MARKETING COMMUNICATIONS RESEARCH CENTRE

A REVIEW OF FACTORS AFFECTING DIRECT RESPONSE CAMPAIGNS' SUCCESS AND AN ANALYSIS OF A CAMPAIGN

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CONTENTS

	Page
INTRODUCTION	1
WHAT IS DIRECT RESPONSE ADVERTISING AND WHAT ARE THE CHIEF DECISIONS?	2
A SUMMARY OF RELEVANT PUBLISHED STUDIES	4
Recruitment	4
Electrical Analogy of Regular Direct Response Advertising	5
Size of Advertisements	8
Diminishing Returns	9
Copy Change Effects	12
Advertisement Scheduling	13
Some Useful Assumptions	14
Ideas for Further Research	16
AN ANALYSIS OF A DIRECT RESPONSE CAMPAIGN	16
Description of the Campaign	16
The Four Measures of Response	17
Attributing Response to Advertisements	26
Removing Seasonaility	33
Thresholds and Diminishing-Returns Effects	38
Models of Response	42
Comparison of Different Advertisements	46
SUMMARY AND CONCLUSIONS	53
APPENDICES	

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INTRODUCTION

Direct response advertising is a particularly interesting subject to study in the marketing field because, by its very definition, the value of the response to each advertisement is known. This fact makes it much easier to evaluate the results of direct response advertising than to determine the effectiveness of ordinary advertising where no direct value of the response to an advertisement is usually known.

Although there are some differences between direct response advertising and ordinary newspaper and magazine advertising, it is possible to apply knowledge of one type of advertising to the other. Therefore, conclusions reached in this report may be of some use to advertising managers who are planning an ordinary newspaper and magazine advertising campaign.

This report begins with a brief definition of what is meant by direct response advertising and what constitutes the main management decisions for its effective use.

In the next section some published studies of a direct response nature are reviewed to see what general principles or results can be ascertained.

Finally, in order to further examine some of the earlier conclusions, the results of an actual direct response campaign are analysed in detail.

WHAT IS DIRECT RESPONSE ADVERTISING AND WHAT ARE THE CHIEF DECISIONS?

A direct response advertisement is one in which a reader is invited to reply, requesting a specific product or information about the product. It must be possible to identify which advertisement has stimulated the respondent's interest in the advertised product, which can be done in a number of ways. The most usual way of doing this is to ask the reader to write his name and address (to which the information is to be sent) on a coupon which has a key. This key is different for each advertisement and, therefore, it is possible to identify which medium induced each response. From the total response to all advertisements it is possible to measure the effectiveness of each medium for the given advertisement. Although direct response advertising is usually used only in the press it is now possible to use television. In these T.V. advertisements the viewer is invited to 'phone a telephone number for further details.

When an advertising manager decides on a direct response newspaper advertising campaign he has many options open to him and hence a lot of decisions to make. He has to decide whether to put advertisements in every daily paper and weekly magazine or to concentrate on a few. When he has decided on a monetary allocation to a certain medium (e.g. The Times), he still has to decide the size of his advertisements. Should he put his advertisements in consecutive issues of the medium or space them out over several weeks? Is Tuesday's issue of the medium better than Friday's for his advertisements? Is it better to have his advertisement on the left hand page rather than the right?

The advertising manager does not usually have a clear objective way of answering these questions, he can only rely on judgement and experience. The advertising manager must be provided with objective ways of answering some of these questions which will help him in making his decisions.

A seminar organised by the Institute of Practitioners in Advertising (IPA) in October 1973 was devoted to direct response advertising. A special survey was conducted for the seminar among advertising agencies. It was found that many agencies worked on hunches and that few used an effective system for evaluating the response to coupons or the worth of the medium used. It was also concluded that there must be an enormous wastage due to research and testing inadequacies.

It is hoped this report will draw together some of the hard evidence available and discuss some approaches to dealing with some of the problems.

The Purpose of Direct Response Advertising

In many ways direct response advertising is similar to ordinary newspaper advertising and work done on one type of advertising can be applied to the other type. There are differences, however, in the way the two types of advertising are used. Whilst ordinary advertising is usually used to try to persuade people to buy a certain brand of a product which they buy frequently, direct response advertising is used to advertise products which are only bought infrequently (e.g. Central Heating, Holidays, etc.).

Another difference, related to the first, is that when an advertising manager is planning a direct response advertising campaign he often tries to maximise the 'coverage' of the campaign (i.e. the proportion of the target population seeing at least one advertisement). However, if he is planning an ordinary advertising campaign he often tries to maximise the 'impact' of the campaign (i.e. the average number of advertisements seen by each member of the target population).

Quality of Response

The effectiveness of a direct response advertisement can be assessed at two levels, depending on the overall purpose of the advertising campaign. In some circumstances all that is required is to achieve as large a number of returned coupons as possible (e.g. where the coupon is actually an order for the goods advertised). In other circumstances the 'quality' of the replies is important and the object of the campaign is to achieve an as large as possible number of replies which are eventually turned into a sale of the goods or services advertised.

The objectives of most coupon response campaigns, it is felt, is the former type and the aim is to achieve as great a response as possible, on the assumption that the greater the initial response the greater the eventual sales. It is felt that the content of the advertisement will influence the 'quality' of the response, and this is just one of the variables about which the advertiser must make decisions. Although acknowledging the considerations of 'quality' of response, in this report only those factors which influence total response are considered.

A SUMMARY OF PUBLISHED STUDIES

Introduction

In this section the findings of various papers are summarised. Very few specific examples were found and not all were complete on important information concerning the direct response campaigns. Emphasis has been given, where possible, to the method of analysis as much as to the results themselves.

Recruitment

After an extensive search through abstracts of relevant academic publications only one paper was found which gave a detailed analysis of an actual direct response advertising campaign. This paper, by Maitland and Pennycuick (1964) 1, analysed a Metropolitan Police recruitment advertising campaign in which direct response advertisements had been placed in most national newspapers, many local newspapers and periodicals.

The authors split the country into districts and postulated that the number of applicants from district 'i' in response to an advertisement in medium 'k' was A_{ik}.

where $A_{ik} = C_{ik}.D_i.N_k$

and C_{ik} = the circulation of medium 'k' in district 'i'

D_i = a district factor for district 'i'

N_k = an impact factor for medium 'k'

As A_{ik} and C_{ik} were known, it was possible to use an iterative method to obtain values for D_i and N_k.

Using the values computed for D_i and N_k, and the circulation figures C_{ik}, the authors then calculated the expected values of the response A_{ik}. There was good agreement between the expected response and the actual response which, although suggesting that the form of the model is correct, does not confirm the values of D_i and N_k. In order to have given their model a better test of validity, the authors could have examined their

model against data from another police recruitment advertising campaign, but this does not seem to have been undertaken, perhaps because such data was unavailable at the time.

This paper did not consider the size of the advertisements, perhaps because the advertisements in any given medium were probably the same size. The day of insertions in the newspapers was also not examined. The authors also point out that the point of diminishing returns was only reached in one medium and this problem was not treated. Although this paper is interesting,methodologically it seems to shed little light on the problem of direct response advertising in general.

Austin Knight Survey

In August 1973 Austin Knight, a large recruitment agency, published the results of an annual survey of the recruitment advertising success of 65 local authorities in the U.K. Some of their findings included such observations that

- display advertisements had double the replies of those in semi-display
- display advertisements had 60% more replies than those in simple lineage form
- the first insertion of an advertisement gained double that of the second insertion
- advertisements quoting salaries had 20 times the response of those not citing such information
- offers of houses appeared to have little effect.

These results are those from a straightforward count of replies to advertisements. No account has been taken of such factors as the nature of the jobs advertised: for example, the better paid jobs may usually be advertised in display form - hence the higher response.

The results of this survey do give indications of some of the factors that must be considered, and tested systematically if necessary, when planning recruitment advertising.

Electrical Analogy of Regular Direct Response Advertising

The first part of the paper 'Operational Research and Advertising Theories of Response', by Benjamin, Jolly and Maitland (1960) 2, examines physiological

analogies of the relationship between total advertising expenditure and sales of the product being advertised. The relevant section of the paper is the second part which puts forward electrical analogies of direct response advertising.

The first assumption is that the cumulative response to a single direct response advertisement (r), rises exponentially from zero to its final value, r_o.

i.e. $r = r_o (1 - \exp(-k_1 t))$

Where k_1 is a constant which depends on the factors specific to an advertisement.

The curve obtained by plotting the expected response against time is shown below (Figure 1).

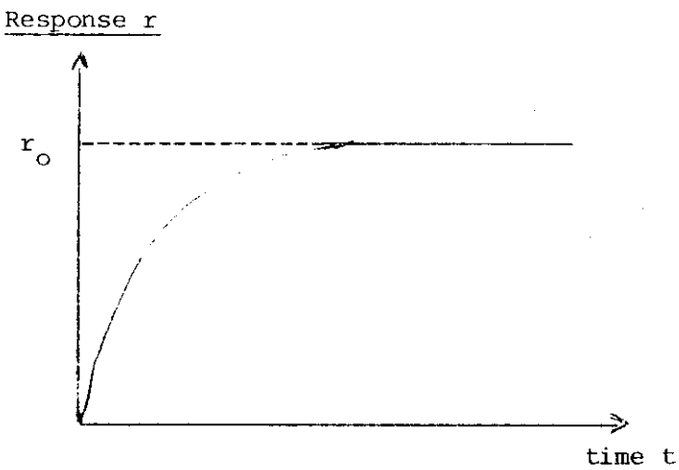


Figure 1 Expected growth in response (Benjamin, Jolly and Maitland)

The second assumption is concerned with the law of diminishing returns for an advertising campaign in which the same direct response advertisement is inserted regularly in the same medium. The assumption is that total response for each advertisement (r_o) will fall exponentially with time to a steady positive value.

i.e. $r_o = R_o + R_1 \exp(-k_2 t)$

Where $(R_o + R_1)$ is the total response to the first advertisement and R_o is the total response to an advertisement which appears late in the advertising campaign. This is shown graphically below (Figure 2).

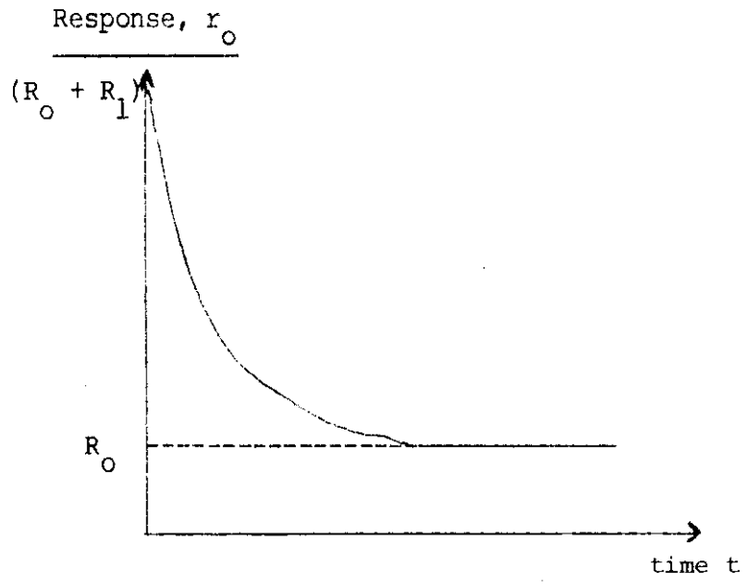


Figure 2 Expected delay in response (Benjamin et al.)

The third assumption, which the author arrived at after looking at data from past advertising campaigns, again concerns direct response advertisements which were inserted regularly in the same medium. In two of these advertising campaigns it was found that if one advertisement was left out, then the response in the period was diminished, but this decrease in response was regained in the next period which had a greater than expected response. In effect, some response was "carried over" from one period to the next.

It was also noticed that, in all the advertising campaigns which were examined, the same effect was evident over Christmas, i.e. Christmas was equivalent to missing out one advertisement from the campaign. Although this occurred in all the advertising campaigns which were examined by the authors, one would not expect it to occur for all products similarly advertised, especially for those products which are sold more in the Christmas period.

The authors found that these three assumptions could be used quite successfully to predict the response to regular direct response advertising campaigns. Unfortunately no account can be taken of any variation in the advertisements (e.g. size of advertisement and position of advertisement), but this paper gives some useful initial assumptions which might be able to be enlarged to take into account more complex advertising campaigns.

Size of Advertisements

There are two ways of comparing the size of advertisements appearing in different media. One way is in terms of the absolute area of each advertisement, the other is in terms of their size relative to the page in which they appear. For example, if the absolute area of advertisement is thought most important, then a one page advertisement in the Readers Digest could be considered equivalent to an eighth of a page advertisement in a broadsheet newspaper, because each advertisement occupies the same area. If, however, the most important thing is the size of the advertisement relative to the page on which it appears, then a one page advertisement in the Readers Digest is equivalent to a one page advertisement in a broadsheet newspaper. Two advertisements in different media could be considered 'equivalent' if each advertisement is seen by the same proportion of the total readership of the respective medium.

Work has been done by Gregory, for example "A page is a PAGE", (1970) 3, which indicates that the effectiveness of display advertising is more closely related to the proportion of the page occupied than it is to the absolute area of the advertisement.

Gregory's observations on the relative size of advertisements is based primarily upon reading and noting data (Gallop) rather than actual coupon response. In his first study he examined data over a period 1964 - 67 for 13 issues and 35 issues respectively of the Sunday Mirror and The People and data for 1968 for 5 issues each of The Daily Mirror and The Daily Express. He found that for equal space sizes the tabloids gave a 70% better value for advertising than the broadsheets (in terms of reading and noting per £). A second study examined 492 and 498 advertisements respectively in the Mirror and the Express: advertisements of equivalent space size were compared in terms of achieved reading and noting and it was found that, on average, those in the Mirror were 80% better value. In a third study, Gregory looked at advertisements for the same twelve products in the tabloid Daily Mail and the broadsheet Daily Express. Advertisements for the same product were examined in tabloid and broadsheet for their performance. Overall, the advertisements in the Mail occupied 71% of the physical space used in the Express but gained 35% more in reading and noting terms. On an equivalent area basis they would have gained 94% more, it was estimated.

Although the "page-relative" concept for comparing advertisement sizes is probably applicable to most advertisements, there may be some circumstances where this is not so. When a reader is looking through advertisements to locate something he specifically wants to find, (e.g. used cars, flats to rent), the effectiveness of an advertisement is probably more closely related to the absolute area of the advertisement.

Another study of this nature by Heads (1968) 4, investigates the claim that people with a low propensity to recall press advertisements are liable to miss a series of small advertisements and, therefore, can only recall large advertisements.

Again, response is measured in terms of proved recall. The results presented below are for male and female respondents combined, and relate to a wide range of product fields for studies conducted throughout 1965 for over 380 advertisements.

	Proved Recall (%)		
	Daily Mirror	Daily Express	
Full Page	19	28	Full Page
Full length x 5 columns	15	18	1/2
3/4 x 4 "	13	13	13 ins. x 5 columns
3/4 x 2 "	10	10	11 x 5 "
1/2 x 2 "	9	9	8 x 2 "

The economics of gaining recall depend on the relative costs of different sizes of space. An examination of the Express data by Heads suggests that smaller spaces (eg.8 x 2 and 11 x 3) are just as economic as half pages and full pages in reaching respondents only able to recall one advertisement. These spaces are considerably more economic in reaching people able to recall more than one advertisement in an issue.

Diminishing Returns

An experiment was carried out by DeFleur (1950) 5, in eight similar towns in the U.S.A. Leaflets were dropped from the air and the number of leaflets per inhabitant was different for each of the eight towns, namely 1/4, 1/1, 2/1, 4/1, 8/1, 16/1, 32/1. The leaflets asked the reader to send part of the leaflet to a central control. (Free postage was provided.)

Two measures of the response to this stimulus were obtained. The first was the number of people who had mailed a leaflet to the control centre, the second was the number of people who knew the message when interviewed.

