IPA

Econometrics Explained

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Introduction

We live in tough times. Marketing budgets are being scrutinised harder than ever. Activity that doesn't add to the bottom line is increasingly difficult to justify. In this climate, spending on communications can seem like a luxury. So wouldn't it be easier if there were a way to measure the payback from your marketing communications?

There is – it's called econometrics. With the right data, econometrics can measure the impact your communications have on sales and profit. It can even forecast the effects of future campaigns.

Econometrics is not new. UK marketers have been using it for over 25 years, and the methodology behind it goes back much further. Yet even after all this time, econometrics is not as widely used as it could and perhaps should be.

One possible reason for this is a lack of understanding. Most people in marketing have probably heard the term 'econometrics', and most probably have a vague idea that it's something to do with building models and measuring things. But that's as far as it goes. To most people, econometrics is an obscure and intimidating art, practised by ivory-tower boffins, with little relevance to the day-to-day practice of marketing.

We at the IPA believe that this lack of understanding is preventing UK clients and their agencies from exploiting the full potential of econometrics. Hence this guide. Written by two of the UK's foremost practitioners, it aims to introduce the basic concepts of econometrics in a straightforward and user-friendly way.

If you are interested in measuring the effects of marketing communications, and would like to know how econometrics can help, then this guide is for you. It will tell you what econometrics is, how it works, and how to get the best out of it. No previous knowledge of econometrics is assumed, and very little maths is needed.

What this guide will **not** tell you is how to actually do econometrics. Econometrics is a specialised skill, and requires trained experts. But, armed with this guide, you should at least be able to commission and judge econometrics with some degree of confidence.

Section 1 explains in broad terms what econometrics is and what it is used for. Section 2 then focuses in on how it is applied to communications. For those of you who are curious, Section 3 explains in very simple terms how econometrics actually works. Those of a more practical bent may wish to skip to Section 4, which tells you how to commission an econometric project. Having commissioned an econometric model, Section 5 tells you how to judge whether or not it is any good. Finally, assuming you now have a robust econometric model, Section 6 then tells you how to use it.

Les Binet
IPA Value of Advertising Committee

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Section 1 – What is econometrics and what can it do?

Econometric analysis is a form of quantitative research. It provides a means by which seemingly unfathomable mountains of data can be turned into actionable information. Initially developed as a means of understanding the vagaries of the economy, it now has widespread uses in marketing and communications.

Consider the following situation:

Your new advertising campaign was well received. Sales levels are particularly high but there is disagreement as to whether this is due to advertising because there were other positive influences. The weather was good, competitors advertised less, the sales-force were actively securing new distribution and promotions boosted short-term sales. This is not an untypical situation. Frequently therefore, advertising's effect is not immediately distinguishable.

Econometric analysis can provide a useful means of adjudication. One of its main benefits is its ability to **separate** the effects of contemporaneous influences and to quantify their individual effects. It shows how much sales change per unit of advertising, per distribution point, per degree Celsius etc. As part of the econometric process the key factors influencing sales are **identified**, as are the **timescales** over which they take effect (important for advertising where effects may persist for years).

In addition to evaluating advertising effects, econometrics has a variety of other applications. It can be used to measure the impact of most marketing influences (price, promotions, direct marketing, etc) as well as the impact of macro-economic and other long-term trends. It can provide a detailed understanding of the seasonal influences underlying sales and can be used to investigate the effects on sales of a range of one-off factors such as launches, negative publicity, supply problems and so on.

Once we know the sales response per unit of activity (be it advertising, price, promotions etc) we can calculate the overall effect of that activity and the **profit** accruing from it. We can also use the econometric results to make predictions under a range of future options.

Essentially econometric analysis offers three things:

1. A rigorous means of understanding a brand's sales history, ie how the brand arrived at its current position.

2. A systematic method of exploring how future targets might be achieved.

3. A means by which to test hypotheses. For example, we may have theories about how a brand's advertising works in the long term. We can use econometrics to test whether these are upheld by the available data.

Econometrics can be very powerful but it is not a panacea. It is important to be aware of its limitations, covered in Sections 2 and 3.

Section 2 – Using econometrics to evaluate communications

Alongside its broad capabilities, econometrics has the facility to address a wide variety of more specific questions. This is particularly true in the communications field, something that this section explores more thoroughly.

It is commonly accepted that advertising's effects may last for years. The following classification is therefore useful:

- **Short-term** – effects close to airtime.

- **Medium-term** – effects lasting up to around five years, typically incorporating the effects of repeat purchasing and proportional to the brand's adstock. (Past advertising still affecting a brand's sales is typically termed its 'adstock'.)

- **Long-term** – effects manifested in the way the brand interacts with its competitive environment. It may have become less price sensitive or more resilient to competitive activity.

Econometrics is adept at measuring short and medium-term effects. Long-term effects are much more difficult to tie back specifically to advertising and are thus not routinely measured[1].

Short and medium-term applications of econometrics

The short and medium-term applications can be divided into seven types:

1. **Overall communication effectiveness** (**payback**)

   This is the aggregate response of consumers to an advertising campaign over the entire period of its influence. Effects can often be reported by individual media. Sometimes it is also possible to quantify secondary effects where advertising increases (say) distribution that in turn, generates additional sales.

2. **Comparative campaign effects**

   Econometric modelling can help to determine which campaign is the most potent influence on sales or other key measures.

3. **Efficiency**

   Efficiency covers a diversity of issues:

   - How big a budget is needed to:
     - reach sales targets
     - maintain adstock levels.

[1] Examples of long-term effects include PG Tips *(Advertising Works 6)* and Optrex *(Advertising Works 7)*

- How should advertising be flighted:
  - press vs television vs other media
  - burst vs drip
  - by time of year (media cost and relative effectiveness may be issues)
  - relative to previous activity (recency).

- What are the most effective coverage or frequency levels?

- Are particular weights of advertising more effective per unit of advertising, ie at what point does diminishing returns set in?

(The issue of diminishing marginal returns to scale with respect to advertising weight is one of the aspects of efficiency most often raised. It has several facets and thus may mean different things to different people. It can imply ratings becoming less effective per additional rating point. It could refer to costs or responses that differ by region or time of year. All imply a resource allocation issue where econometrics can be helpful.)

4. Cross-brand effects: portfolio, umbrella and halo

In some markets operators have a portfolio of products that may even be direct competitors, eg brewing or financial products. Advertising one of these could positively or adversely affect others. Thorough evaluation of advertising should investigate both the effects on the advertised brand and its stable-mates.

5. Competitive effects

Competitive effects can be measured:
- On your own brand.
- On the competitor by modelling their sales (also showing your brand's effects on them).

Once the relative effects of own and competitive media activity are understood it becomes possible to calculate the budget levels required to offset competitive actions.

