Predictive Strategies for the Determination of Sales and Advertising Expenditures in the Pharmaceutical Industry in Nigeria *(Pp. 206-223)*

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Abstract
Advertising budget setting continues to be a controversial topic.   The objective of this study is too formulate a scientifically –based approach to setting advertising budgets and correct the lack-lustre approach towards this. Secondary sources of data were used in this study. Data analysis was done by using the SPSS statistical software package. This study was based on the premise that little is known about how managers actually set advertising budgets and little attention is paid to this issue and managers are making less than optimal decisions on advertising budgets. It was identified that optimizing scientific methods were not the basis of many decisions on advertising budget settings. It has also revealed the slowly increasing use of quantitative models and the widespread use of heuristic such as percent-of-sales and competitive parity. Despite the controversies surrounding budget setting for advertisement, the study has been able to provide a leverage of confidence limits such that, regardless of whatever approach adopted, the confidence limit is the guiding star towards achieving 'optimum' budget to reap the benefits of advertisement.

Keywords: advertising budget, confidence limit, response-curve, econometrics, allocation decisions.

Introduction

Advertising is performed to achieve results and the advertiser wants and needs to know what effect advertising will have on his products, customers and potential customers. This expenditure consume scarce resources. Thus, the central problem is how much should be allocated to advertising and the advertiser's interest in this area is to manipulate the situation to his advantage. Forecasts are used to reduce risks and permit him to capitalize his opportunities. The predictive power of knowledge about advertising is severely limited. The lack of clearly formulated theories and law-like relationships is a major constraint (Cannon, 1973).

Advertising budgeting continues to be a controversial topic. Yet, surprisingly, little is known about how managers actually set advertising budgets and little attention is paid to this issue (Carfman et al, 1994). Most research on the advertising budget decision falls into one of the following two categories: normative work concerned with developing optimal rules (Erickson, 1985) and a much smaller body of descriptive work which relies on self-ratings of behaviour (Jones, 1990).

A number of researchers have focused on deriving optimal budgets given various sales response functions. Partly because of the difficulty of specifying the correct sales response function, often researchers have attempted to develop 'reasonable' decisions, often using subjective inputs.

Literature Review

Research and experience have led to the development of techniques and procedures which are capable of making advertising a more efficient and effective tool in the marketing process. The development and use of scientific techniques is critical to the further development of knowledge of the advertising process. The importance of decision-making techniques lies in their ability to give firms a real basis for capitalizing on their increased knowledge.

The allocation of funds and efforts among the elements in the marketing mix is a central problem of marketing. The marketing mix is made up of the price, advertising (promotion), distribution and the product characteristics. The

allocation of funds is frequently a function of corporate tradition and the distribution of funds and other resources is often the result of the demands of 'interest groups' or the 'dominants coalition' within the firm. Spending decisions are frequently subject to organizational realities such as power, politics and, in many companies, budget allocation decisions are subject to competing pressures (Mohr, 1999).

There are five specific factors to consider when setting the advertising budget (Aaker et al 1982, Schultz et al, 1984). These are: stage in the product life cycle, market share and consumer base, competition and clutter, advertising frequency and product substitutability.

Budgeting Approaches or Decision Rules
These rules are the guiding principles for determining the size of the advertising budget. Firms have taken a number of approaches to the establishment of advertising budgets.

(a) The most fundamental approach is the 'affordable method' or 'spend what we can afford'. The criteria here lie in a subjective judgment of advertising value and what the firm wants. Firms with limited resources may decide to spend all that they can reasonably allocate to advertising after other unavoidable expenditure have been allocated. Some larger firms also use this rule. It rests on the assumption that sales are independent of the advertising expenditure. There is no realization that advertising may influence sales. The only reason that advertising is included is that its absence would be difficult to justify.

(b) The percentage of sales approach does give a more substantive, quantitative figure. This approach is also referred to as the 'No Guts No Glory' Approach (Killing & Co, 2005). The firm sets its budget as at a certain percentage of past, current, or estimated future sales. This method creates a competitive stability because competing firms tend to spend about the same percentage of their sales on advertising. Hence, forecasts of increased sales produce increased advertising. This approach can lead to excessive expenditures for well established brands and inadequate expenditures for new and promising brands. It also reduces advertising to an effect of sales.