The author tested the hypothesis that the response (P_i) to a stimulus (r_i) was given by the equation $P_i = a \ln r_i + b$, where a and b are constants.* Figure 3 illustrates the form of the responses. This model was found to be adequate for the 'message knowers', but when the data on the number of leaflets mailed was plotted on a graph, one of the points was significantly different to what was expected. This discrepancy could be explained by the fact that in this one town there was a particularly strong civil defence group who took it upon themselves to see that the experiment was a success. As this point could be explained by external factors, the author concluded that the model could be used to describe the relationship between stimulus intensity and response.

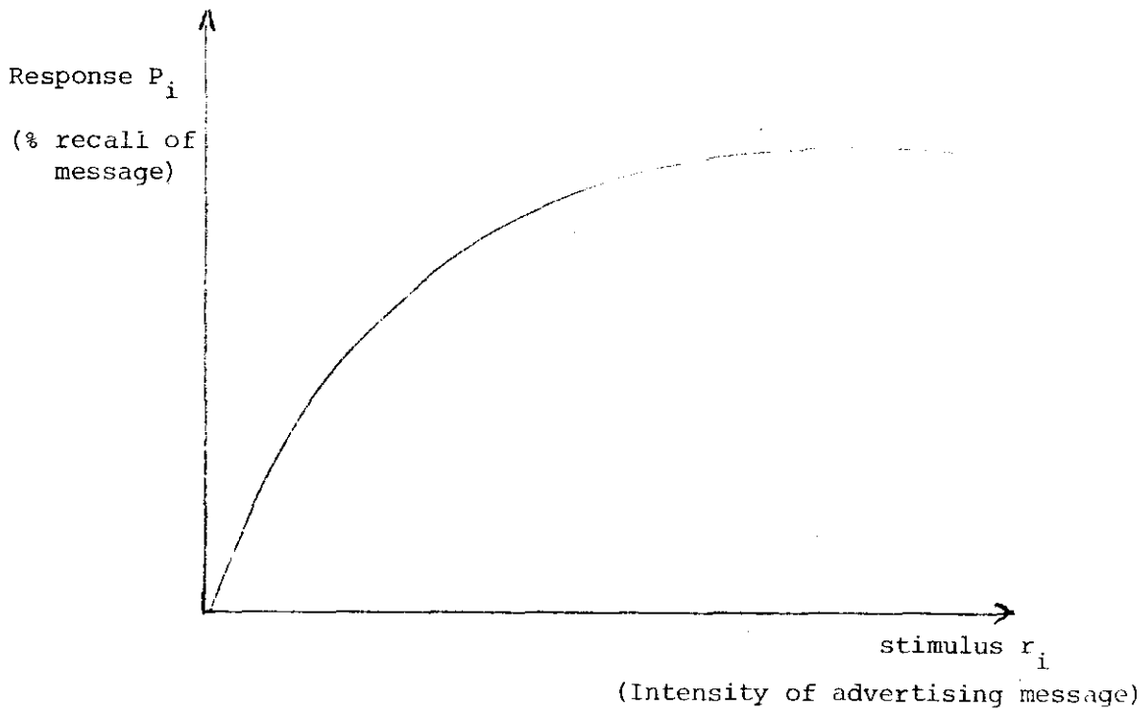


Figure 3 Relationship between stimulus and response in DeFleur's experiment

Other models have been fitted to this data (refs. 6 and 7), the most successful being an S-curve, $P_i = a/(1 + b2^{-cr_i})$, where a, b and c are constants. The S-curve has been shown to give better agreement with the data than the above log model. Figure 4 illustrates the form of the S-curve relationship.

*ln means natural log.

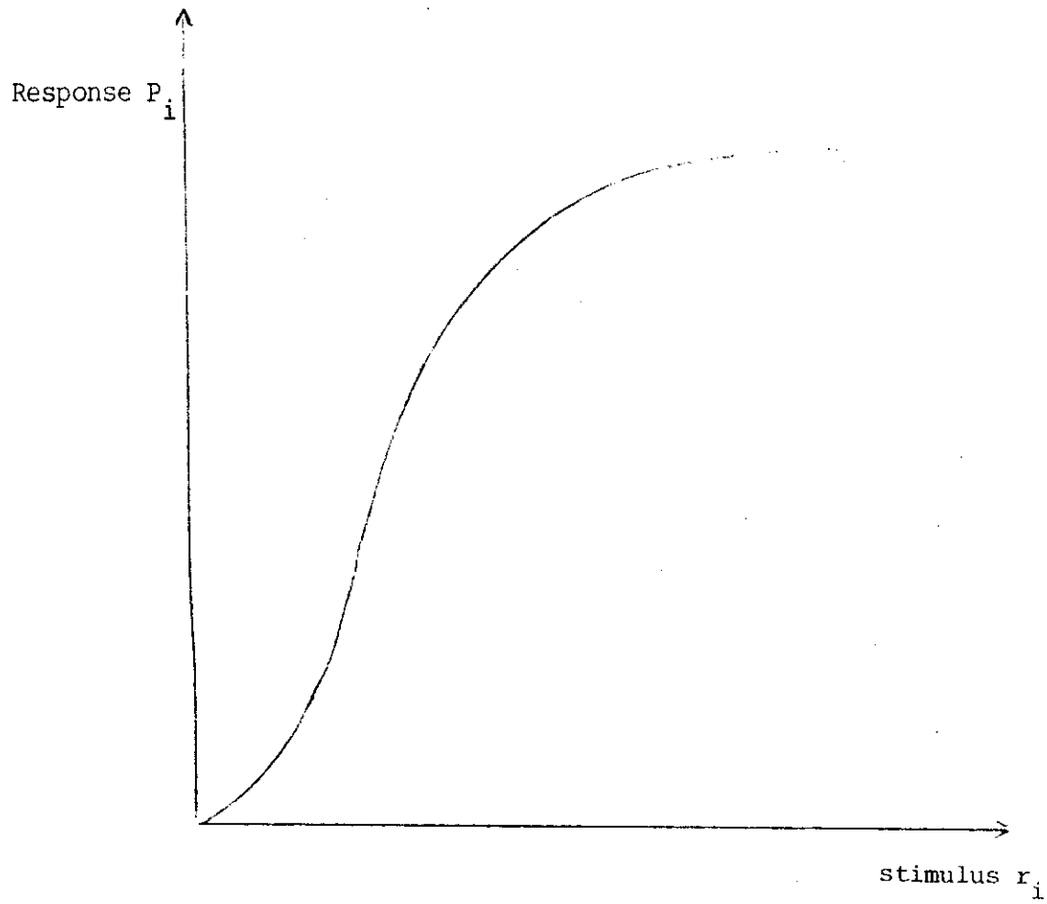


Figure 4 The improved form of the relationship between stimulus and response for DeFleur's Experiment (Weinberg)

Both the S-curve and the log model exhibit the expected diminishing return for increasing stimulus. The difference between the two curves is most evident at small values of the stimulus. For the S-curve there is a threshold value for stimulus, below which very little response is obtained while this does not occur for the log model.
Although the data which has been used to investigate these models relates to airborne leaflet communication, the results could be applicable to other forms of media communication. The results might be used to help predict the response to different levels of stimulus in newspaper advertising.

A large publicity campaign is described by Arnot and Rodnight (1974) 8, which used TV, press and leaflets. The campaign was to inform citizens of their rights to legal aid and to encourage needy cases to apply for aid. The press and leaflet advertisements carried coupons and this was used to measure response. The results are outlined below in terms of enquiries per week:

Week:	1	2	3	4	5	6	7
Total response:	1084	1316	938	1025	527	346	280
% press coupons:	81	73	67	70	42	22	25

During the first three weeks, first insertions were appearing in the press media while from the fourth onwards all media were receiving the second insertions. The time of response was recorded only when the coupon was processed rather than when it was received back through the post, and so there is some delay represented in the figures.

It was found that the overall difference in response between first and second insertions varied little between daily and sunday papers:

	Sunday Papers	Daily Papers
Total Response	1947	1619
	%	%
1st insertion	63	60
2nd "	37	40

Copy changes

Mustard (1965) 9, has reported the results of an experiment to test the effects of copy changes for a direct response advertising campaign. The product was a non-seasonal (agricultural) one and the period of the experiment twelve months. Four journals were used: in three the advertising copy was changed every alternate two and three months, while in the fourth the copy was not changed at all. The results in indexed form are presented below:

	Response to Advertisements (indexed)	
	Journals with changed copy	'Control' Journal no copy change
Period 1	100	100
" 2	94.2	95.5
" 3	83	56.9
" 4	67.5	37.8
" 5	38.3	16.7

The total response over the year was 1609 items.

The results indicate that varying copy can maintain interest and response at a much higher level. This, of course, assumes that the journal used as the 'control' is not intrinsically different in affecting response than the other three. This could be established before the experiment. Another

possible conclusion is that for this market changing copy after two months is unnecessarily too quick, as the response to the unchanged advertisement in the 'control' magazine is no lower in the second period than that of the new advertisement in the other magazines.

A similar exercise was recounted by Cooklin (1970) 10; for the test three different advertisements were alternated in six issues of a periodical. The same copy was used in all six issues of another periodical. Cooklin did not give details of the product or of the nature of the media. For interest, his results, in index form, are presented below:

	Response to Advertisements (indexed)	
Issue of periodical	Advertising Copy changed	Same Advertisement repeated
1	100	100
2	138	110
3	145	65
4	110	80
5	130	45
6	135	50

Advertising Scheduling

An experiment was carried out by Zielske (1959) 11, which investigated the effects of different advertising schedules. The advertisements were carried in media delivered direct to a large sample of women readers. The experiment was considered in detail in MCRC Report No.2ii. The author considered three different advertising schedules:

(1) Thirteen advertisements spread evenly over one year (one every four weeks).

(2) Thirteen advertisements appearing every week for the first quarter of the year.

(3) One advertisement at the beginning of the year.

The rate of forgetting for the different schedules was determined by Zielske's experiment through a careful programme of interviews by telephone. Although the experiment was not strictly for direct response advertisements, in that respondents did not have to mail a reply, it is

felt the results could be applied to planning direct response advertising. Each advertising schedule was found to be useful, and the decision about which one was the best depended on the objectives of the advertising campaign.

Because the cost of the third schedule is one thirteenth that of the other two, the 'cost efficiency' of the advertisements has to be considered. The cost efficiency of an advertisement is the number of recallers achieved per dollar spent. If the objective of the advertising campaign was to maximise the weekly average number of recallers per dollar, then the optimum schedule is the first, i.e. all advertisements spread evenly over the year. If the objective of the advertising campaign was to maximise the number of people who recalled the message at any one point in the year, then the most 'cost effective' way of doing this is to use the third schedule. If, however, 'cost efficiency' is unimportant then the second schedule is the best one.

Although this experiment is limited and more experiments ought to be performed to further investigate the problem of advertising schedules, it enables some conclusions to be drawn. It was found that if the objective of the advertising campaign is to maximise the number of people who recalled the message at any one point in the year then, as the number of advertisements used increases, the 'cost efficiency' decreases. If, however, the objective is to obtain a maximum average weekly number of consumers remembering the advertised message, then the 'cost efficiency' of the advertising increases as additional exposures to the advertising are purchased (at least up to thirteen exposures).

Some Useful Assumptions

A paper has been written by C. J. Taylor (1970) 12, which developes a method of optimally allocating advertising expenditure between various media. Although the method is of no direct use to the study of direct response campaigns, it is based on several assumptions, some of which are stated below and which may help in considering methods of handling some relevant problems.

The author assumes that each member of the target population is either

a reader or a non-reader of a given medium (i.e. he looks at every issue or never looks at any issues) and that the probability of 'seeing' a particular insertion in a particular medium is effectively the same for every reader of that medium.

A further assumption is that, given any selection of media which excludes some other medium 'i', then the proportion of the readers (who are members of the target population) of all this selection of media who also read medium 'i' is equal to the proportion of the target population who read medium 'i'. The author found that this assumption was most realistic for daily and Sunday newspapers and for other media with a broadly based appeal.

It is also assumed that the first advertisement seen by an individual makes a positive contribution, A, to his expected response, and each subsequent insertion seen by him makes a contribution equal to q times that of the previous insertion ($0 \leq q \leq 1$).

In order to further simplify the model some more assumptions are made about the advertisements. All the advertisements in any medium have to be the same size and, although it is not mentioned, the advertisements are also assumed to be on the same page (unless all pages are equivalent). Each issue of any medium is assumed to be equally effective in producing response which, although probably adequate for weekly publications, does not necessarily hold for daily newspapers.

The first step in determining an optimal advertising schedule using these assumptions is to calculate the optimum size (and position of) the advertisements in each medium. This was done using the model of advertising response combined with results obtained from an experiment concerning the 'visibility' of airline advertisements (the author was interested in airline advertising).

The number of advertisements to be placed in each medium is determined by considering the marginal costs of advertisements in each medium. The author demonstrates how a nomogram can be constructed to determine an optimal multiple advertisement schedule.

These assumptions give some idea of what may be happening on the level of the individual, and the methods used in the analysis can be employed when planning an advertising campaign if the effectiveness of different sized advertisements are known.

Ideas for Further Research

The MCRC has examined the results of some sponsors own research into the effectiveness of their direct response campaigns. One of the criticisms of direct response campaign's evaluation has been that the 'quality' of the response is not necessarily known if the public are invited to write in for further information. A numerically 'good' response may contain brochure collectors, it is argued, and the ultimate sales' level may not be correlated with the level of initial enquiries. Some companies now conduct regular postal questionnaire surveys among those who return coupons from advertising campaigns. These surveys allow the 'quality' of response to be monitored by ascertaining how many enquirers actually ultimately purchase the product or service advertised. These surveys allow the value of different media to be gauged in terms of potential sales, and allow the next campaign to be planned on more useful bases.

AN ANALYSIS OF A DIRECT RESPONSE CAMPAIGN

Description of the Advertising Campaign

A service company with showrooms throughout the Greater London area placed advertisements in the two London evening newspapers, the Evening Standard and the Evening News. These advertisements invited the reader to telephone a 'central office' to hear details about the service being advertised. Different telephone numbers were used in the Evening News and Evening Standard so that response from one newspaper could be differentiated from response from the other.

As well as the central office telephone number, the advertisements also contained a list of the company's showrooms together with their addresses and telephone numbers. An individual seeing an advertisement could, therefore, respond in three ways: he could either telephone the central office , or telephone or visit the most convenient showroom.

The data available consists of four measures of daily response:

(1) The number of telephone calls to the Evening Standard central office number.

(2) The number of telephone calls to the Evening News central office number.

(3) The total number of people who telephone the showrooms.

(4) The total number of people who visited the showrooms.

There is no way of telling if the people who visited and telephoned the showrooms directly were motivated to do so by one of the advertisements in the newspapers; some of these people may have seen an advertisement whereas other people may have had other reasons for enquiring. The people who telephoned the central office however, must have been motivated to do so by one, or more, newspaper advertisements because the central office telephone numbers were only published in these advertisements.

Unfortunately, as there is only a daily record of the total number of telephone calls to each central office telephone number, there is no direct value of the response to each advertisement available. Some difficulties arise when it is attempted to allocate the response to specific advertisements because the response from one advertisement can overlap the response to the next, but this problem will be considered later.

Relationship Between the Four Measures of Response

The aim of this analysis is to be able to predict the response to advertisements placed in the Evening Standard and/or the Evening News. As the people who contact the showrooms directly do not indicate their motivation for doing so, it would be difficult to use this data to determine an advertisement's effectiveness. The central office telephone numbers appear only in the newspaper advertisements; therefore only the data concerning the number of people who have telephoned each central office will be used to derive a model of advertising response.

When determining the optimal advertising campaign, it is necessary to know the total expected response to the advertisements. Therefore, as well as knowing the expected response to the central office, it is also necessary to know the response direct to the showrooms. One ought to be able to

predict this response direct to the showrooms by using the expected response to the central office and other external factors such as the number of showrooms open to the public.

It is necessary to know the relationship between the response direct to the showrooms and the response to the central office. Although there is not a causal relationship between the two factors, they can both be assumed to be related through advertising.

