe a new product.
- In the Results section, we show how much influence the external effects model can have on predicted share estimates under different market situations.

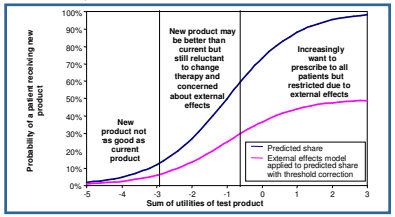

Figure 3: The new assumptions made for the model that includes the threshold calculation and the external effects correction

RESULTS

- **(a) A new product for the treatment of hypertension to be launched into a competitive market with inexpensive alternatives that can be used to treat hypertension in a satisfactory way.**

The results of this study are shown in Figure 4. The chart shows the predicted uptake for a new product for a model used to simulate a traditional conjoint analysis; another uptake curve shows the effect of including the reluctance to prescribe based on the clinical attributes (the threshold model) and the third line represents the threshold model with the external effects calculation. The external effects calculation can be seen to exert a dramatic effect on the predicted market share and it is now within the range that market knowledge would suggest.

- **(b) A new cancer drug with only a few currently available treatments.**

The results of this study are shown in Figure 5. This chart shows the external effects calculation having an almost negligible impact on predicted share. This can be attributed to the fact that the treatment can mean the difference between life and death and also that the suitable patient population size is not large enough for physicians to have to worry about the cost of prescribing the product. Unlike the example above, the decision regarding whether or not to prescribe the new treatment depends almost entirely on the clinical attributes of the new product.

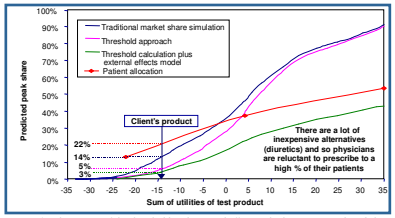

Figure 4: The impact of the threshold and external effects calculations on predicted share compared to a traditional conjoint simulation and patient allocation data

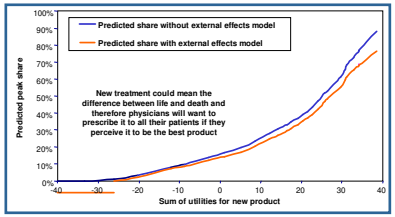

Figure 5: The impact of the external effects calculation for a new anti-cancer treatment

- **(c) A pricing study to find the optimum price of a 'first in class product'**

This study was carried out in a different way to the previous two. Five different prices were tested. The patient allocation question was asked for the best product on the attribute and levels grid, and this was repeated for each of the five prices. Cubic-splines were used to estimate the uptakes between these levels at the level of individual patient/physician consultations.

Figures 6 and 7 show the results of market simulations using this approach. An index of maximum revenue was also derived. This was calculated by multiplying the predicted uptake by the price. The maximum of this value for the given price range was allocated the value of 100% and then all other values indexed to this. Figure 6 shows the predicted uptake and optimum value without the external effects calculation and Figure 7 shows the results obtained when including the external effects model.

When the physicians are asked to consider an individual patient, they do not appear to take price into account. This gives the rather flat curve, with the maximum revenue curve continuing to increase beyond the maximum price tested. The physician is only trying to assess whether the new product is sufficiently better than the patient's current treatment in order to make it worthwhile switching products.

When the physicians are asked to consider their whole patient population, they then consider the external effects that influence prescribing. The external effects model again produced results that were in line with other independent research and which market knowledge could support.

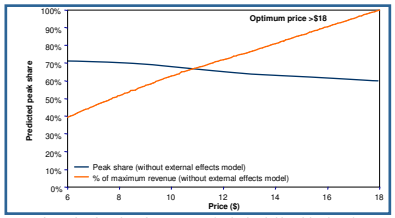

Figure 6: Predicted uptake and revenue curve for the threshold model without the external effects calculation

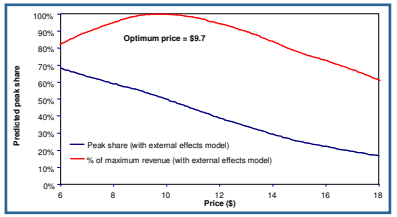

Figure 7: Predicted uptake and revenue curve for the threshold model with the external effects calculation

CONCLUSIONS

- The new model with the threshold and external effects calculations has achieved the following:
  1. It addresses issues relating to the reluctance to change the current treatment of a patient.
  2. It provides a means to adjust for the external effects that may limit the prescriptions of a new drug as perceived by the physician.
- The in share due to the external effects varies considerably according to the particular situation (the incidence and seriousness of the disease, and the degree of market competition). It is therefore not possible to derive a single correction factor that will reduce the predicted share to a realistic level that will work in all situations. It is also not possible to model a correction factor using data from products that have been launched. Too many changes take place during the time period, from the market research to the time of launch (new products not meeting or exceeding expectations, any changes to policies and guidelines).
- The fact that we are only modeling a few new products against the threshold value and not trying to model all products in a market purely in terms of their utility values means that we are able to take into account other variables such as the level of satisfaction with current treatments and how well established the existing products are.
- In the pharmaceutical market, much knowledge already exists regarding preference but not how this preference can be converted into market share. What we have managed to achieve is to get a significant step closer to converting preference share to market share. Our intention is to continue this type of research to further understand prescribing behavior.