(c) With the competitive partly approach, the advertising budget is adjusted so that it is comparable to those of competitors. The firm

sets its budget in relation to competitive activity. The limitation here is the danger of 'the blind leading to blind.'

(d) The objective and task method allows for the firm to budget for its advertising in terms of its own goals and needs. The approach is logical in that it assures that there is a causal flow from advertising to sales. In effect, it represents an effort to introduce intervening variable such as awareness or attitude which will presumably be indicators of future sales as well as immediate sales. The shortcoming here is that the link between the objective and immediate and future sales is often not spelt out.

(e) Marginal budgeting method

In recent years, numerous articles have been written about methods and techniques for budget allocation. For instance, Dyson (2002) describes a mathematical process for allocating budget across a portfolio of brands based on advertising response curves and outlines the financial benefits as well as the pitfalls. It has been around formally in economics for over 100 years. Known as Gossen's second law of marginal utility, it is used to explain how consumers trade off their income across goods and services. This method uses the parameters of contribution and fixed costs to determine:

(a) the maximum increase in sales that can be achieved by advertising

(b) the amount to be spent on advertising against the projected sales (or profit) which would be generated as a result.

This approach will always give an 'optimum' advertising spend that is higher than the 'constant profit margin' model which might give an 'optimum' budget that could be larger than the amount available. Another disadvantage is that the profit margin for a particular brand in the market needs to be known before hand. Also, Harper and Bridges (2003) argue that the model is too complicated and a 'black box' for clients to understand and, therefore, constrains the budget allocation process. This has only given how widely used the 'constant profit model is in marketing departments and media agencies (Weaver and Merrick, 2004). However, a balanced approach would ideally combine both of the above budget methods 'd' and 'e' to achieve the set profitability objectives. The marginal method is focused on deciding the amount to be spent and not on the activities that the amount is to be spent on. It can be termed as the 'quantitative method' whereas the 'task oriented method' may be termed as the 'qualitative method' for budgeting and disbursement.

Other approaches are defined by Killian & Co (2005) but they are splinter groupings of the above methods. Despite the ease of these approaches, findings indicate that the advertising budgeting method in practice are more sophisticated than the earlier descriptions in literature (Michel, 1993).

But how does a company know if it will be spending the right amount? If it spends too little, the effect will be neglible, if it spends too much, then some of the money could have been put to better use. This calls for more than the rule of the thumb. A more scientific method is appropriate. A number of alternative approaches have been developed to meet the need for optimal allocation. Decision theory, Linear Programming (LP) Simulation models and Regression Analysis (RA) have been most widely discussed for allocation of resources among the elements of the marketing mix (Cannon, 1973). Buchanan (1942) was one of the earliest economists to deal with price and advertising as simultaneous variables.   The relationship between advertising expenditure, distribution and other promotional variables has also been subjects for research.

Decision models have been used extensively in the attempt to create scientific bases for making decisions in the light of uncertainty and poor information. This approach depends on the assumption that when faced with a decision whose outcome is uncertain, the optimal solution lies in assigning values to consequences and probabilities to events. The act with the highest expected value is then selected. This expected value closely approaches the demands imposed by the goal and is then acted upon. For instance, with a promotional budget of one million monetary value (Naira, dollar etc), the marketing manager can spend the money entirely on media advertising, 50% each on media and non-media or entirely on non-media advertising. A simple decision tree will allow him to arrive at estimates of possible returns with optimistic, realistic and pessimistic as alternative estimates and each with its projected returns. The expected values are arrived at by multiplying the projected returns, in turn, by their probability estimates.

The major problems lie in assigning the correct probabilities and estimating the sales response. In arriving at correct probabilities, past experience, subjective judgments and test information can be used. Bayes' theorem and the Bayesian decision model can be used to estimate probabilities in the face of the uncertainty generated by the lack of information or changed circumstances.