An hypothesis that would establish a relationship between response direct to the showrooms, the number of showrooms, and the response to the central office, is expounded below. When an advertisement appears in a newspaper, a certain number of people see it and decide to obtain further details. Of these people, a certain constant proportion do not have access to a telephone. Those people who can telephone do so to the central office, those who cannot telephone decide to visit one of the company's showrooms. If there is not a showroom nearby the potential customers go elsewhere and are lost. Therefore, if the only people who visit the showrooms are people who have seen the company's advertisements, there is a linear relationship (passing through the origin) between the number of people who telephone the central office and the number of people visiting the showrooms divided by the number of showrooms. This also assumed that the population is evenly distributed and that there is no overlapping of showroom areas of business.

As well as the people who visit the showrooms because of an advertisement they have seen, there are those who visit the showrooms for other reasons. If it is assumed that the number of people who visit the showrooms is proportional to the number of showrooms open to the public, then the relationship is still linear, but does not pass through the origin.

If this relationship does not vary, then the parameters of the straight line can be evaluated on the first year's data, verified by the second year's data, and then used to determine the total response from the expected response to the central office.

As well as direct visitors to the showrooms, there is also data on the number of telephone calls direct to the showrooms. These are similar to people who have not got access to a telephone, and so the method of

handling this problem is the same.

In order to see if the expected linear relationships occur, three graphs are plotted using the first year's data. The data plotted is:

Fig. 5: $\frac{\text{(Total weekly visitors to the showrooms)}}{\text{(number of showrooms)}}$

Fig. 6: $\frac{\text{(Total weekly telephone calls to the showrooms)}}{\text{(number of showrooms)}}$

Fig. 7: $\frac{\text{(Total weekly contacts direct to the showrooms)}^*}{\text{(number of showrooms)}}$

In each case the total weekly number of telephone calls to the central office is plotted on the horizontal axis.

As a straight line was the expected form of the three graphs and most of the points seem to lie on a straight line, the exceptional points were investigated to see if there was any external reason for these points to lie outside the general trend. Most of these points can be explained by the fact that they occurred when there were only a very few showrooms. Other exceptional points came from data around Christmas and other events which could be expected to distort the patterns of response. The points which have been excluded from the analysis for the above reasons are shown on the graphs by the symbol $\otimes$.

In order to fit the best straight line through the points, a Linear Regression programme was used. The results are shown below.**

In each case X = Total weekly response to the central office.

(1) Fig. 5 $Y_1 = \frac{\text{(Total weekly visitors direct to the showrooms)}}{\text{(number of showrooms)}}$

Best equation is $Y_1 = 0.20X + 12.1$

Correlation coefficient is $r = 0.968$

Amount of variation explained is $r^2 = 0.937$

(2) Fig. 6 $Y_2 = \frac{\text{(Total weekly telephone calls direct to the showrooms)}}{\text{(number of showrooms)}}$

Best equation is $Y_2 = 0.025X + 1.17$

Correlation coefficient is $r = 0.967$

Amount of variation explained $r^2 = 0.935$

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* Sum of the previous two factors.

** For a more detailed analysis see Appendix I.

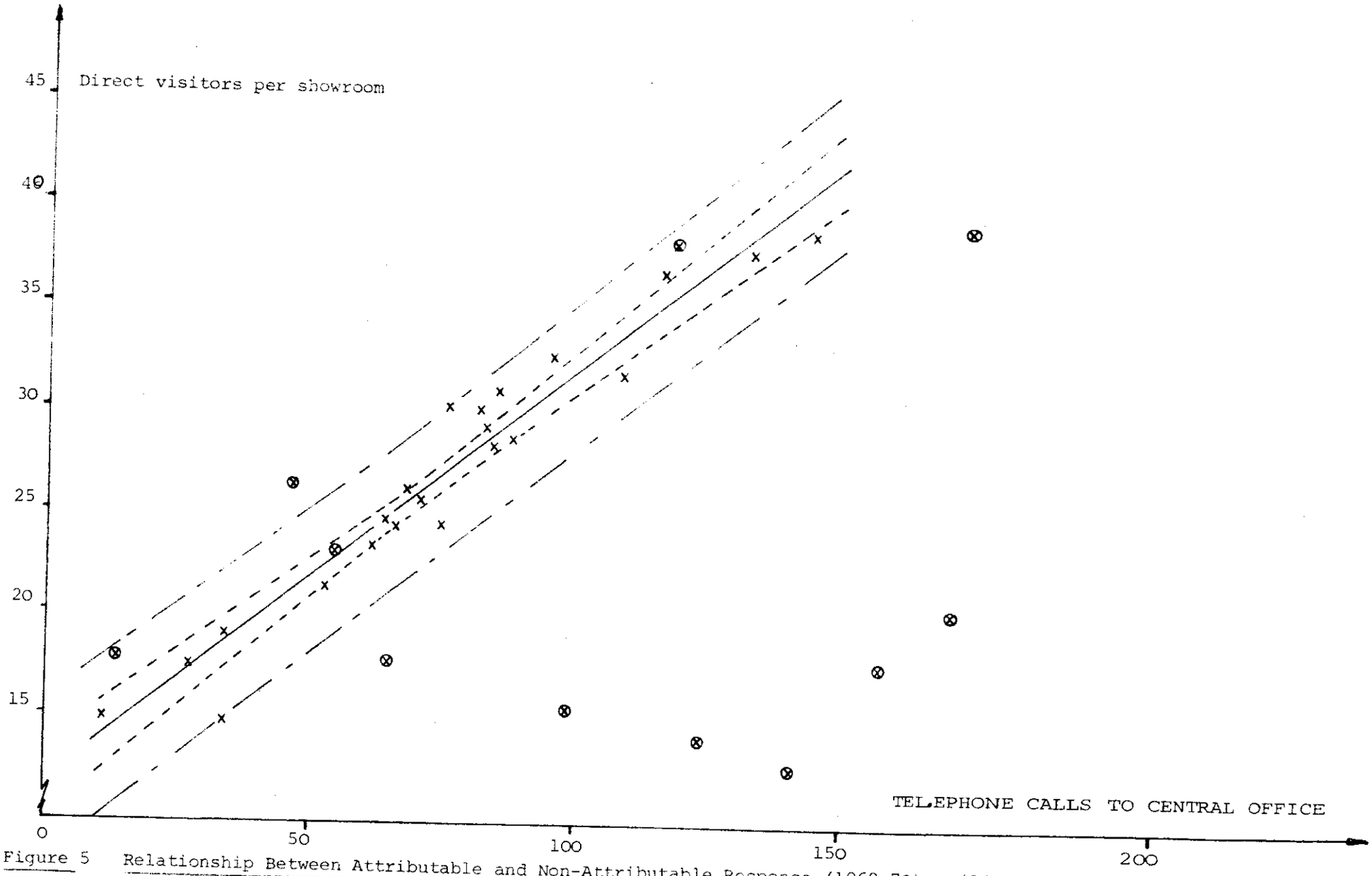


Figure 5 Relationship Between Attributable and Non-Attributable Response (1969-70) (1)

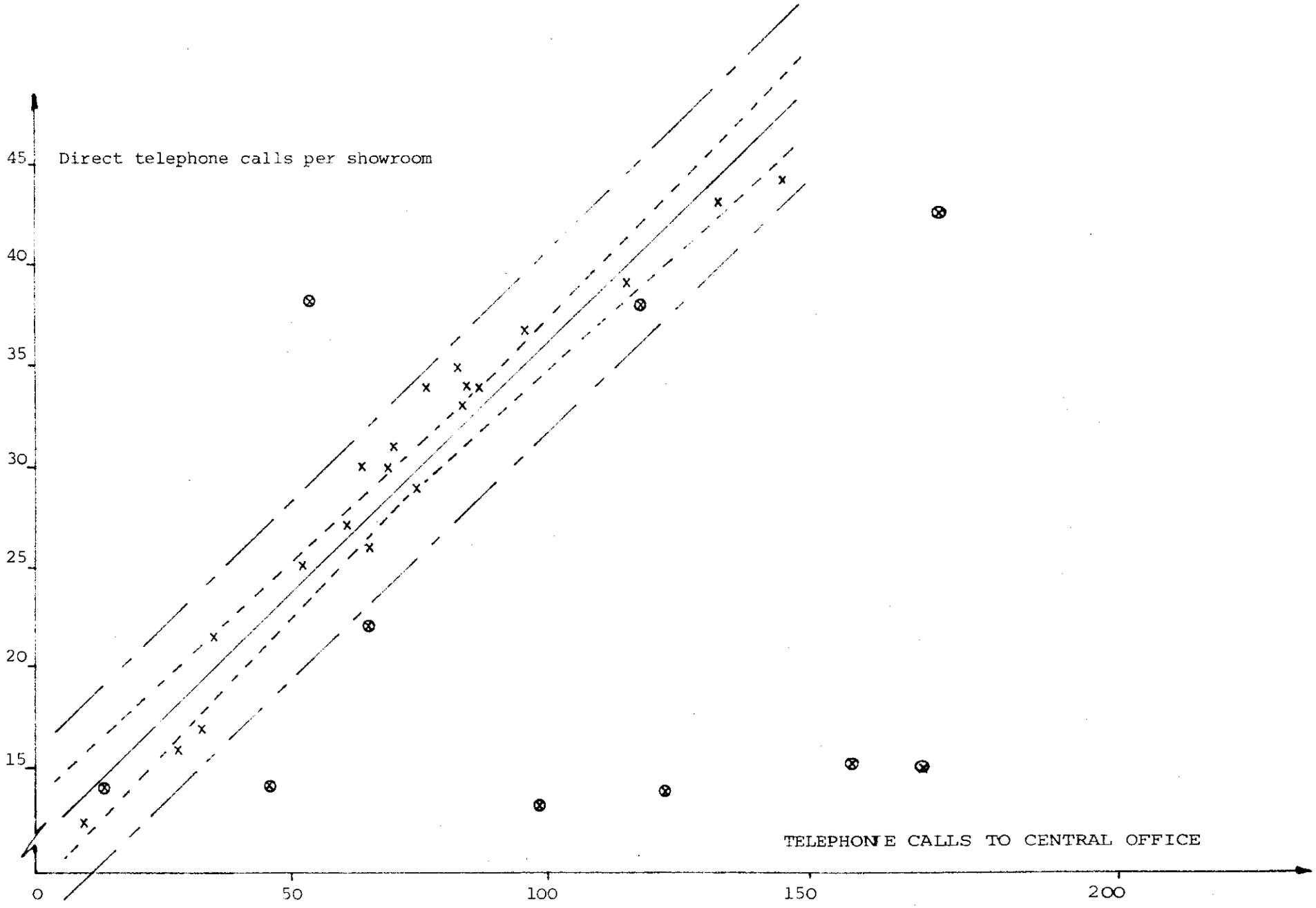


Figure 6 Relationship Between Attributable and Non-Attributable Response (1969–70) (2)

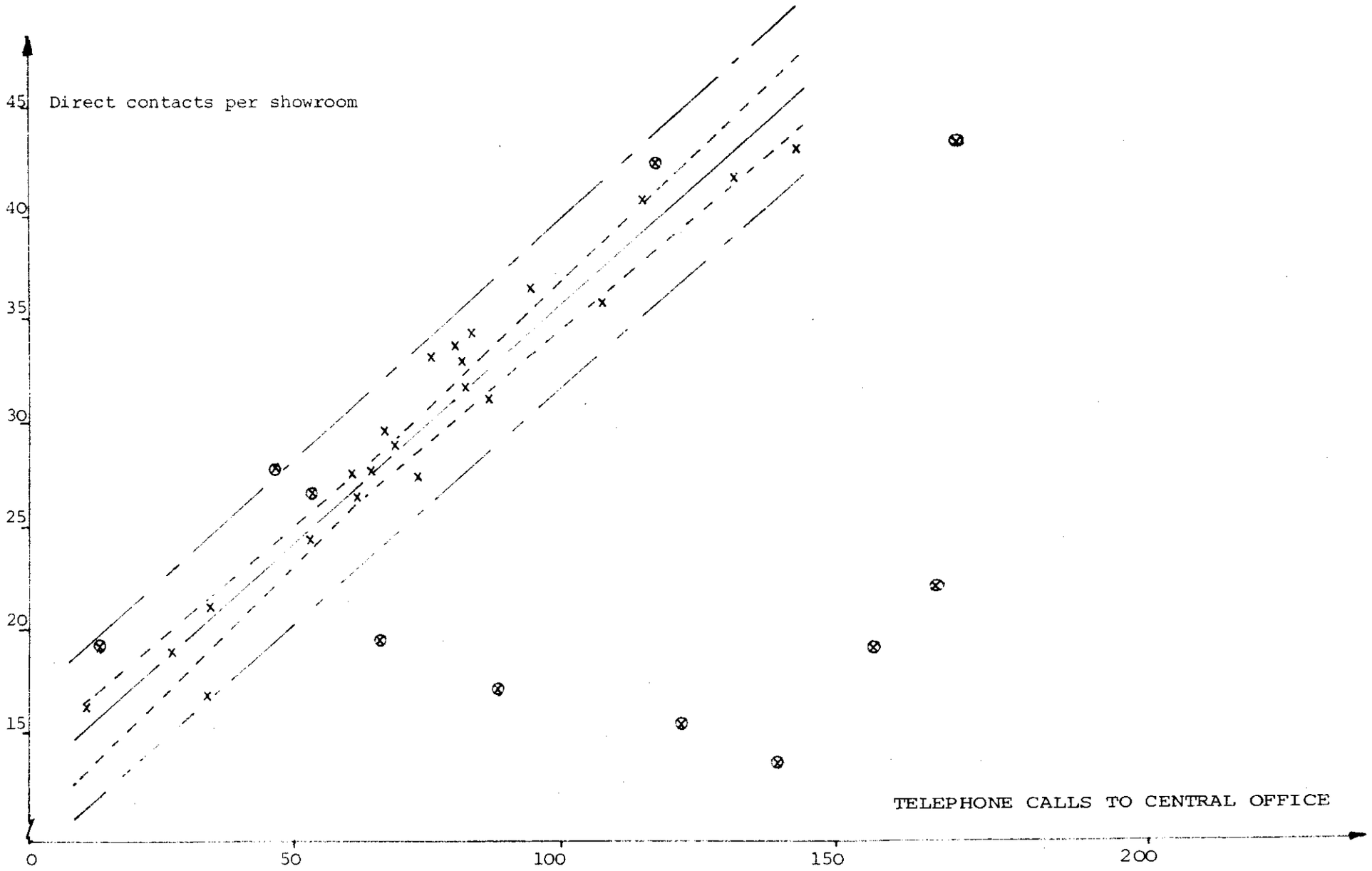


Figure 7 Relationship Between Attributable and Non-Attributable Response (1969-70) (3)

(3) Fig. 7 $Y_3 = \frac{\text{(Total weekly contacts direct to the showrooms)}}{\text{(number of showrooms}}$

Best equation is	$Y_3 = 0.22X + 13.7$
Correlation coefficient is	$r = 0.970$
Amount of variation explained	$r^2 = 0.941$

In each case the regression line is drawn on the graph (continuous line). The inner pair of lines (small dashes) are the 95% confidence limits on the regression line, i.e. there is a probability of 0.95 that the regression line lies within these limits. The outer pair of lines (chain dashed) are the 95% confidence limits on individual points, i.e. there is a probability of 95% that an individual point (from the same distribution) will lie within these limits.

Although the above relationships appear very satisfactory for the first year's data, it is necessary to check them using the data on the second year of the advertising campaign. Two graphs are drawn:

(1) Fig. 8 $\frac{\text{(Total weekly visitors direct to the showrooms)}}{\text{(number of showrooms)}}$

(2) Fig. 9 $\frac{\text{(Total weekly telephone calls direct to the showrooms)}}{\text{(number of showrooms)}}$

In both cases the total weekly response to the central offices is plotted on the horizontal axis.

As well as the data points and regression line there is drawn on both graphs, with a dashed line, the regression line, estimated above, using the first year's data.