6. Non-sales effects

The impact that advertising can have on distribution was mentioned earlier. It is possible to use econometric techniques to investigate this and also the effects of communication activity on a range of non-sales measures like call-centre traffic, staff morale or on more traditional intermediate measures like awareness or image.

7. Media tests

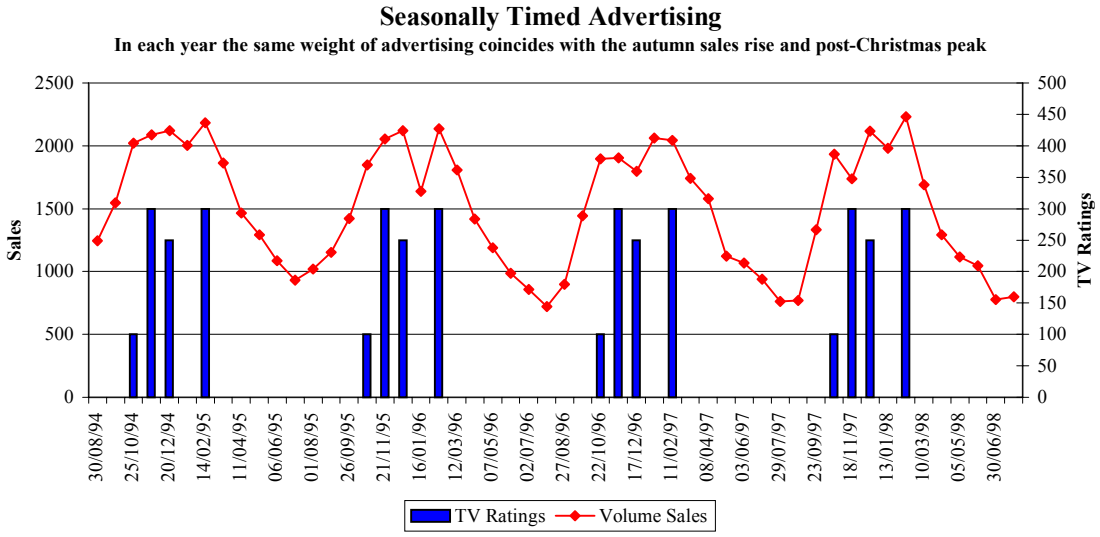
Media tests may be conducted to explore issues like changes in advertising weight, campaign or media flighting. Econometrics can be used to quantify the effects of these tests and to provide confidence intervals for those estimates. However, many media tests fail to produce conclusive results because insufficient account is taken

of measurement difficulties when the test is designed. The econometrician is in a good position to advise on the nature of these problems and can play a vital role in helping to design tests that will be measurable.

Econometrics can address all the above issues but it is important to be aware that there are situations where technical difficulties or data limitations may compromise the analysis. These are discussed next.

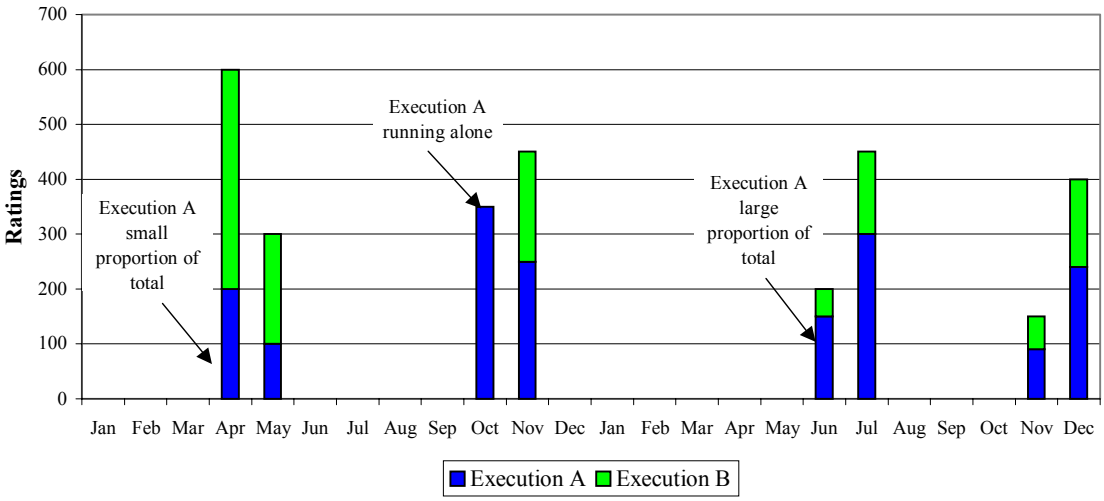
Communication questions: potential difficulties

Where econometrics cannot answer the above questions it is usually because there is insufficient information (variation) within the brand's history to enable individual effects to be isolated. For example, a general problem occurs where activity coincides with the seasonal sales peak (see chart below). This makes it difficult to separate accurately the underlying seasonality from advertising. Year-to-year variations in advertising weight are thus helpful.



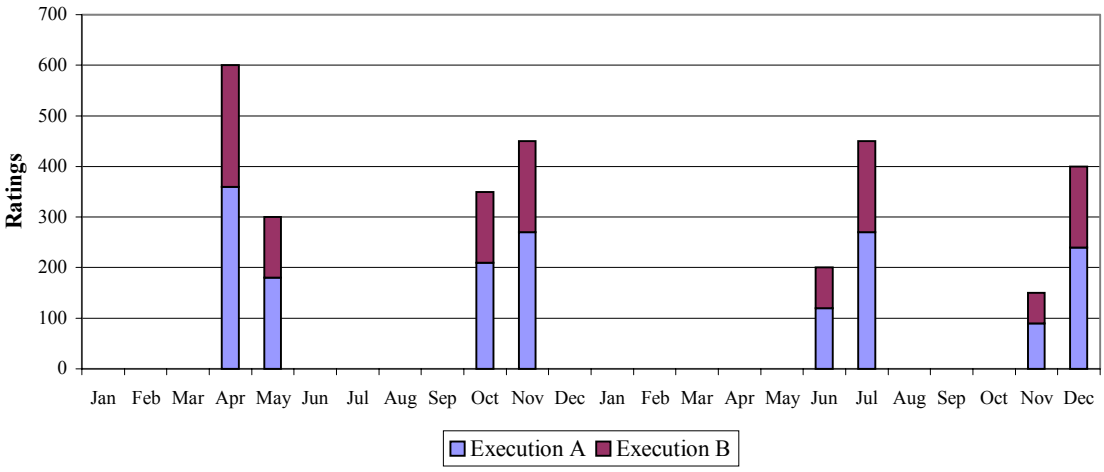
A similar stumbling block is associated when executions or time lengths run in rotation. Their relative proportions must vary over time for their individual effects to be identifiable. Two examples illustrate this. In the first, execution 'A' runs solus and is both a large and a small proportion of a month's activity. This provides discrete information about its effect which the modelling can make use of.