Linear programming (LP) has also been applied in the allocation of marketing mix elements and in many industrial situations (Engel, 1964). It is assumed that each marketing mix variable has a constant and independent effect on profits, sales and media exposure. The central concern is with maximizing the objective function, sales, profits or exposures. This objective function depends on certain variable quantities – advertising, sales-force expenditure, distribution costs and product characteristics. These, in turn, are subject to certain restrictions or constraints – the variable quantities, LP offers a method of estimating the variable quantities which maximizes the objective function within the limits imposed by the constraints. Kotler (1992) offers fuller descriptions of the model. The drawbacks of LP come from the assumptions of constant and independent effects. This is not an accurate picture of the effect of advertising and other marketing mix elements. Diminishing returns to advertising have been identified after a certain level. There is a lagged effect on sales from advertising, which influences the response to changed levels. The elements in the mix may interact to produce responses very different from the sum of the parts.

Simulation is the construction of a model situation which purports to represent the real situation. It is used, mainly, to predict changes in the real world from the changes in the modeled world. In this model, factors which the firm can control – price, distribution and sales force expenditure- are manipulated. This model has been used mainly in business management for problems of competitive bidding, portfolio selection and media scheduling. Though a number of different simulation techniques have been developed, the Monte Carlo method is probably the oldest use of simulation (Meyer, 1956). The central problems of simulation lie in the identification of variables to be included in the model and the formulation of theories regarding their relationships. Together, they represent the limitations of simulation. These approaches can be supported with econometric analysis – a branch of economics. It is its recent use in setting and allocating budgets which now makes it of potential interest. (Stewart, 1978).

Regression Analysis (RA) offers a technique for identifying the factors which the firm controls and their impact upon the factors which the firms does not control and expressing their results in quantitative terms (Batra, Meyers and Aaker, (1996). It permits the measurement of changes in the dependent variable sales, profits or brand shares) which are associated with changes in the independent variables (advertising, price sales force, distribution, product

characteristics). Cannon (1973) points out that it is one of the most commonly used techniques in economic and business studies to study the relationship between two or more variables that are assumed to be causally related. There are univariate (or simple) and multi–variate regression analysis. The former between the dependent variables and any one of the independent variables (e.g. sales versus advertising) while the multivariate permits the analysis of the relationship between the dependent variable and a number of independent variables e.g. sales versus price and advertising. Both are represented mathematically as

$y = f(x)$ for simple regression analysis and $y = f(x_1, x_2…xn)$ for multiple regression analysis: where y represents sales; x represents advertising (or price or even product availability). Hence, in multivariate regression analysis, multi-colinearity exists. This is a situation where some independent variables are not independent of each or one another e.g. increased advertising may compel increased prices and both can affect sales together. The limitation of this model is its inability to fully explore the complexity of marketing problems.

All these models have been tested on the effects of advertising on sales and despite the complexities involved, they indicate that the assessment does not constitute an insuparable problem.

In the determination of sales and advertising expenditure, they do not offer any easy way of putting a value on advertising but they do show how firms, wishing to obtain results and willing to invest time and money, can reap results (Cannon, 1973). Bass (1969) pointed out that these models failed to take into consideration the two-way interaction between these variables, advertising affects sales which in turn affect future advertising. He proposed the use of a simultaneous equation taking into account this two-way interaction of these variables.

The simultaneous equation model uses the general equation of any straight line;

$y = a + bx$ (or $y = mx + c$)

where 'a' and 'b' are constants respectively representing the fixed element and the slope of the line thus:
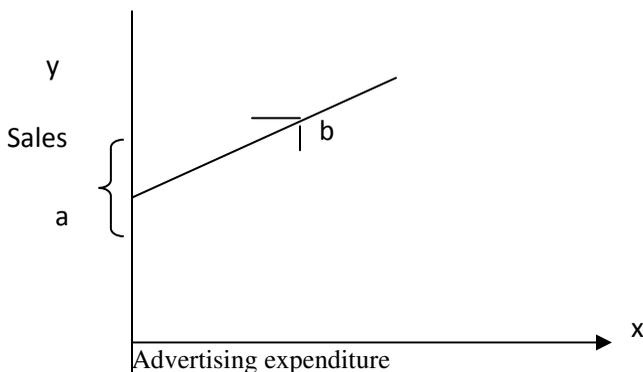
b = ratio of vertical increase in 'y' to the horizontal increase in 'x'.