It is evident that, although each year's data is self consistent, there is a significant difference between the regression lines calculated from the data. Both the slope of the line and its intercept with the vertical axis has changed. Because this is not a gradual change over the year, but takes place over the summer when there is no advertising activity, the probable cause is some change in the data recording procedure from the first year to the second. One possible reason is that two different people might have recorded the data, one of them including some factor that the other left out.

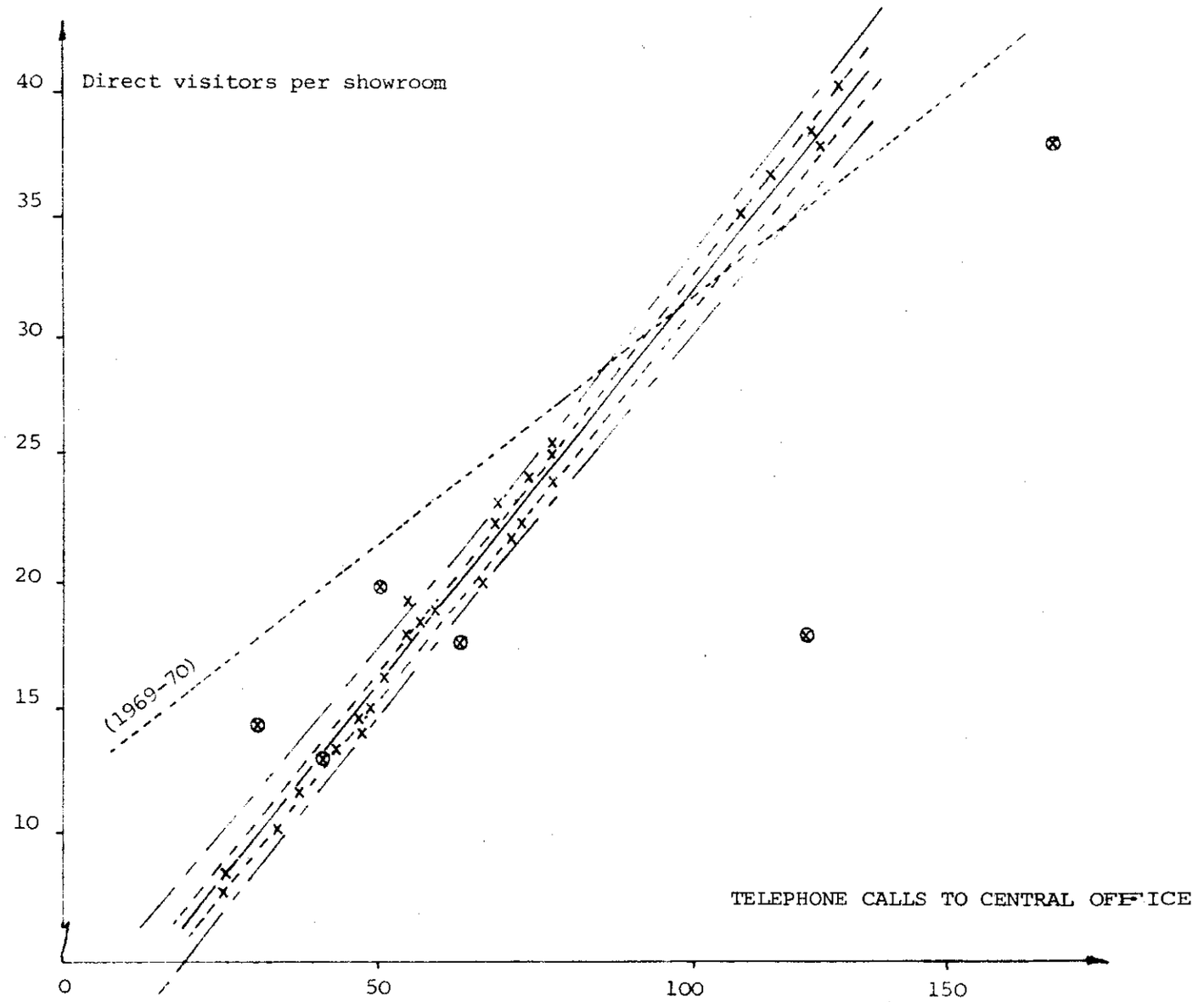


Figure 8 Relationship Between Attributable and Non-Attributable Response (1970-71) (1)

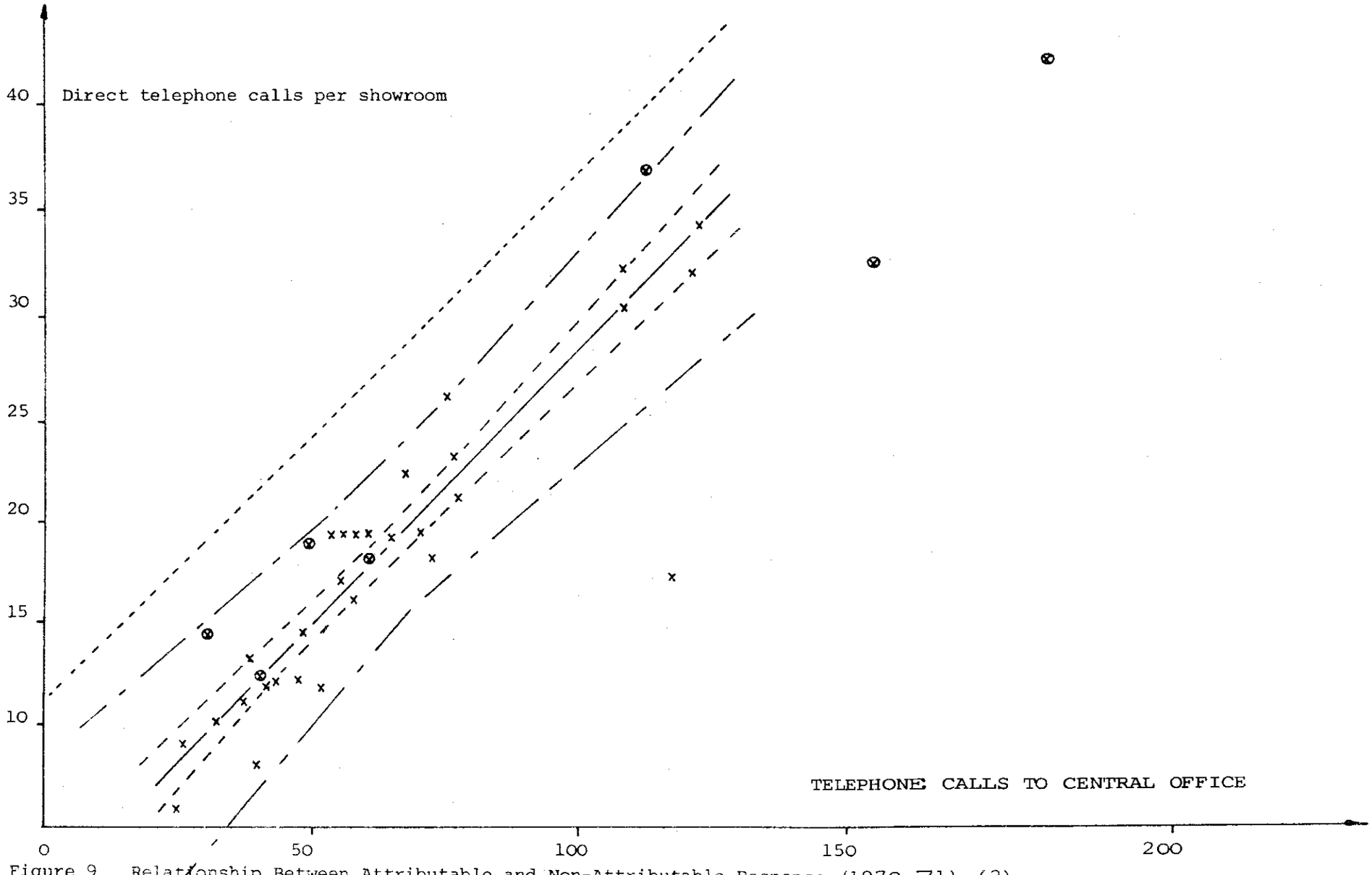


Figure 9 Relationship Between Attributable and Non-Attributable Response (1970-71) (2)

The company have been told about the discrepancy, but could not provide any answers to this problem. Unfortunately, this specific advertising campaign was only used for two years, and so no more data can be used to shed any light on the problem. If both sets of figures represent what they purport to, then each regression line must be used for the year it was calculated for, and no regression line can be used for hypothetical advertising campaigns in the third, or any other, year. On the above evidence, when planning a similar advertising campaign, it is necessary to have a few recent data points before the above factors can be accounted for.

Attributing Response to Specific Advertisements

In order to fully analyse the advertising campaign it is necessary to know the response to each advertisement. Unfortunately, the data available consists only of daily totals of the number of telephone calls from each newspaper advertisement. Therefore, although it is possible to tell which newspaper has produced a given response, it is not always immediately clear which issue of that newspaper has produced it, because response from one advertisement might overlap the response of the next, e.g. if advertisements appeared in two consecutive issues of the same newspaper, it would be difficult to split the second day's response into its two component parts, i.e. those respondents who saw the first day's advertisement and those who saw the second. The two central office telephone numbers were never varied.

The advertising agency could have made the analysis easier by using varying telephone numbers for the central offices. Even if each newspaper had two central office telephone numbers which alternated with each advertisement (four telephone numbers in all), it would have been much easier and more accurate when attributing the daily response to specific advertisements.

The advertisements in the two newspapers were different both in their patterns of insertion and patterns of response, and so they are treated separately below.

Evening Standard 'Carryover' of Response.

The first thing that was examined was whether there was any continuation of the response to an advertisement over the weekend. This is very

important because over 40% of the advertisements placed in the Evening Standard appeared on a Monday, and the analysis would be simplified if it could be assumed that there was no continuation of response over the weekend.

There are periods when advertisements have not been inserted for over one week, and as the response has decayed by then, the base level is reached where the only response is from people picking up old copies of the newspaper and seeing the advertisement. This base level is expected to be present throughout the advertising campaign. In order to determine if there is any 'carryover' of response from an advertisement on Friday (or before) over the weekend, it is necessary to see if the response after the weekend (when there is not an advertisement on the Monday) is significantly different from the base level of response.

There are five weekends when the hypothesis that there is no 'carryover' of response over the weekend can be tested. The chi-squared goodness of fit test was used but, as there were only five points, the test was not very powerful. The calculated proportion point of chi-squared was 0.50, so the hypothesis cannot be rejected, and it was assumed from then on that there was no 'carryover' of response to an advertisement over the weekend. See Appendix II for the analysis.

Decay of Response

The next thing to be examined was the decay of the response to an advertisement. Earlier in this report a paper was reviewed (Ref.5) in which it was assumed (on good evidence) that the decay of the response to an advertisement is negative exponential. Looking at our data it seemed that the decay could be negative exponential. As there were many advertisements on a Monday, it was decided to look initially at the decay of these advertisements when there were no other advertisements that week before Friday.

It was first assumed that although the absolute response to advertisements of different sizes, appearing on different pages, would probably be different, the proportion decay would be the same. With this in mind, the daily absolute response was converted into 'proportional response'*, in order to facilitate the comparing of different weeks (with different absolute response).

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*The idea of proportional response is best explained by the use of an example. If the four daily response figures (from Monday to Thursday) are 4, 3, 2, 1 (Total = 10) then four days proportional response is 0.4, 0.3, 0.2, 0.1.

Just by looking at these proportional response figures it was evident that there were inconsistencies, which indicated that one or more of the assumptions was not valid. On further examination it was found that, as well as the absolute response being different, the decay of different sized advertisements was also different. This means that different sized advertisements, appearing on different pages, have to be considered separately as far as decay in response is concerned.

The most common combination of size and position of advertisement was the half page underneath the television programme guide and responses for such advertisements were examined first. The proportional response for the eight similar advertisements were pooled and then plotted on a histogram (Fig.10). The calculated proportion means are not absolutely accurate. After examination, each value of a proportion was considered to be drawn from a normal population, and the 95% confidence limits on the means were calculated and are drawn as shaded areas on the histogram.

It was not possible, from the data, to obtain the proportion of the response to an advertisement which occurs on a Friday and Saturday because, for the weeks that were being looked at, there was always an advertisement on the Friday and so the responses overlapped. A negative exponential curve was drawn on the histogram (Fig.10) and the proportion of the response occurring on a Friday and Saturday was estimated from this curve. With these two extra days included, the sum of the proportions does not add up to unity and, in order to correct this, each of the six daily proportions must be divided by the sum of the proportions. The results of this procedure can be seen on a similar histogram (Fig.11).

A similar procedure was carried out when the decay of the other advertisements which appeared on a Monday were examined. The decay for these advertisements was much more rapid than for the advertisements occupying half of the television page, and in every case the response on Thursday had fallen to less than 5% of the total response to the advertisement. For this reason, it was assumed that no response from these advertisements was obtained on the Friday after each insertion, i.e. all the response was obtained over four days.

One hypothesis that might explain some of the difference between the decay of those advertisements which appear on the television page and