Ratings Behind Executions Split in Different Proportions



In contrast, in the second example the ratings are always split in similar proportions. There is no discrete information about their individual effects.

Ratings Behind Executions Always Split in the Same Proportion



Similar issues are relevant to analysis of coverage and frequency. The curves describing the growth over time in different levels of coverage can be highly correlated with one another, making it difficult to distinguish the best.

There are many different ways econometrics can be used to evaluate advertising and communication effects, but the variation within the brand's own previous activity dictates what will ultimately be possible.

Section 3 – What is an econometric model and how is it developed?

Having covered its applications, it is time to explain more fully what econometrics is and how it works. Essentially, it is a set of statistical techniques, some for developing and some for validating econometric models. In a marketing context these are typically models of brand behaviour, showing responses to changes in price, communications, promotions etc.

What is a model?
Econometric models are mathematical models but the word 'model' applies in its widest context. Models can also be physical (Airfix planes) or diagrammatical (some maps and plans). The London underground map is a model. It clearly shows how the lines inter-relate but it exaggerates the central zones and compresses the outlying zones. Because it is not an exact replica of the network, like all models, it is wrong by definition! As a consequence, whilst providing helpful guidelines, models require an awareness of context to be used successfully.

A mathematical model is an **equation**. The dependent variable, eg sales, lies on one side of this equation with the explanatory factors, those causing sales variation, on the other. (In practise the model could explain awareness, image, distribution or other measures of interest.)

The modelling process shows **how** sales relate to these factors. It estimates weights, often expressed as **elasticities** specifying how sales respond to a **1% change in each explanatory factor.**

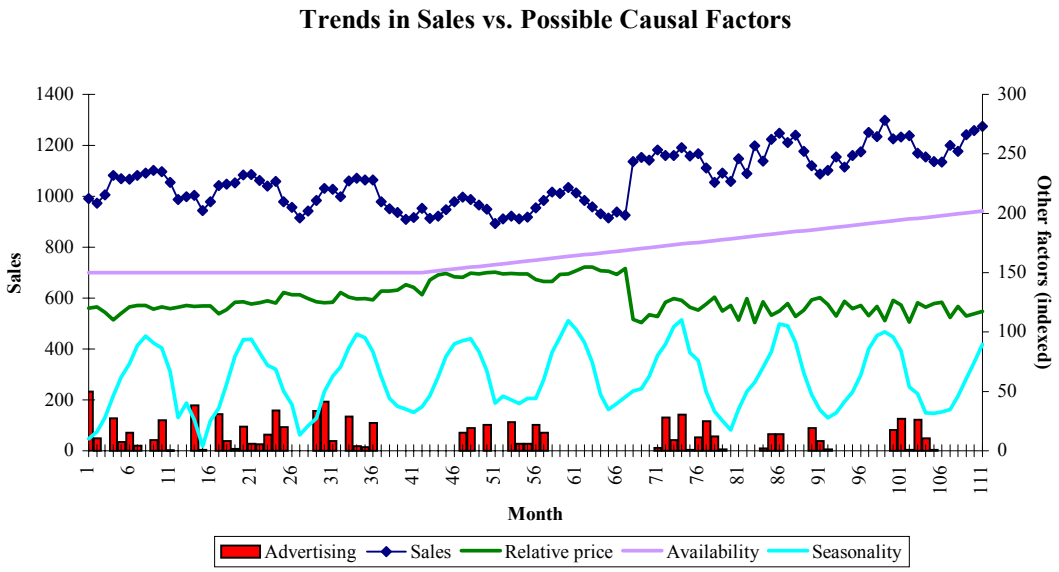
An equation could take this form:

Sales	=	+0.2	x	Temperature
		+0.8	x	Distribution
		-0.5	x	Price
		+0.1	x	Advertising

The minus sign in front of price implies that when price changes, sales move in the opposite direction, ie, when price rises, sales fall.

How is a model developed?
Models are developed from historic time-series data[2]. The chart below shows the data on which the above equation is based.

[2] The word historic is important. Whilst many relationships hold over very long periods, some markets change so fast that history is of limited help.



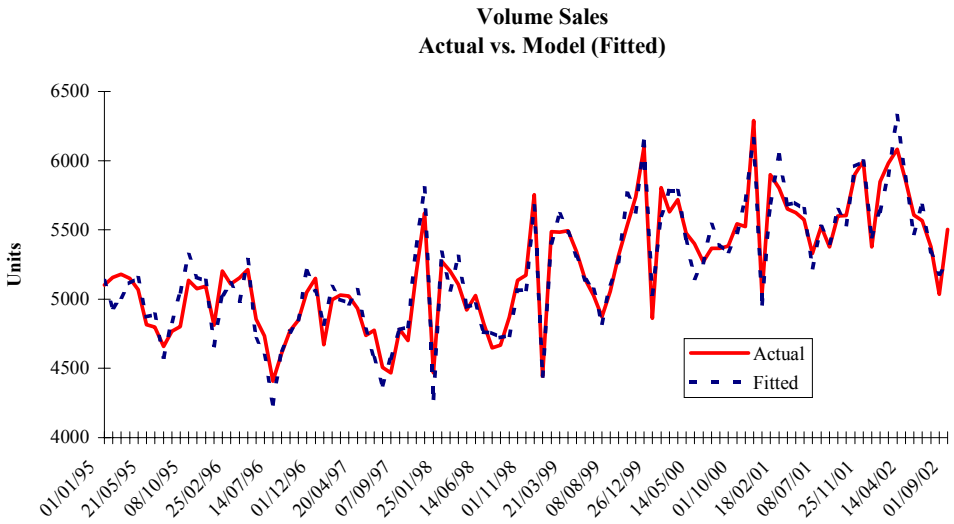
There do appear to be clear visual correlations between movements in sales and in most other factors:

- The seasonal pattern corresponds to temperature variation.
- A gradual upward sales trend corresponds to the distribution rise.
- Sales experience a step-change when price falls sharply relative to competitors.
- Advertising's effects are less clear cut (they may not be limited to airtime).

The econometrician's task is to re-express the sales fluctuations in terms of the factors causing them. Think of a cake that has a set combination of ingredients. The econometrician must determine both which ingredients and how much to include in order to replicate the sales patterns displayed.