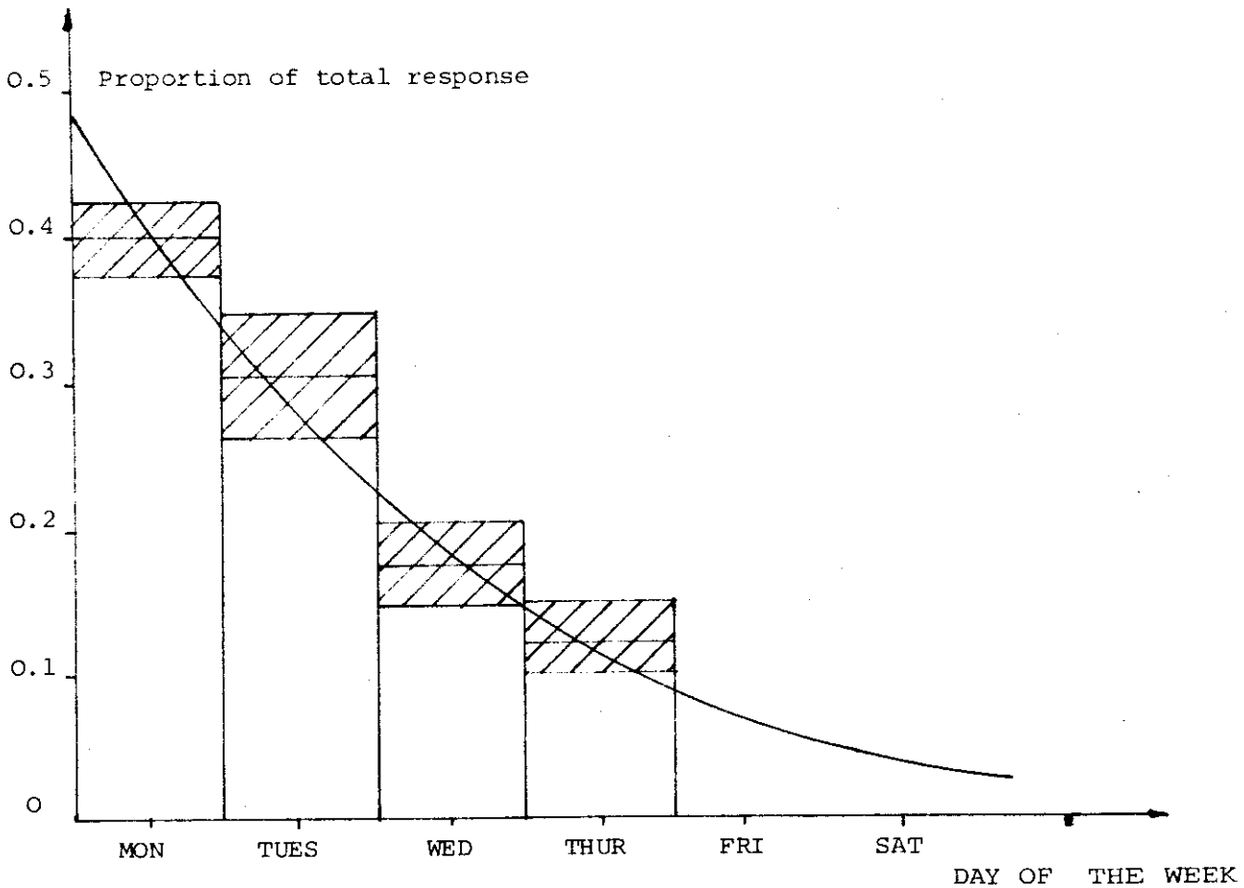


Figure 10 Observed Decay of the Response to a Single Advertisement

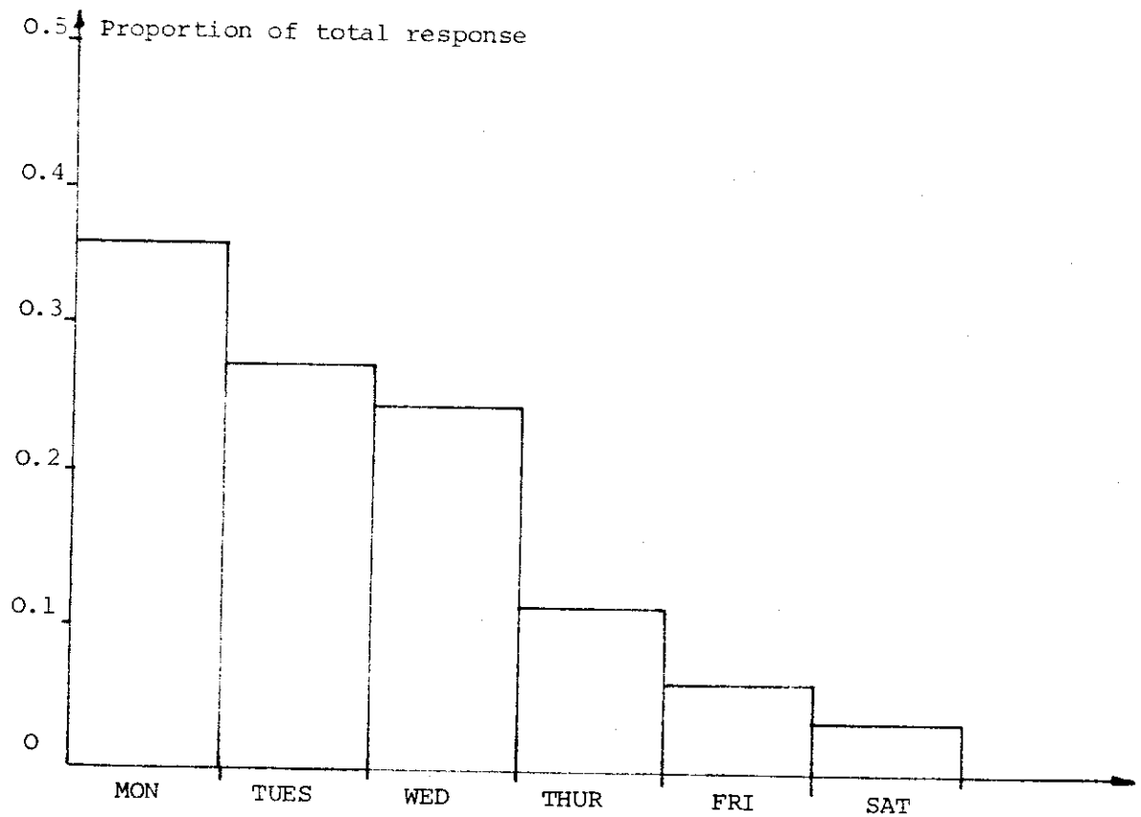


Figure 11 Extended Decay of the Response to a Single Advertisement

those that do not, is that somebody who is a potential customer is very likely to watch a substantial amount of television. The potential customer will probably look at the television page to find out about the programmes. He is likely to fold the newspaper in such a way as to have the television programme quide on one side of the newspaper and the bottom half of the television page on the other. If an advertisement is inserted on this page it gets a lot of exposure as the newspaper is likely to stay folded in this position until it is thrown away.

Comparison of Decay of Response for Different Day's Advertisements

The response to advertisements inserted on a Friday appears to have a very different form from the response to advertisements inserted on a Monday, the number of replies was sometimes greater on the Saturday than on the Friday of the advertisement. This could perhaps be explained by the fact that Friday is the last day of the working week and hence people get more opportunity to read the newspaper on the following Saturday. This different pattern of response to Friday's advertisements is not important because advertisements were never inserted on a Saturday, (Saturday's circulation is much lower) and there is no 'carryover' of response over the weekend, and so there are no difficulties when attempting to attribute the response to Friday's advertisements.

There are two instances when it is necessary to determine the rate of decay for advertisements inserted on a Tuesday, because in both cases there are advertisements inserted two days later, on the Thursday, and the response overlaps. It was necessary to determine whether the decay of response was similar to that obtained from an advertisement inserted on a Monday.

Both of these advertisements did not appear on the television page and hence a large fall-off of response was expected to occur on the Wednesday (the day after the advertisement appeared). The two day's response figures, however, indicated that the rate of decay is similar to that observed for an advertisement appearing on the television page. Two possible explanations for this effect are, either that the rate of decay of response for an advertisement inserted on a Tuesday is different to that for a similar advertisement appearing on a Monday, or that as the two advertisements appear in the first two weeks of the advertising campaign the decay of the response is influenced by this. The actual explanation is probably a combination of these and other extraneous effects.

It is assumed, for these two advertisements, that the rate of decay was the same as that for advertisements occupying the bottom half of the television page. In order to determine whether Tuesday's advertisements patterns of response are always difference from Monday's, it would be necessary to insert some advertisements on various Tuesdays, the rest of the week being free from advertisements, and then the daily response analysed as indicated above.

Method Used to Attribute the Response to Specific Advertisements.

As we have established that it is not unreasonable to assume that there is no 'carryover' of response over the weekend, each week can be considered in isolation.

When there is only one advertisement appearing during the week, there are no difficulties encountered when attributing response to this advertisement. The daily response figure for the day the advertisement appeared is summed with the daily response figures for the remaining days of that week. This is the number of people who telephoned the 'central control' after seeing the advertisement that week.

When more than one advertisement was inserted during a week (the maximum number inserted per week was two), the response to the two advertisements can overlap, and it is necessary to use knowledge of the rate of decay of the response to different advertisements to determine the amount of this overlap. Knowing the rate of decay of different advertisements, it was possible to calculate the response to the first advertisement which overlapped the response to the second advertisement (using the histograms, Figs. 10 and 11). This proportional figure was then converted into an absolute figure (number of telephone calls) by using the value of the proportion together with the known response to the first advertisement on the days before the second advertisement appeared. When the amount of response from the first advertisement which overlapped that from the second had been calculated, it was then possible to attribute the week's response to the two advertisements appearing in that week.

This procedure was used to attribute the daily response to specific advertisements appearing in the Evening Standard during the two years when the advertising campaign was running.

Evening News

During some weeks of the advertising campaign there were three advertisements inserted in the Evening News, two of these advertisements being on consecutive days. It was very difficult to establish a pattern of the decay of the response to different advertisements because, as the Evening News has large pages, there are many different combinations of advertisement size and page position. Consequently there were many advertisements which could not be used to examine the decay rate as they were inserted on consecutive days.

There were some weeks during the advertising campaign when there was only one advertisement appearing. It was not difficult to attribute the response to these advertisements. In several other weeks there were two advertisements appearing, separated by several days. In these cases the overlap of response was determined by assuming that the decay of response was negative exponential.

It was impossible to determine the overlap of response to advertisements inserted on consecutive days with any accuracy, and no value of the response to these advertisement could be obtained. The advertisements for which no response could be determined accounted for 15% of the total number of advertisements inserted in the Evening News over the two year period of the advertising campaign. This underlines the usefulness of the suggestion made above concerning the alternation of the 'central office' telephone numbers for successive advertisements, particularly those appearing in the Evening News.

Removing the Seasonality

The use and demand for the service advertised is very seasonal. Hence it would be expected that replies to advertisements inserted throughout a year would also be seasonal. Just by looking at the response to the advertisements spread over two years it is evident that the level of response is seasonal. Advertisements inserted during the summer months produced so little response, compared to the rest of the year, that the advertising manager felt that it was not worthwhile advertising then.

In order to get some idea of the seasonal effect, the response to similar advertisements* which were inserted throughout the season (October-May) was examined. There were only two types of advertisements which had been inserted at all regularly, these were the advertisements which occupied the bottom half of the television page in the Evening Standard on Mondays and Fridays. The response to these advertisements was used to investigate the seasonality and this response is plotted in Figs.12 and 13. The first season's data (1969 - 1970) is plotted in Fig.13 and the second season's data (1970 - 1971) in Fig.12.

The points on the graph which are circled (X) indicate that, on the same date that the advertisement appeared, there was a similar advertisement inserted by a competitor. This could be expected to affect the level of response to the advertisement. It can be seen that during the first advertising season these advertisements were only inserted in the last half of the period and so are not much use when examining seasonality. The second season's data is a little more helpful, and there is the expected peak occurring in the winter months.

There is a very large response during the Christmas week and a very small response to an advertisement inserted in the week after Christmas. When the seasonality is removed it is to be expected that Christmas (and other major events) will be an additional factor which effects the level of response to an advertisement.

Because there is only one year's data available (for a constant set of circumstances), it is impossible to attempt to extract the seasonality from this alone, as in doing so any trend that might be present in the data is also removed. For this reason it was felt necessary to find some other indication of the seasonality of the business which could be used to extract the seasonal effects from the two years' data.

External Indicators of Seasonality

The first external indicator of seasonality that was examined was the monthly total of the number of the service item delivered by the manufacturers to the trade. These figures were not used as they did not appear to be very helpful,

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* Similar advertisements are advertisements of the same size, occupying the same position in the same newspaper, appearing on the same day.

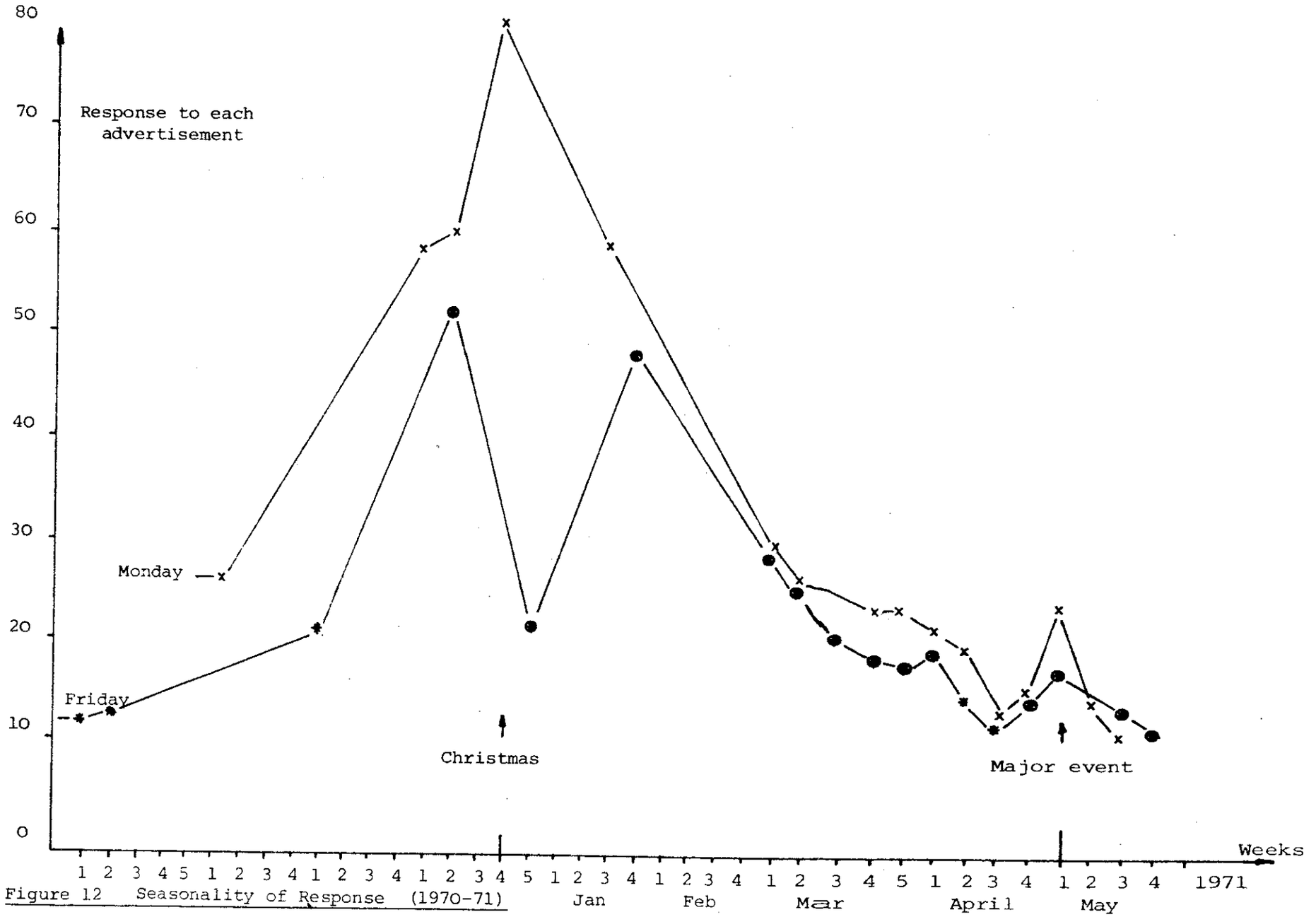


Figure 12 Seasonality of Response (1970-71)

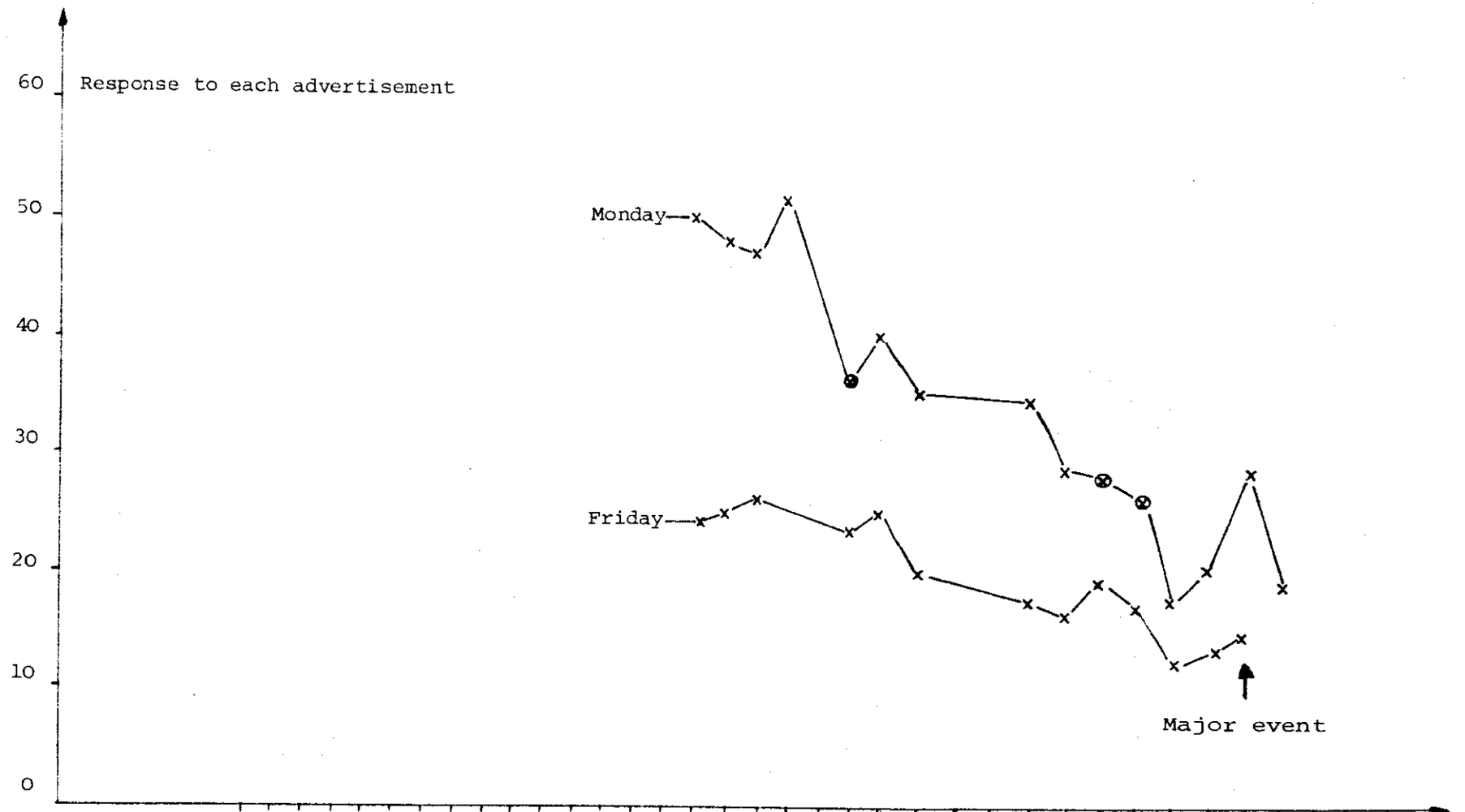


Figure 13 Seasonality of Response (1969-70)

because it was difficult to see how the observed seasonality in our data could be predicted by them. This was probably because there are a lot of different time lags between the time the items were delivered to the shops and the time they reached the consumer.