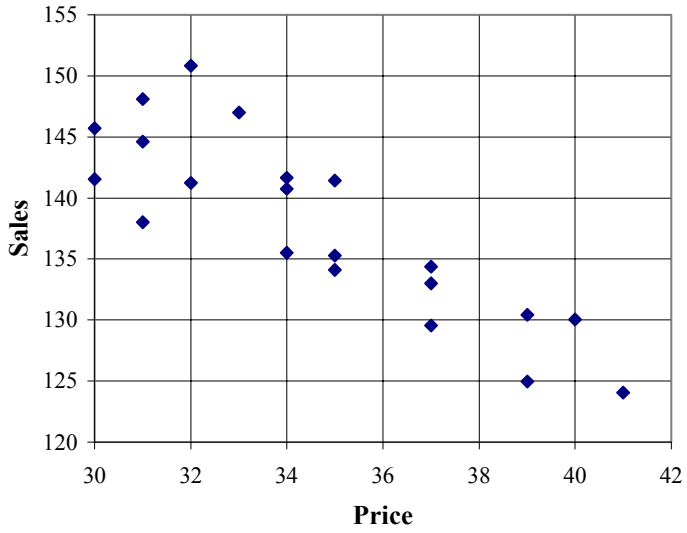
The modelling process works by 'marrying' the fluctuations in sales to those in the explanatory factors. From this the appropriate weights are calculated. Sometimes a factor has maintained such a consistent level over time that it hasn't caused any sales variation (often the case with distribution) and so its potential effect isn't calculable. Not all effects can be separated. Where two factors always vary simultaneously and by similar proportions, their effects are inseparable. This was discussed in Section 2 in the context of communications issues.

In the following chart, the dotted line is the level of sales predicted by the model for each time period, based on the factors it includes and their weights. It is called the line of 'best fit'. Producing a model that closely tracks actual sales patterns is only a first step. It must also be theoretically sensible and technically sound (see Section 5).

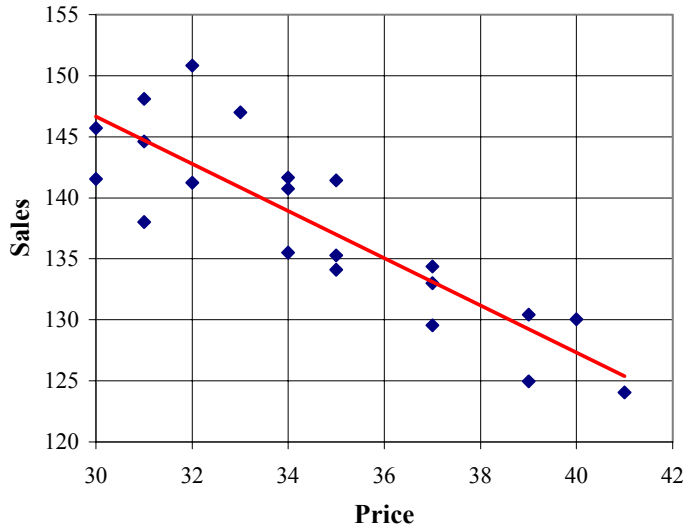


The modelling technique used to determine this line of 'best fit' is regression analysis. The way it works can be illustrated quite simply.

The chart below shows a typical scatter-plot of sales against price where higher sales correspond to lower prices.



Illustrating that relationship with a line through the points seems an obvious thing to do.



Instinctively we pick a line through the centre of the scatter. By comparing points on the line we see how sales respond to price. A price increase of 11p (from 30p to 41p) corresponds to a sales fall of 21 units (from 146 to 125). Each unit price increase thus corresponds to sales falling by almost two units. In this two-dimensional example a tiny bit of algebra produces the equation linking sales to price. A similar 'manual' exercise could be performed in three dimensions where price and say advertising affect sales.

Of course the real world is more complex, but the intuition is still valid. Correctly specified models must include all the major factors affecting sales. Determining what should be included is a key part of any modelling project. Most broad influences are relevant but the detail differs by market. The best mechanism for specifying which factors to investigate and any theories as to how they affect sales is often a brain-storming session with a multi-disciplinary team. The output provides the econometrician with a theoretical framework to underpin the modelling, something which plays a vital role in assessing the model's validity. If its results contradict theory, it has a high probability of being misleading.

This section has outlined how regression techniques work at a basic level. A range of more complex approaches are available when required.

Section 4 – Planning and undertaking a project

Typically, model construction involves many people and many hours of work. Careful project management will be repaid in the quality of the final models produced. Though every modelling project differs in its detail, general guidelines do apply.

Do you have sufficient data?
In a seasonal market a minimum of three years' data are required. Unless data are reported monthly or more frequently, even three years is unlikely to provide enough data points to enable any but the most straightforward of questions to be addressed. Data are required for sales (or whichever variable is the subject of the modelling) and for all the variables that are likely to cause sales to change.

Choosing an econometrician
Do this exactly as for anything else that is expensive, important and could have serious consequences if it went wrong.

Get recommendations. Compare relevant experience. How much interest is shown in your particular issues? How much senior level input is typical? What is after-sales service like? How successfully are results and technical gobbledygook translated into something accessible? Will the technical details of the models be available?

Determine your key objectives and prioritise them
List the questions the analysis should address then assess whether these are primarily issues of long-term strategy or of shorter-term fine-tuning? (A detailed analysis of promotional effects uses different data and produces models with different capabilities from those constructed primarily to evaluate advertising.) If you are clear about priority areas, the econometrician will advise how best to construct the models and on the implications of choosing one route over another.

Ensure the econometrician is well briefed
The econometrician needs to have a good grasp of market context (competitors, trends, legislation, etc). This must come from the brand team and from existing research. A brainstorming session can be the best way to build the necessary theoretical framework, to specify the ground the econometric analysis must cover and the requisite data. A multi-disciplinary group (including external agencies) will provide a useful range of perspectives. It ensures potentially important insights do not get missed. Furthermore, by involving everyone early on, it tends to produce a model more broadly acceptable to all stakeholders.

Ensure senior level back-up for data collection
Data collection is arduous, time-consuming and frequently falls to busy people for whom it may not be a priority. If the econometrics deadline is important to the business as a whole, ensure this is known and that adequate pressure can be applied.

Deliver correct and complete data
This sounds absurdly obvious, but incorrect data are unfortunately commonplace. Someone unfamiliar with your market may not spot a column of data pasted inappropriately in a spreadsheet. Check it before you send it.

Be a useful sounding board
Once the modelling gets underway it is the econometrician who will be doing most of the work. However, there will be questions about quirks in the data or unexpected findings. They may need to talk to particular experts within your company, so arrange for this to happen. Your views on the plausibility of the results will also be helpful.

Ultimately the success of a modelling project depends on client and econometrician. Econometricians are dependent on you for accurate data supplies, for a sufficiently comprehensive market briefing, for a substantial theoretical input and for helping to assess whether the results make common sense.

Above all, allow enough time
Depending on the difficulty of a project, the econometrician will need anything from 6-12 weeks (**after** receiving all necessary data). Data collation can take weeks. Delays in obtaining internal authorisation frequently hold up projects. Any less than three months from your ultimate deadline, and you will need the wind behind you.

Section 5 – How good is your model?

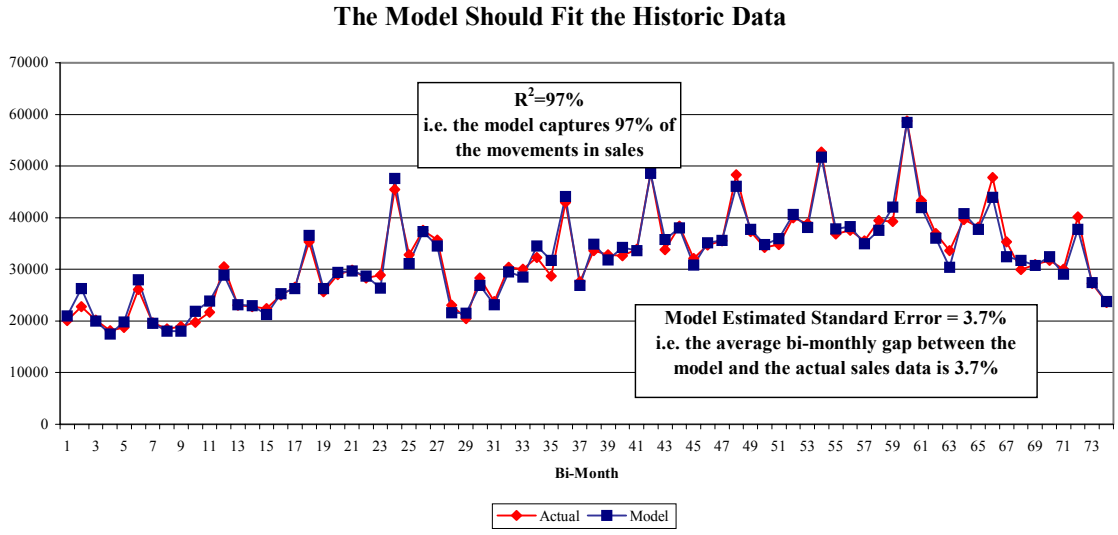
A bad model will mislead and consequently is worse than no model. Section 3 introduced the idea that models should both closely track actual sales and be technically sound. This section revisits that ground and provides basic information to help non-technicians judge models. It also outlines the technical issues that your econometrician should address to ensure a statistically valid model.

There are three questions which should be asked of any model:

1. Does it make common sense and mirror reality?
2. Is it statistically valid?
3. Is it sufficiently accurate for its intended purpose?

Does the model make common sense and mirror reality?
A model's quantifications should appear sensible. Own price cuts shouldn't generally reduce sales, competitive advertising won't normally increase sales. Rising consumer incomes tend to increase sales but, in most markets, this rate of increase is generally similar to or below that in income. Let common sense prevail.

The model should fit the historic data. There are two important measures of model fit – **R-Squared** (or R-Bar-Squared) and the **Estimated Standard Error** (ESE). The chart below showing a model of champagne sales illustrates both of these.



R-Squared measures the proportion of the variation (movement) in the dependent variable explained by the model. In general the higher the R-Squared the better. However, because it is easy to interpret, the R-Squared tends to be given undue weight in the overall assessment of a model.

The **Estimated Standard Error** provides a better measure of model accuracy. Intuitively, this statistic gives the average error for the model as a whole and can be used to calculate confidence intervals for forecasts and scenario simulations.

Is the model statistically valid?

Statistical checks are the responsibility of the econometrician but you are well within your rights to ask for a run down of the model's validation diagnostics. Statistical validity requires:

- The models quantifications must be good approximations to the truth – ie they must be unbiased and not distorted by poor modelling methodology.

- The diagnostics used to determine a model's specification must themselves be valid.

Detecting the presence of biased quantifications

Bias will occur if factors are missing from a model or if spurious factors are included. If a factor is omitted or overlooked, the factors actually in the model will 'steal' the effect of any missing ones. This might result in a price elasticity being exaggerated or an advertising effect under-reported. Whilst the econometrician has a variety of technical tools to detect potential bias, clients can also play a useful role by determining whether factors are likely to be missing.

The validity of statistical diagnostics and confidence intervals

The techniques used to estimate econometric models require certain technical conditions to hold for a model to be statistically valid. These conditions can be summarised intuitively:

- There should be no systematic pattern(s) in the model errors. In more technical terms the model errors must be independent, random and conform to a so-called 'normal distribution'. Problematic patterns are shown on the charts at the end of this section.

- The model errors must not show any tendency to get larger or smaller on average over time.

- The model quantifications must be stable over time, eg if the advertising quantification is not stable this implies a more sophisticated approach is required, perhaps splitting the advertising by campaign.

If the errors have any sort of systematic pattern, something must be causing this. It is very likely that an important variable has been missed (causing omitted variable bias).

Furthermore, if the underlying error across the whole of the model's history is not similar there are two worries:

1. There might be an omitted factor.
2. The statistical tests used to specify the factors in the model will be invalid.

This situation is common when the dependent variable has an underlying growth trend. In these circumstances the econometrician needs to revise the specification of the model.

In summary if these rather technical conditions do not hold, there is prima facie evidence that there is something wrong with the model. Furthermore the diagnostic tests for the statistical validity are themselves invalid – hence there is no 'statistical' justification for the model's specification and its quantifications.

Is the accuracy of the model sufficient for its intended purpose?

Even if a model is statistically sound, is it helpful? This depends on its accuracy relative to its end use. As noted above, models have two general purposes:

1. To understand the past (quantify and decompose).
2. To make an assessment of the future (forecasting and scenario planning).

Model accuracy is defined by:

- The confidence intervals of the quantifications, ie the ranges in which the true price elasticity or advertising quantification lies at a given level of probability. A very small confidence interval indicates accuracy, a wide confidence interval less accuracy.

- The estimated standard error (ESE) of the model provides a measure of the expected forecasting accuracy of the model.

The above is a very condensed summary of statistical requirements for a 'good' model. If the model does not conform to the above, the accuracy of its predictions are compromised.

Good model, bad model

To illustrate how the layman might diagnose an inadequate model, a 'bad model' has been constructed by taking the model used to illustrate R2 and ESE and by deliberately:

- Omitting competitive advertising effects (this biased own-advertising effects downwards).