It was possible to obtain figures which reflected the total market for another, well established competitor in previous years. Although this data was better than that examined before, the figures contained business from existing customers as well as the number of new customers. Data from this source relating to new customer enquiries was obtained and this was used to extract the seasonality from the response figures.

Seasonality Factors

Monthly figures, spread over two years, were available and as there was virtually no difference between the two years' figures, the data was grouped to give one year's seasonality. The data was simply grouped by adding to one year's monthly figures the respective monthly figures of the other year. The figures that were obtained are given below (Table 1), but they have been multiplied by a constant factor to transform the largest number (that of December) to 1.0.

January	0.96
February	0.94
March	0.91
April	0.87
May	0.84
June	0.77
July	0.74
August	0.72
September	0.73
October	0.83
November	0.93
December	1.00

Table 1

Data used to correct for Seasonality

What these figures mean is that the potential market varies throughout the year. As an example, the potential market in March of any one year is 91% of the potential market in December of that year. It is assumed that, all

other things being equal, if two identical advertisements were used in these two months then the response to the advertisements in March would be 91% of the response to the one in December. Therefore, it can be seen that multiplying the monthly figures by a constant does not affect their usefulness because, no matter what the multiplying factor, the figure for March will always be 91% of the figure for December and hence the transformation performed on the response data will not affect seasonality.

The seasonality has to be removed from the response data before different advertisements can be compared because different values of response might be due, in part, to the advertisements being inserted at different times of the year. The actual response data for each advertisement was de-seasonalised by dividing each response figure by its respective monthly figure shown in Table 1. This means that the response to an advertisement is converted to the expected value of the response to the same advertisement, had it been inserted in December. As an example, consider an advertisement that produced 50 enquiries when it was inserted in January, the de-seasonalised value of the response is 52 (=50/0.96).

When further analysis is performed, it must be remembered that the response figures used are values of the response which would be expected if the advertisement was inserted in December. If the advertisement is inserted in any other month, then the expected response is smaller, the actual figure being obtained by multiplying the calculated expected response by the respective monthly figure from Table 1. E.g. if the calculated value of response to an advertisement is 52, then this means that if the advertisement was inserted in December the expected response would be 52; if however it was inserted in January then the expected response would be 50 (=52 x 0.95).

Form of the De-Seasonalised Response - Thresholds and Diminishing Returns

After the seasonality has been removed it might have been expected that all similar advertisements ought to have roughly similar values of response. However, looking at the graphs of the response to similar advertisements after the seasonality has been removed (Figs. 14 and 15), it can be seen that the level of response varies throughout the year. This effect must be removed before the response to different types of advertisement can be compared on an equivalent basis.

The shape of the response values is not entirely unexpected, and it can be explained qualitatively. It is not unreasonable to assume that the effectiveness of the first few advertisements in an advertising campaign increases as the number of advertisements that have been inserted increases. This means that the effectiveness of the fourth advertisement is greater than that of the third advertisement which in turn is greater than that of the second. This is because as the number of advertisements which have been inserted increases, so does the number of people who have seen previous advertisements but not yet responded, hence the number of replies to a given advertisement also increases. This explains the rise in response (positive slope of the graph) which occurs at the beginning of the 1970 - 1971 season. This could be described as a 'threshold' effect whereby people had to have seen several advertisements before they become sufficiently motivated.

The decline in response in the latter part of the season can be explained by assuming that after a series of advertisements have been displayed there is a large group of people who are both potential customers and who have seen at least one of the advertisements. It would be expected that the larger this group of people, the larger the response to a given advertisement. Therefore when one advertisement has been inserted, this group of people who are both potential customers and who have seen at least one advertisement decreases, because the people who reply to the advertisement leave the group as their need has been satisfied, assuming they have become a customer. Because the size of the group has decreased, the expected response to the next advertisement decreases. This decrease in response for successive advertisements continues to occur until it is expected that the response to a given advertisement will reach a steady level. The state where response has levelled off is expected to occur when the only people who reply to an advertisement are those who have recently joined the target population of potential customers. This, in fact, describes what has been termed the 'diminishing returns' situation of advertising.

The data plotted in Figs. 14 and 15 is the data plotted in Figs. 12 and 13 respectively which has had the seasonality removed. The shape of the graphs is similar to that explained above, but the expected levelling-off of response is not observed, probably because the advertising campaign was not continued for a long enough period. It has previously been assumed (Ref.2) that the shape of the response curve is negative exponential. This, however, does not predict the initial part of the response curve and hence cannot be used.

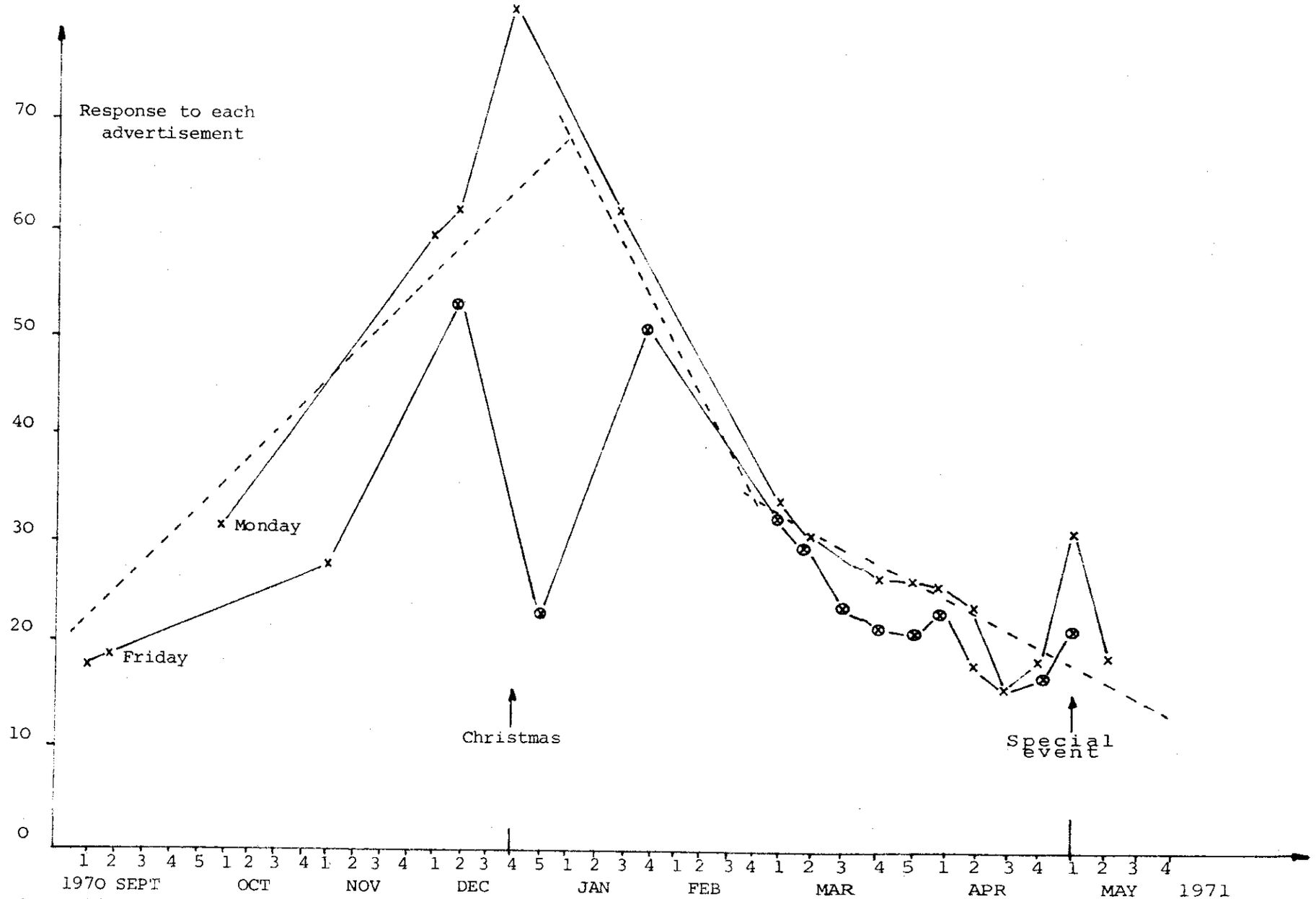


Figure 14 De-Seasonalised Response (1970-71)

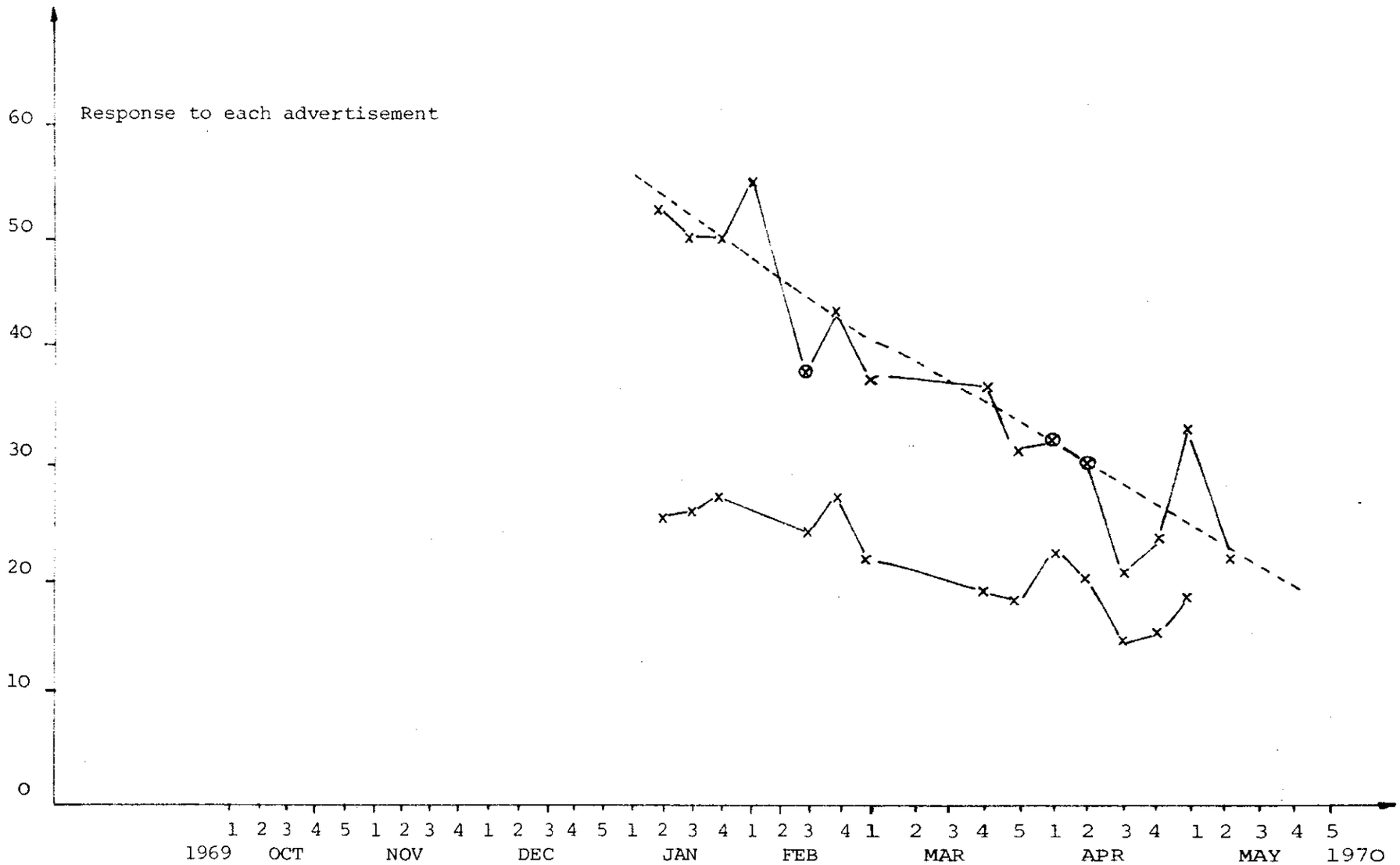


Figure 15 De-Seasonalised Response (1969-70)

Unfortunately it was not possible to derive the shape of the graphs from exogenous data.

In order to remove this effect it is necessary to make several assumptions. This first assumption is that if the effect was not present, then all similar advertisements would produce the same number of replies. This is not exactly true because there are bound to be some random fluctuations. The second assumption is that this effect is similar in proportional terms for different types of advertisements. By this it is meant that if the response to two similar advertisements drops by 50% when the advertisements are separated by several weeks, then the response to two other advertisements similar in some other respect would also have fallen by 50% if they had been inserted at the same time as the other two advertisements. Although the decline in response depends on the number of people who have already replied to an advertisement, the level of response is assumed to depend on the number of weeks that the advertising campaign has been running. This assumption seems reasonable because the de-seasonalised number of replied to the 'central office' does not vary too much.

Models of Response

The pattern of response was modelled using the de-seasonalised response for the advertisements appearing in the Evening Standard which occupied the bottom half of the Television programme page on a Monday. Three linear approximations were made for the second year's data and they are shown in Fig.14 by the dotted line. The shape of the last half of the first year's data (all that we have to work on) was approximated by a straight line which is shown in Fig.15 by a dotted line.

Once the pattern of response had been established for one type of advertisement, it was then necessary to correct all the data on other advertisements to eliminate these trends so that the response to different advertisements could be analysed. It would have been desirable to correct all the response data to the values of response that the advertisements would have produced if they were inserted after the response had levelled off. As the response was not observed to level off,this was impossible. It was not meaningful to correct the data to an average value because the average would vary depending on the length of time over which the advertisements were inserted. Therefore, it was decided to correct the data in such a way that the expected response to an advertisement inserted in the Evening Standard on a Monday, which occupied the bottom half of the television page, was a purely arbitrary value of 40.

Multiplying factors were calculated for each week by dividing 40 (arbitrary value) by the approximated weekly values of the slope of the response (shown in Figs.14 and 15 by dotted lines). These multiplying factors are plotted in Figs. 16 and 17. The de-seasonalised response data could then be finally transformed by multiplying each value of the response by the appropriate weekly multiplying factor. Both years' data was transformed by the same method.

It does not matter to what figure the response to the Monday's advertisements are corrected because the proportional response to different advertisements will always be the same; i.e. if one type of advertisement produces 50% of the response to another type of advertisement then it will always do so, irrespective of the correction factor (40 in this case).

It must be remembered that the final corrected response figures do not correspond to values of response that would be expected if the advertisements were inserted in the newspaper. In order to arrive at the expected value of the response to any advertisement inserted in the Evening Standard, the expected value of the response must be calculated using these final corrected response figures. This figure must be corrected for the trends present by dividing it by the appropriate value of the weekly 'multiplying' factor (Figs.17 and 18). This corrected figure must then be further corrected to take account of seasonality. The method of removing seasonality is described in the previous section.