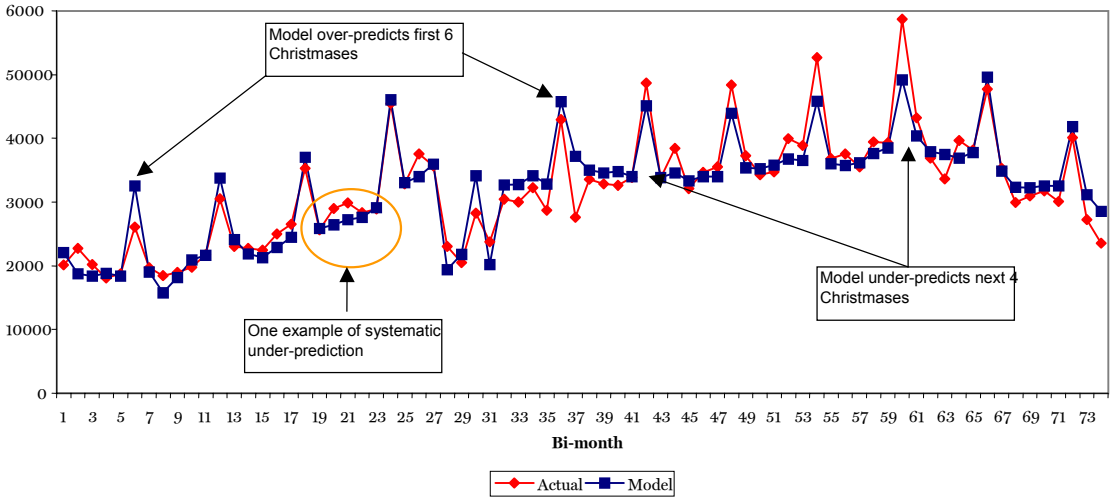
- Omitting the short-run effect of competitive relaunch periods 31–40 (this biased the short-run price effects).

- Inadequately modelling the seasonality (this biased the quantification of the Christmas marketing effects).

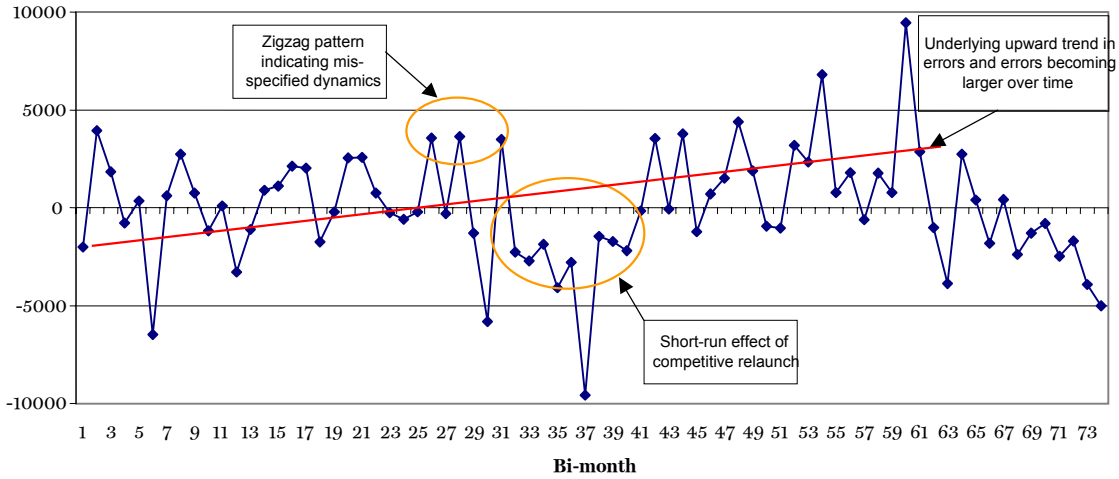
- Ignoring pricing dynamics (leading to a misunderstanding of promotional effects).

The first of the charts below shows the actual sales vs the model, the second the corresponding errors (the gap between the model and the actual data). In the second chart those errors above the zero line are model under-predictions, those below are over-predictions.

Champagne sales 'bad model' actual vs model



Champagne sales 'Bad Model'



The features to notice are:

1. The model over-predicts the first six Christmases and under-predicts the next four – a clear indication that most important period of the year has been modelled inadequately.

2. The underlying upward trend in the errors – this type of pattern is usually the result of omitting a variable with a long-term underlying effect – in this case by the omission of competitive advertising effects.

3. The serious under-prediction periods 31–40 was caused by the omission of the competitive relaunch.

4. Various periods show adjacent zigzag patterns in the errors – these are the result of omitting price dynamics.

5. The average underlying errors are not constant, ie they are smaller in the first half of the data then the second half – this feature alone at a technical level invalidates all of the confidence intervals and therefore the model.

6. There are numerous examples of where the model systematically over or under-predicts for three or more periods.

Section 6 – Using the output from a model

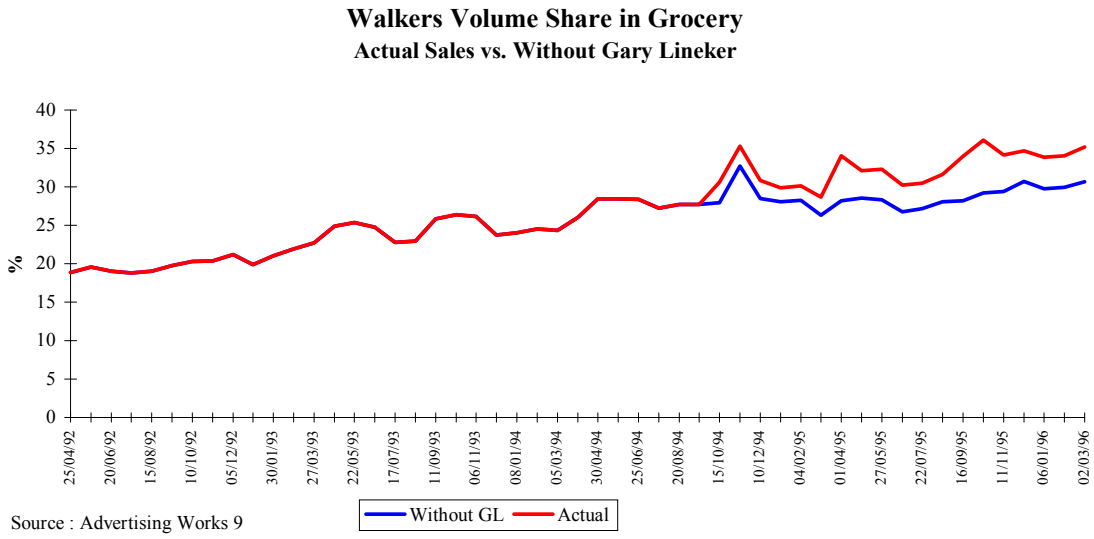
The previous sections have outlined the situations where econometrics can deliver useful information and have discussed both how it works and issues of model validation. The next step is to convert the raw model output into actionable information. This is the modeller's job, and they will generally be steered by the specific questions in the brief. There are however many ways that a model's findings can be expressed and different methods are useful at different times or to different users.

Below is a summary of the various types of information models deliver. Note these items are not mutually exclusive.