The trends have only been extracted from the response figures for advertisements which appeared in the Evening Standard; due to lack of time the Evening News figures were untreated. The Evening News response data could be treated in a similar manner by anybody who wished to investigate this data further. Although a similar method could be used to extract the trends, difficulties could arise due to the fact that the advertisements which were inserted in the Evening News varied greatly throughout the year, i.e. there was not a single type of advertisement that was inserted with any regularity throughout the advertising campaign, unlike the case of the Evening Standard.

The critical effect that was not observed in the data was the expected flattening-off of the response curve. It would have been very interesting to observe whether this effect does, in fact, occur and at what level the response to the advertisements level off. Unfortunately, the response probably would have levelled off at such a value that it would no longer be profitable to advertise.

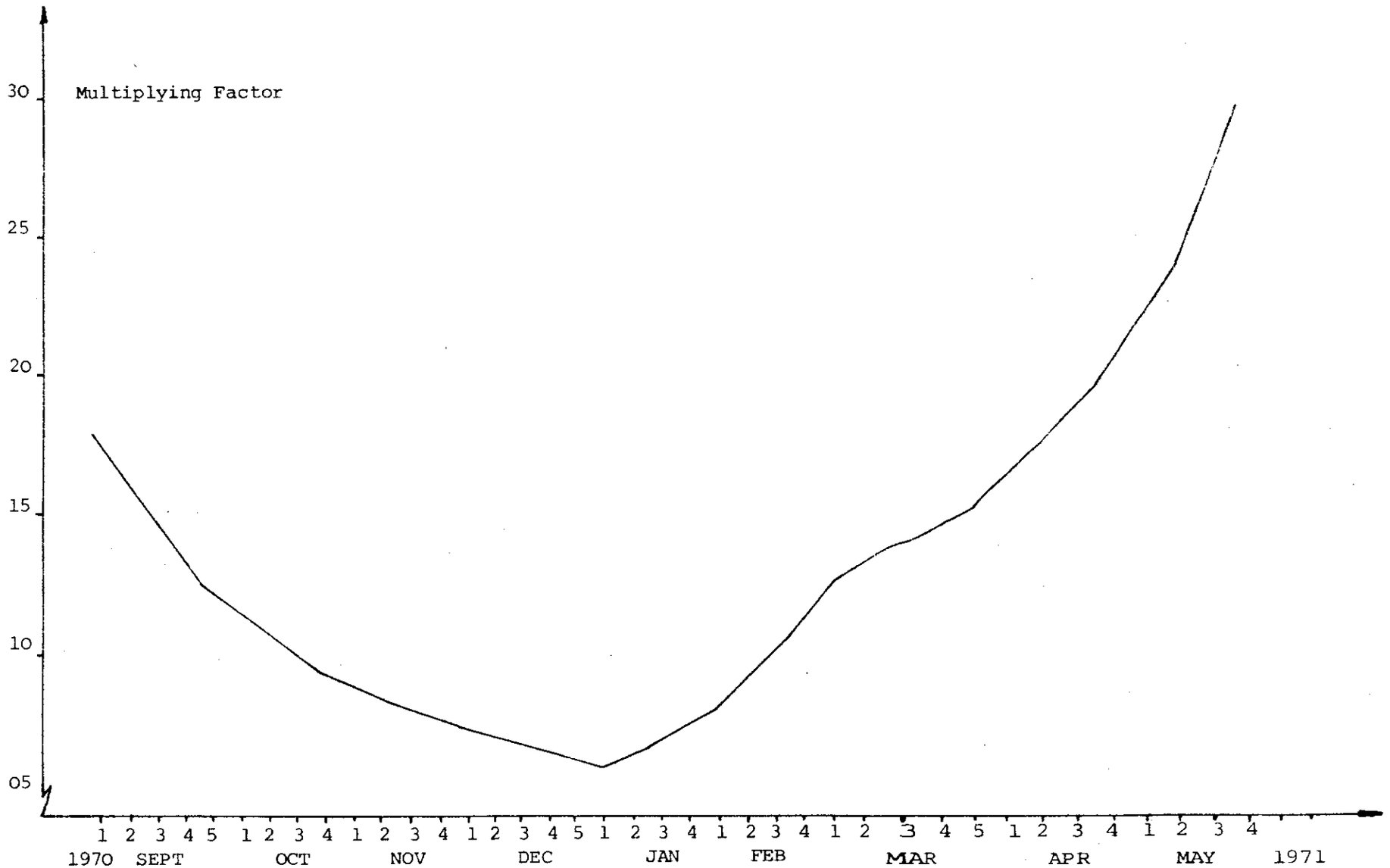


Figure 16 Multiplying Factors for Further Correcting the De-Seasonalised Response (1970-71)

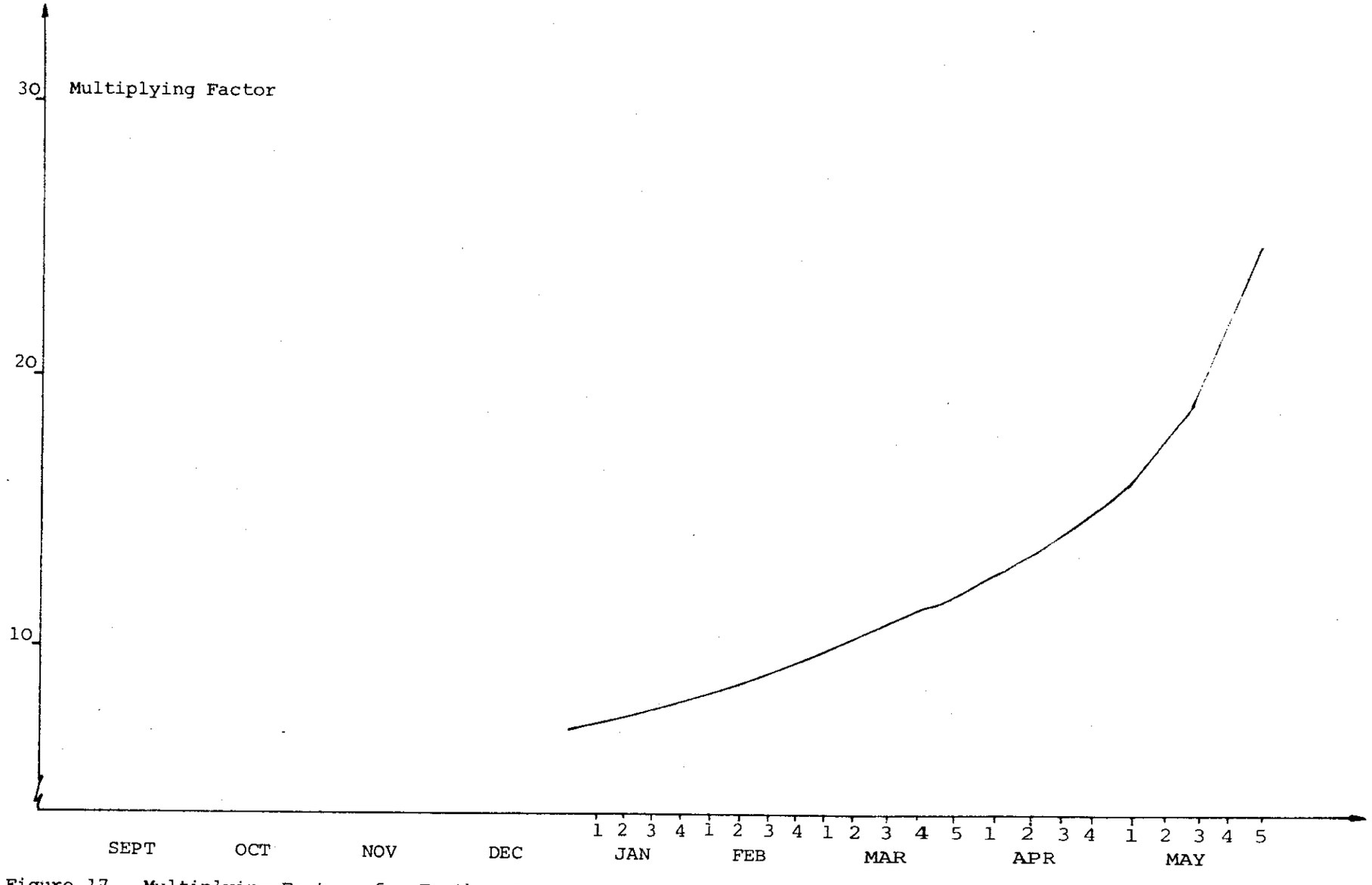


Figure 17 Multiplying Factors for Further Correcting the De-Seasonalised Response (1969-70)

Comparison of Different Advertisements

The response to different advertisements can now be investigated because the completely corrected response to advertisements appearing throughout the year is independent of the time of insertion, as the trends have been extracted. It is expected that the response to one type of advertisement will be constant for all these advertisements. This final corrected response is investigated below.

The data concerning the final corrected response is shown in Appendix III, (together with the partially corrected data). This data has to be reorganised to make it easier to observe the response to different advertisements. The response to advertisements appearing on the Television programme page is considered first because the data is plentiful and hence the analysis is easier. The final corrected response figures for advertisements appearing on the Television programme page is given below, Table 2.

(1)	(2)	(3)	(4)	(5)	(6)
1970-71	1969-70	1970-71	1969-70	1970-71	1970-71
38	38	31	19	36	23
42	39	30	20	36	22
41	40	26	22	40	24
40	46	30	22	38	21
42	34	30	25	32	
40	40		21	31	
40	37		21	32	
40	41		21	38	
41	37		27	34	
40	35		27		
36	37		23		
43			29		
40					

Column (1) = ½ page, Monday no competitors*
Column (2) = ½ page, Monday no competitors
Column (3) = ½ page, Friday no competitors
Column (4) = ½ page, Friday no competitors
Column (5) = ½ page, Friday with competitors
Column (6) = 1/4 page, Monday, Tuesday, Wednesday and Thursday no competitors

Table 2

Final corrected response figures for advertisements appearing on the Television page

*'No competitors' means that there was not a competitive advertisement in the same edition of the newspaper as these advertisements.

One figure (35) has been omitted from group (6) because it is very different from the rest. This is the response to an advertisement which appeared on the Monday of the first week in February 1971. As well as the response figure being different, the subsequent decline of the response during the rest of the week to that particular advertisement was also different. It must be assumed that some external factor had a very great effect on the response to that advertisement.

It would be expected that the two means (averages) of groups (1) and (2) are the same because it was decided to correct both years' response to these particular advertisements (½ page, Monday, at the bottom half of the Television page) to a value of 40. However, to be statistically correct, a t-test must be performed on the two groups, this is done below.

The two groups of figures are assumed to come from normal populations, which is necessary in order to use the t-test. By looking at the two groups it is evident that this assumption is valid. Before using the t-test it is also necessary that the population variances of the two groups are the same.

if S_i^2 = variance of the i^{th} group

then if the group variances are calculated

$S_1^2 = 6.7$ $\qquad$ $S_2^2 = 15.0$

The statistic S_2^2/S_1^2 is distributed as the F distribution

Observed F = 2.2

This value of F is not statistically significant, therefore the sample variances are pooled to give a better estimate of the two population variances because is is based on more degrees of freedom.

pooled variance = $S^2 = \frac{12 \times 6.7 + 10 \times 15.2}{22} = 10.5$ with 22 degrees of freedom

The null hypothesis that we are testing by the t-test is:

H_o: The two means (of groups (1) and (2)) are equal.

H_1: The two means are not equal.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = 0.85 \text{ with 22 degrees of freedom} = \gamma$$

This value of t is not statistically significant and hence the null hypothesis cannot be rejected. The two groups can therefore be pooled.

Mean of pooled values = 39.5

The 95% confidence limits on the population mean are calculated as follows:

95% confidence limits are $\bar{x} \pm (t_{0.025,)}) S/\sqrt{n}$

$= 39.5 \pm 2.07 \times 3.24/\sqrt{24} = 39.5 \pm 1.4$

The next hypothesis to be tested is whether the means of groups (3) and (4) can be assumed to be the same. The response in these two groups comes from similar advertisements, the only difference is that the group (3) response comes from 1970-71, but that in group (4) from 1969-70. The t-test is used as above.

$s_3^2 = 5.0 \quad \nu_3 = 4 \quad s_4^2 = 9.1 \quad \nu_4 = 11$

where ν_i is the number of degress of freedom in the i^{th} group

$s_4^2/s_3^2 = 1.8.$

This value of F is not statistically significant and hence it can be assumed that the two variances are the same and can be pooled.

pooled variance = $s^2 = 8.0$

We again test the null hypothesis:

H_o: The means of groups (3) and (4) are equal.

H_1: The means of groups (3) and (4) are not equal.

$t = 4.2 \quad \nu = 15$

This value of t is significantly large and hence the null hypothesis must be rejected. This means that the average response to advertisements inserted on Fridays on the bottom half of the television programme page changes significantly from one year to the next.

It is also interesting to see whether there is any statistical difference between the mean values of groups (3) and (5). The only difference between the advertisements in the two groups is, that all the advertisements producing the response in group (5) were accompanied by a competitive advertisement in the same issue of the newspaper. The advertisement from group (3) had no competitive advertisements. Once again the t-test is used.

$$S_3^2 = 5.0 \quad \nu_3 = 4 \quad S_5^2 = 6.3 \quad \nu_5 = 8$$

$$S_5^2/S_3^2 = 1.26$$

This value of F is not statistically significant, therefore the two variances can be pooled.

$$\text{pooled variance} = S^2 = 5.9$$

We are testing the null hypothesis:

H_0: The means of groups (3) and (5) are equal.

H_1: The means of groups (3) and (5) are not equal.

This value of t is significantly large at the 1% level, therefore the null hypothesis must be rejected. This means that those advertisements which appear on a Friday on the bottom half of the television page and are accompanied by a competitive advertisement have a larger average response than those advertisements for which there is no competitive advertisement.

The 95% confidence limits on the polulation means are calculated by the same method used for group (1). The results are given below in Table 3.

	lower 95% limit	mean	upper 95% limit
(1) ½ page, Monday, 1970-71 no competitors, 1969-70	38.1	39.5	40.9
(3) ½ page, Friday, 1970-71 no competitors	26.6	29.4	32.2
(4) ½ page, Friday, 1969-70 no competitors	21.2	23.1	25.0
(5) ½ page, Friday, 1970-71 with competitors	33.2	35.2	37.2
(6) 1/4 page, Mon.,Tues., Wed., Thurs., 1970-71 no competitors	20.4	22.5	24.6

Table 3

95% confidence limits on the response to advertisements appearing on the Television page

The cost of placing an advertisement, occupying half a page or less, in the Evening Standard is directly proportional to the area of the advertisement. If a full page advertisement is used, a slight discount is offered.