The quantifications can be expressed as 'rules of thumb'. This can be as elasticities, ie the effect on sales of a 1% change in say price, distribution or income. It can be as effects per unit of input. A one-degree fall in temperature could boost sales by 2.5%. One hundred ratings might boost sales by 5% when aired, and by an average of 2% over the following year.

The model can be mounted in a spreadsheet or bespoke simulation software and used to simulate the impact of particular actions. In essence the model is asked to predict what sales would have been had one or more variables behaved differently, ie taken different values. It then becomes straightforward to calculate the profit implications of these actions. Effectively the model can be used to:

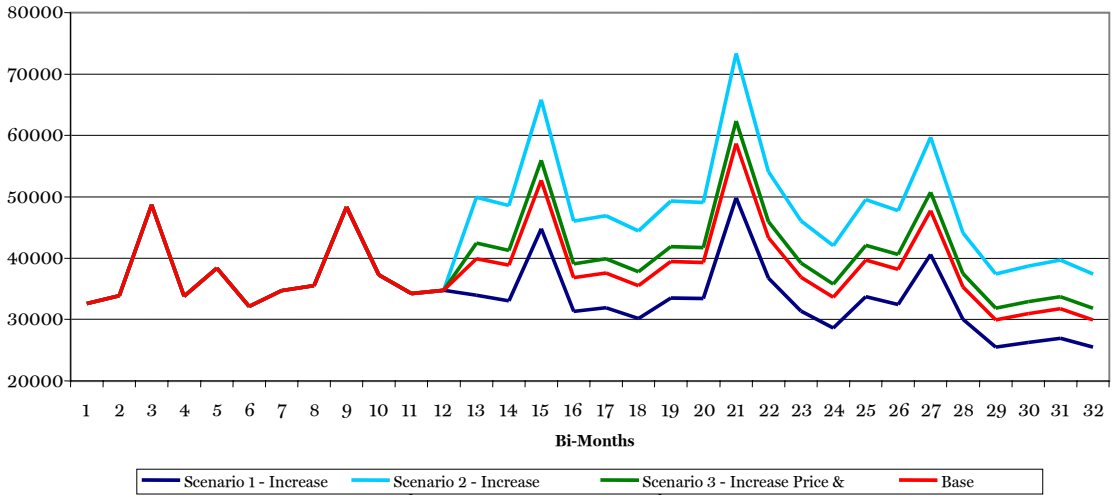
- Examine the contribution of a single factor. This is done by asking the model to predict sales had, for example, price been say, 10% lower, or had there been no advertising.



Source : Advertising Works 9

- Examine the joint contribution of two or more factors on sales. Here the overall impact of a change in marketing strategy could be calculated.

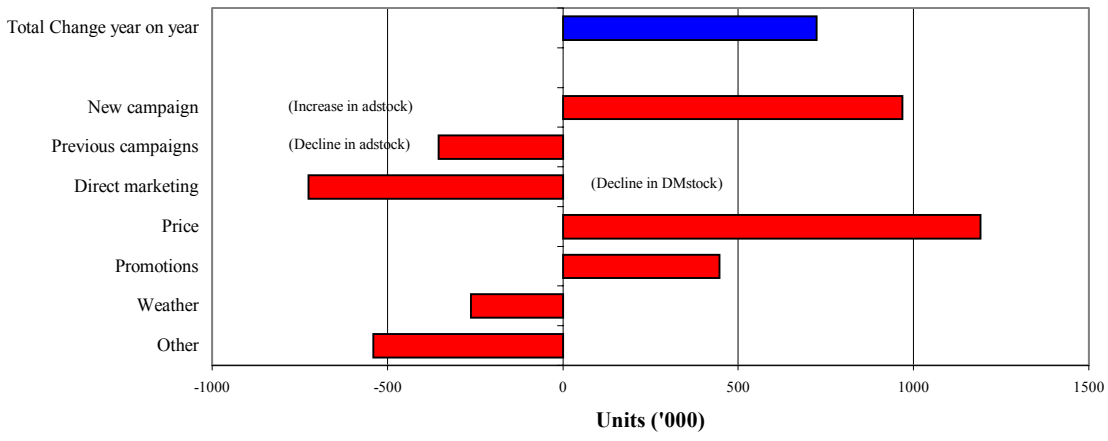
Examining alternative strategies



A step further would be to use the model to decompose year-on-year[3] sales changes into their component parts, ie what proportion of growth was due to price reductions, advertising, distribution changes, promotions etc. This can be very useful when setting sales objectives because it demonstrates clearly whether growth is repeatable and at what cost.

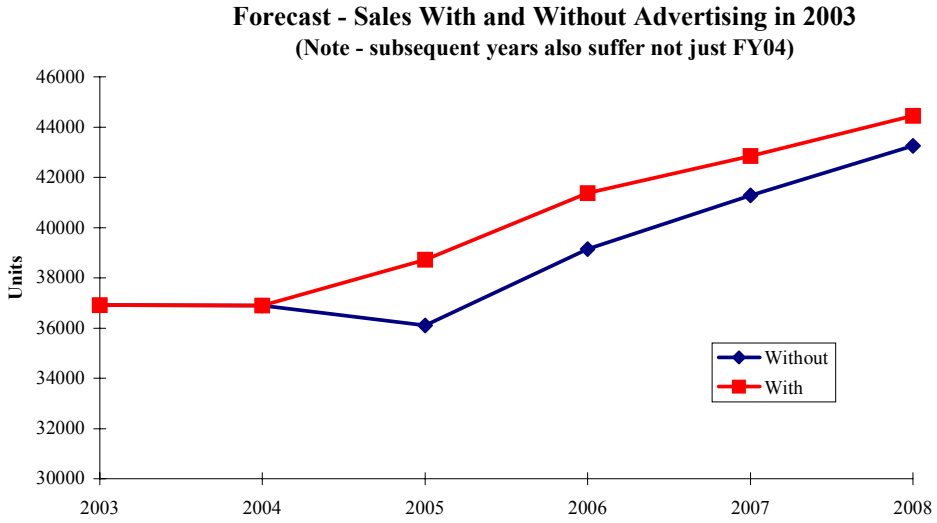
In the chart below the blue bar shows year-on-year sales growth. The red bars show the positive and negative influences underlying this. Price, new advertising and promotions have benefited sales, weather has been unhelpful. Previous campaigns (including DM) have a negative effect year on year because their adstock is eroding over time and thus they contribute less with every passing year. Note the gain from the new advertising is insufficient to offset the erosion in the old advertising and DM.

Components of Annual Sales Change
12 Months to January 2002 vs. 12 Months to January 2001



[3] In practise this could be any two comparable periods of interest.

A model can not only dissect the past but can also be used to forecast future performance so long as realistic assumptions are possible for the likely future behaviour of all the factors driving sales. In the chart below the future impact of advertising is examined.



The next step might be to use the model to generate multiple scenarios with differing media weights, price levels, promotions, etc.

Where a company has brands that interact, their models can be 'bolted together' to examine the impacts of their combined activity on the company's overall performance. Here we see advertising for Brand A negatively affecting Brand B. Brand B's gain from its own advertising fails to offset this.

Advertising contribution (units) from £1m advertising per brand

Year	Brand A Total	Brand B loss to A	Brand A net of B's loss	Brand B From own ads	Brand B Net gain
2000	40,870	-10,418	30,452	20,618	10,200
2001	96,306	-26,282	70,024	18,132	-8,150
2002	48,910	-14,006	34,904	5,592	-8,414
2003	17,124	-5,030	12,094	1,628	-3,402
2004	5,408	-1,590	3,818	472	-1,118
Total	208,618	-57,326	151,292	46,342	-10,994

'Shelf life'

Models are based on historic data. This means that they have a 'shelf life' and periodically need updating. This may simply be because the latest advertising campaign needs evaluating. However it may also be the case that models need reworking because new products are introduced, because technical innovations occur, or because marketing genuinely succeeds in changing underlying relationships. In most instances an annual update should suffice but the 'sell-by date' will vary by product and by market, so models need to be monitored regularly to ensure their continued relevance and accuracy.

Glossary

The text contains some technical language, marketing terms and industry shorthand. This glossary defines the terms used but not defined within the text.

Adstock *(marketing)*. A mathematical device used to represent the carryover effects of advertising beyond the time on air (see Simon Broadbent, (1997) Accountable Advertising, Admap Publications, Chapter 8, for a detailed and accessible explanation).

Burst *(media planning term)*. Discrete slice(s) of communication/advertising.

Causal factor *(econometrics)*. A factor that when changed induces a change in the dependent factor/variable (see Explanatory factor).

Confidence interval *(statistics)*. A measure of the accuracy of a quantification. Any confidence interval must always be described in terms of a probability and a range. For example 10 +/-2.5 at the 95% probability level means that we can be 95% sure that the truth lies between 7.5 and 12.5.

Coverage *(media planning term)*. The proportion of the target audience exposed to a communication.

Dependent factor/variable *(econometrics)*. The phenomenon/data that is the object of the econometric model (eg sales, awareness).

Diminishing returns *(economics)*. More correctly diminishing marginal returns to scale. The situation where an additional unit of advertising (in terms of weight or expenditure) contributes less than the previous (marginal) unit.

Drip *(media planning)*. An unbroken run of communication/advertising.

Elasticity *(economics)*. The percentage response in Y given a 1% change in X.

Errors/model errors *(econometrics)*. The difference between the actual data and the model prediction. Also referred to as the residual.

Explanatory or causal factor *(econometrics)*. A factor that when changed induces a change in the dependent factor/variable.

Factor *(econometrics)*. Anything that influences the dependent variable.

Frequency *(media planning)*. The number of times on average an individual in the target audience who is exposed at all to the communication will see it (see frequency distribution).

Frequency distribution. The proportion of the target audience seeing a communication once, twice, three times, etc.

Halo *(marketing)*. The effects of advertising beyond those specific to the product being advertised.

Media flighting *(media planning)*. Media allocation over time.

Media test *(media planning)*. A controlled experiment used to generate data such that the quantitative characteristics of a communication or an advertising weight can be assessed.

Portfolio *(marketing)*. The interrelated products owned by a company.

Recency *(media planning)*. The time since an individual's last exposure to a communication.

Rotation *(marketing/media planning)*. When a campaign comprises a number of executions. The ordering of the different executions within the same overall campaign.

Share of voice *(media planning)*. The proportion of the total market (or sub-set of competitors) advertising accounted for by a specific product/brand. Expressed in weight or spend terms.

Simulation *(econometrics)*. The solving of the econometric model for alternative values of the explanatory factors.

Rating Point *(media planning)*. Used as a measure of advertising exposure A rating point = 100 times the number of impacts (ie the number of times the advertisement is seen by members of the target audience) divided by the number of individuals in the target audience. Normally referred to as Television Rating Points (TVR) for television exposure and Gross Rating Points (GRP) for other media.

Umbrella *(marketing)*. Portfolio or product range advertising.

Recommended further reading

For those who wish to investigate the application of econometrics in the evaluation of communications, we recommend the IPA's Adworks series.

About the authors

Les Binet

Having read Physics at Oxford, Les took an M. Phil. in Artificial Intelligence at Edinburgh University. His research there focussed on the use of computer models to study the way human beings process language. In 1987, he joined the Account Planning Department at BMP DDB, where he turned his modelling skills to the problem of measuring the effects of advertising. He now heads the European office of DDB Matrix, DDB's in-house econometrics consultancy.

Over the years, Les has worked for a wide range of clients, including Unilever, Heinz, Nestlé, Volkswagen, Johnson & Johnson, Kraft Jacob Suchard, Sony, and Anheuser Busch. He has also played an important part in establishing BMP DDB's reputation for effectiveness, having won 15 IPA Advertising Effectiveness awards. Since 2001, he has served on the IPA's Value of Advertising Committee, helping to promote effectiveness and evaluation in the wider marketing community.

Louise Cook

Louise has been a partner in Holmes & Cook since 1996. She graduated from Birmingham University in 1983 with an M.Sc in Operational Research and a B.Soc.Sc in Mathematical Economics. She attended the LSE's first Advanced Econometrics Summer School in 1995.

She worked at Beecham and Ogilvy & Mather, before joining BMP in 1986 to set up and run their econometrics department. In addition to advertising evaluation, work at BMP involved analysis aimed at assisting clients with a wide range of marketing issues.

With Paul Feldwick and Sarah Carter, Louise won the MRS Best Paper Award in 1991. Louise was the econometrics technical judge for the 1998 IPA Advertising Effectiveness Awards. She has spoken about using econometrics for advertising evaluation in a number of forums and is generally commended for her ability to communicate with non-technicians.

Mike Holmes

Following a career in accountancy and credit management, Mike returned to London University where he gained an M.Sc. with a distinction in Econometrics to add to his B.A. in Economics and Mathematics.

After London University he joined the Henley Centre for Forecasting. During five years at HCF he regularly contributed to and edited their publications and was involved in modelling and analysing numerous products and markets. During this period he acted as consultant to the House of Commons Library running the Treasury economic model for MPs.

Mike has taught on courses for a range of institutions including the Henley Centre, the Oxford University Business Summer School, City University, the MRS and the IPA. He has also served as an external examiner to Westminster University.

He first became involved with the advertising industry as economic consultant to the IPA when they were preparing their submission to The Peacock Commission. He then ran FCB Advertising's Marketing Planning Department until 1991 when he started his own consultancy practice. This became Holmes & Cook in 1996.

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