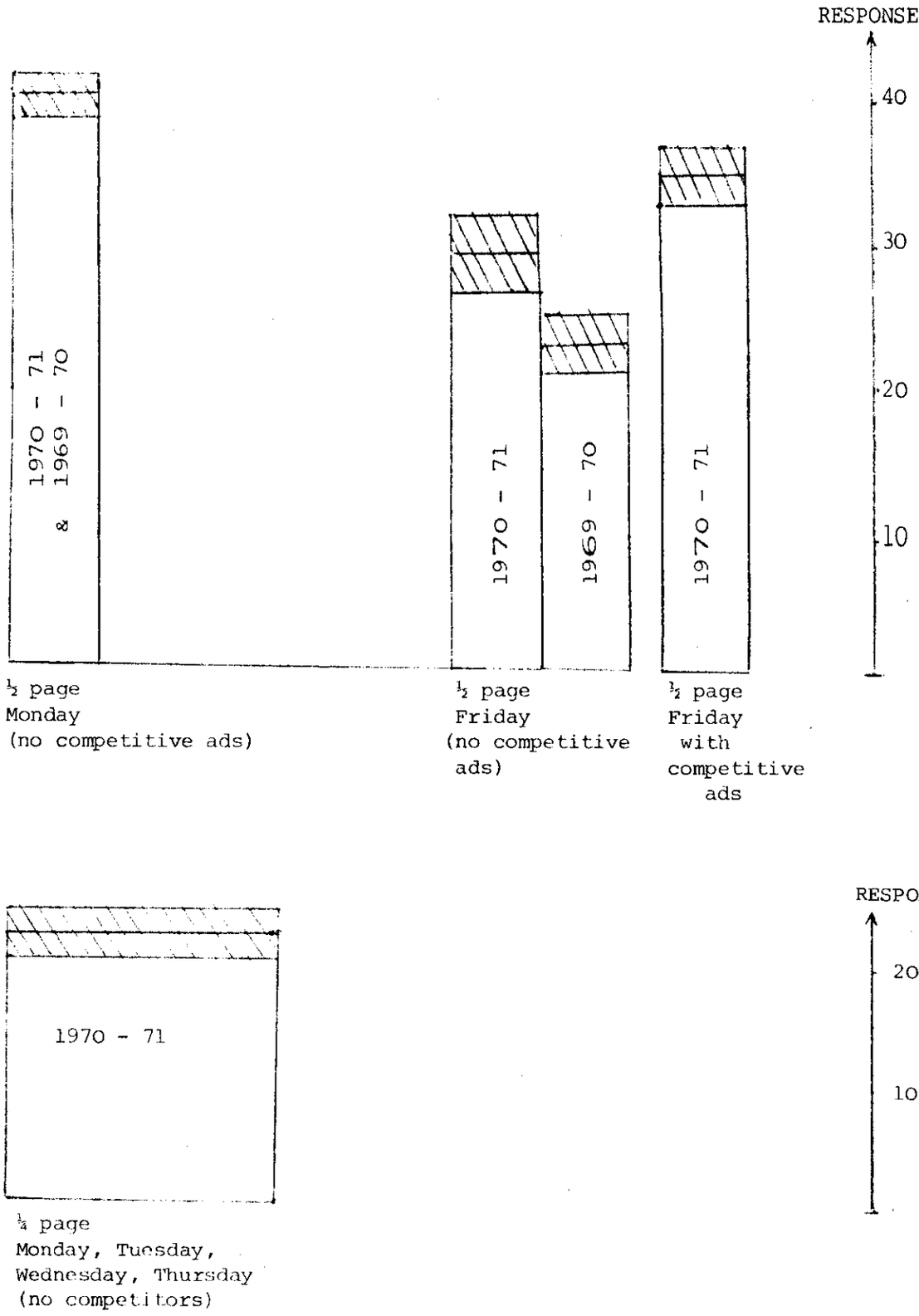


Figure 18. Response by day of week for advertisements on T.V. programme page (see Table 3)

In order to compare the cost effectiveness of the above types of advertisement it is only necessary to multiply the figures in group (6) by a factor of two because the advertisements in group (6) cost half as much as all the other advertisements.

It can be seen that the advertisements in group (6) are marginally more cost effective than those in group (1). The advertisements in group (5) are more cost effective than those in group (3) which means that, at least for those advertisements which appear on the bottom half of the Television page on a Friday, it is advantageous to have a competitive advertisement in the same issue of the newspaper.

Two thirds of the advertisements were inserted on the Television page and hence have been dealt with, but that still leaves one third of the advertisements to be considered. A one-factor analysis of variance was performed to see if there was any difference between the response to different sized advertisements. The data analysed is given below in Table 4.

Size of Advertisement

6ins. x 4 cols.	8ins. x 3 cols.	8ins. x 4 cols.	8ins. x 6 cols.
18	11	36	46
19	12	34	33
24	14	36	30
20	24	27	
23	24		
22	25		
32	24		
34	24		
27	32		
40	23		
34			
44			
26			

Table 4

Completely correct response figures for advertisements not appearing on the Television page

It is reasonable to assume that the data in the four groups comes from four normal populations, each with the same variance.

Source of variation:

Source	Sum of squares	Degrees of freedom	Mean square
Within groups	1411	26	54.3
Between groups	751	3	250
Total	2162	29	

If we propose the null hypothesis:

H_o: There is no difference between the group means.

H_i: At least one group mean is different.

Assuming that the null hypothesis is true, the two values of the Mean Square are both estimates of the underlying population variance. Therefore we must test whether the two estimates of variance can be assumed to be the same.

Observed $F = 250/54.3 = 4.6$, $\nu_1 = 3$, $\nu_2 = 26$

This value of F is not statistically significant at the 1% significance level. This means that there is no evidence to reject the null hypothesis. The variation within the groups is too large and, in order to investigate the data further, account must be taken of the fact that within these groups of data there are various subgroups. These subgroups differentiate between advertisements with different characteristics such as different page position, different day of the week, competitive advertising and the year the advertisements were inserted. Ideally, a multi-factor analysis of variance ought to be performed but, unfortunately, there is not enough data to do this.

If the advertiser's main concern is to determine the effectiveness of various advertisements, then to do this it is essential to experiment with different patterns of advertisements. It would not be necessary to perform the experiment in London where the advertisements are very expensive; it could be done in another town where the advertising costs are less.

The experiment must be designed to indicate the effect of changing each factor (size of advertisement, page position, competitive advertising). It must also indicate the interaction between the factors. A factorial experiment would be suitable where all combinations of the levels of different factors are investigated. The data we already have provides some indication

of the accuracy of the results. From this and from the required accuracy of the final results it ought to be possible to decide on the required number of replications (the number of advertisements of each type).

SUMMARY AND CONCLUSIONS

Relevant published literature is reviewed in the first part of this report. The second part consists of an analysis of an actual direct response campaign: the case studied was one in which advertisements were inserted in the two London evening newspapers inviting the reader to telephone a central office to hear further details.

The data available consisted of the daily number of telephone calls to each central office, as well as the number of people who contacted showrooms directly. It was known when each advertisement was inserted together with details about its size, page position and its advertising message.

The first problem was to assign the response to specific advertisements. When this was done, the seasonaility was removed and another transformation performed on the data so that it was then possible to compare the response to different types of advertisement.

It was possible to check two laws proposed in Reference 2. The first law was that, if a single advertisement is published, the cumulative total of coupons returned from that advertisement rises exponentially with time to it final value. This law was upheld by the analysis performed above, and it was found that the constant in the exponential term, as well as depending on the item advertised and the periodical carrying the advertisement, also depends on the size of the advertisement. Advertisements appearing on a Friday did not obey this law, probably because the pattern of response was distorted by the weekend.

The second proposed law was that, if the same advertisement is inserted regularly in a given periodical, then the total number of replies received to each advertisement will fall exponentially with time to some fixed steady value. Although the author of Reference 2 states that this law was confirmed by the results from a limited number of advertising campaigns, the data from the advertising campaign, which is analysed in this report, breaks the proposed law. The expected decline in response is shown in Figure 19,

the observed pattern of response is shown alongside in Figure 20.

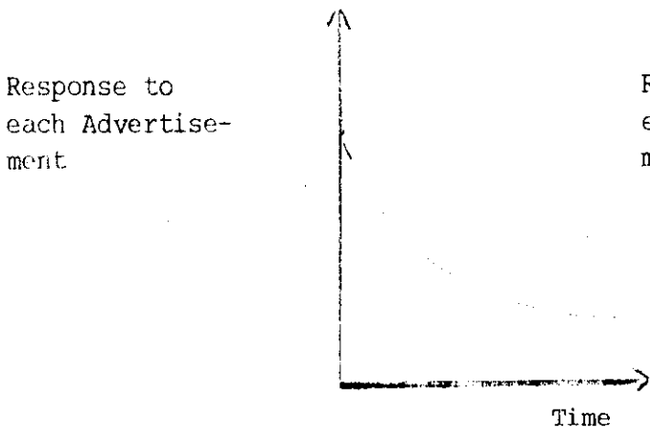


Figure 19 Expected Decay in Response

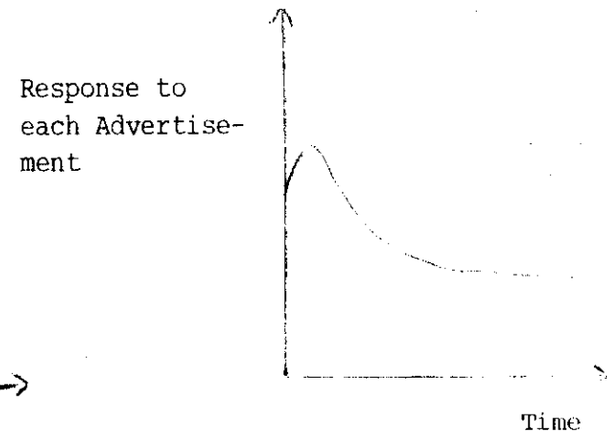


Figure 20 Observed Decay in Response

Although the response to similar advertisements was not observed to fall to a fixed steady value, it is expected that, if the advertisements had been inserted for a longer period, then it would have done. The difference between the two graphs occur at the beginning of the advertising campaign where, with the observed data, there is a 'threshold' effect. This means that in the advertising campaign, which had been examined, several advertisements had to be inserted before very much response is obtained. This fact casts doubts upon the generality of the law proposed by Jolly (Ref.2).

One interesting fact that was observed was that, on some occasions, when the content of the advertisements was changed, the response to that advertisement was less than the expected response. The reason for this could be that the reader does not recognise the advertisement, as the message and format have changed. For similar reasons, it might be expected that, when the size of advertisements being inserted changed, the response ought to have been less than the response to the same advertisement if the previous advertisements had been the same size. This was not observed to happen, but the effect might have been obscured by other factors, or size increase has a significant effect outweighing the 'change' factor.

Because of limitations of the available data, it was only possible to examine the cost effectiveness of advertisements which appeared on the bottom half of the Television page in the Evening Standard. Only two different sized advertisements were used; these occupied quarter and half page. The most cost effective advertisement was found to be the quarter page advertisement which was marginally better than the half page advertisement appearing on

Monday. Advertisements occupying a half page, which appeared on a Friday, were made significantly more cost effective by the presence of a competitive advertisement in the same issue of the nespaper.

On the available evidence it is expected that an advertisement appearing on a Friday will produce less response (direct to the central office) than a similar advertisement appearing on a Monday. One possible explanation for this is that somebody who is influenced by an advertisement appearing on a Friday might decide to visit a showroom directly, rather than telephone the central office. Therefore, although it looks as if Fridays' advertisements are not very cost effective, they could be inducing people to visit the showrooms directly the following Saturday. It would have been very useful to have had some way of differentiating between those people who visited the showrooms because they saw one of the advertisements, and those who were motivated to visit the showrooms by other factors. Although there was data on the number of people who contacted the showrooms daily, because there were sometimes five advertisements appearing in one week, it would be very difficult to estimate at all accurately the number of people who contacted the showrooms because they had seen a specific advertisement. If the people who contacted the showrooms directly after seeing an advertisement could have been included in the response figures, then it is possible that advertising on a Friday could be very much more competitive than it appears to be.

Much more work needs to be done on direct response advertising because published findings are not conclusive and the example examined here had insufficient data. One interesting problem is the effect of newspaper 'special features' on the response to advertisements. Another problem is the effect that one advertisement has on the response to the next, e.g. is the response to an advertisement inserted on a Friday, which is preceded by an advertisement on the Monday of that week, greater than the response to the same advertisement inserted on a Friday which is not preceded by any advertisements in that week. To find out more about such situations more data must be analysed.

In order to evaluate advertising, this study indicated that the advertising researcher has to be involved in advertising planning so that the right data can be obtained in a systematic way. It is only by chance that the total data required is available in a post-event analysis.

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APPENDIX I

A More Detailed Analysis of the Response Direct to the Showrooms

$Y = a + b(x - \bar{x})$ is the estimate of the theoretical regression line $\eta = \alpha + \beta(x - \bar{x})$.

ε_a is the estimate of the standard error of a.

ε_b is the estimate of the standard error of b.

σ_y is the standard error of the points projected onto the Y axis.

σ_x is the standard error of the points projected onto the X axis.

σ is the residual standard error.

The confidence limits are calculated as follows:

$$\sigma^2 = \sigma_y^2 (1 - r^2)$$

$$\varepsilon_a^2 = \frac{\sigma^2}{n}$$

$$\varepsilon_b^2 = \frac{\sigma^2}{\varepsilon_a (x - \bar{x})^2}$$

The 2σ confidence limits on the regression line are $\pm 2\sqrt{\varepsilon_a^2 + \varepsilon_b^2 (x - \bar{x})^2}$

The 2 confidence limits on individual points are $\pm 2\sqrt{\sigma^2 + \varepsilon_a^2 + \varepsilon_b^2 (x - \bar{x})^2}$

These are the confidence limits drawn on the three graphs.
(Figures 5, 6 and 7), and the actual figures used are given below:

(1) Figure 5

$\sigma_x^2 = 1067.16$

$\sigma_y^2 = 45.37$

$\sigma^2 = 2.86$

$\varepsilon_a^2 = 0.13$

$\varepsilon_b^2 = 1.22 \times 10^{-4}$

(2) Figure 6

$\sigma_x^2 = 1067.16$

$\sigma_y^2 = 0.69$

$\sigma^2 = 0.045$

$\varepsilon_a^2 = 0.00204$

$\varepsilon_b^2 = 1.9 \times 10^{-6}$

(3) Figure 7

$\sigma_x^2 = 1067.16$

$\sigma_y^2 = 57.0$

$\sigma^2 = 3.36$

$\varepsilon_a^2 = 0.15$

$\varepsilon_b^2 = 1.43 \times 10^{-4}$

APPENDIX II

Base level of response = 0.5 calls/day.

If R = Sum of Monday's and Tuesday's response after an advertisement has appeared at the end of the previous week when there is no advertisement inserted on the Monday or Tuesday.

If we have the null hypothesis:

H_o: The observed response is the same as the expected response (base level).

H_i: The observed response is different from the expected response.

Expected R	Observed R	$\frac{(E-O)^2}{E}$ = Contribution to Chi-squared
1	2	1
1	2	1
1	2	1
1	1	0
1	1	0
		3

Therefore using the Chi-squared goodness of fit test

$$X^2 = 3 \qquad \nu = 4$$

Looking at the tables of Chi-squared values it can be seen that the calculated value lies between the 70% and 50% points, hence the value of Chi-squared is not significantly large and the null hypothesis can not be rejected.

Therefore it is reasonable to assume that there is no 'carry over' of response, to an advertisement appearing on a Friday, over the weekend.

APPENDIX III

The data given below is an example of the actual data concerning the advertising campaign multiplied by a small constant factor. This is done to disguise the level of business of the company whose data this is.

The first set of data values is the raw data of the daily number of telephone calls received, together with details of the advertisements used.

The symbols used have the following meanings:

A: The number of daily telephone calls to the Evening Standard advertisements.
B: The number of daily telephone calls to the Evening News advertisements.
t: The number of daily telephone calls direct to the showrooms.
C: The number of daily visitors direct to the showrooms.
M, T, W, Th, F, S: days of the week
•: An advertisement was inserted in the Evening Standard on this day.
x: An advertisement was inserted in the Evening News on this day.
TL: Weekly totals of response.
S,P‡: Size of the advertisement, page on which the advertisement appeared (e.g. 6 x 4, 12 means that the advertisement was inserted on page 12 and occupied 6 inches x 4 columns).
*: Denotes that the advertising message has changed.
date: This identifies when the advertisements were inserted (1969, Oct.2 is the second week in October, the week ending 11-10-69).
SR: The number of showrooms open to the public.

‡ The page size of the Evening Standard is 16in. x 6 cols., the page size of the Evening News is 22 in. x 8 cols.

	M	T	W	Th	F	S	TL	S,P A	S,P B	date	SR
A	0	12•	9	10•	3	2	36			1969 Oct.	
B	10	8	13x	8	15x	8	62	6x4, 12	6x4, 3	2	3
t	0	1	1	0	1	0	4	6x4, 14	6x4, 7		
C	11	4	3	6	9	15	48	*	6x4, 6*		