To find the real values of the constants, it is necessary to solve the simultaneous equation:

$$\sum y = an + b\sum x \quad …………… \text{ equation 1}$$
$$\sum xy = a \sum x + b\sum x^2…………… \text{ equation 2}$$

n = number of pairs of figures representing x, and y.
b = the regression coefficient.

However, values of 'a' and 'b' can be got directly by transposing the normal equations with the formula:

$$a = \frac{\sum y}{n} - \frac{b\sum x}{n}; \qquad b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

Since the simultaneous equation model has been confirmed the best of all these models on the determination of the effect of advertising on sales, it can safely be adopted in this study to put a value on advertising or sales. This model is more realistic and scientific in that the result can be used to:

- predict the sales expected on a particular advertising budget expended;
- predict the level of advertising effort needed to achieve a particular forecast sales;
- to identify the minimum advertising effort needed to start sales generation i.e. the effort that will make sales to respond to the advertising after this critical level or threshold ('a')

It is very essential for marketing firms to understand that increased sales does not always result in increased profits, and it is very essential to clearly define the organization's sales objectives (Shrivastava, 2003).

Methodology
Secondary sources were used to collect the data needed for the study. Three companies were used in the study which included one indigenous company. All the companies were engaged in pharmaceutical manufacturing and marketing /sales. Data analysis was done by using the SPSS statistical software package.

Result and Discussion
All the companies have been established over ten (10) years ago. Table 1 shows the 5 year sales and advertising expenditures for the companies (1998-2003). Fixed percentage method of allocation of advertising expenditure was used by company C while the two other companies also used the fixed percentage but responded to competition by increasing the advertising expenditure. (Table 2)

Table 3 shows the regression table for the three companies. From table 3, the regression line y = a+b x can be determined using the method of Bass (1969) to solve the simultaneous equation:

$\sum y = an + b \sum x$ --   -   -   -   -   (1)
$\sum xy = a\sum x + b\sum x^2$-   -   -   -   -   (2)

Substituting the value from Table 3, the simultaneous equations become:
Company A
       6045.053 = 5a+252.44b - -   -   -   (1)
       323731.01= 252.44a+ 13612.33b- -   -   (2)

Company B
       17150 = 5a + 216b   -   -   --   (1)
       826020= 216a + 10406b - -   -   -   (2)

Company C
       34989.51= 4a + 1.5b   -   -   (1)
       1387914.5 = 1.5a + 0.595b   -   - -   (2)

The positive values of 'b', the regression coefficient of y on x, indicates that a positive correlation exists between sales and advertising expenditures (x and y) i.e. as the advertising expenditure increases, the turnover also increases.

The negative value of 'a' for company C indicates that the intercept is below zero on the y=axis i.e. the sales respond slowly to advertising.

The extent of association of the variables is measured by the Pearson or phi (ø) correlation coefficient, r (Table 5) where:

$$r = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2\sum(y-y)^2}} = \frac{(\sum x\, y)}{\sqrt{\sum x^2 y^2}}$$

And the coefficient of determination,

$$r^2 = \frac{n\sum xy - (\sum x)(\sum y)}{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}$$

Table 5 also shows the standard error, Se, of 'r' calculated from Tables 3 using the formula:

$$Se: \sqrt{\frac{\sum y^2 - a\sum y - b\sum xy}{n-2}}$$

These r^2 values show that 85% of the sales revenue for company A was generated as a result of the advertising expenditure. 89% for company B and 99.8% for company C.

From the regression equation in Table 4, a marketing manager can try to control or predict sales by increasing or decreasing advertising expenditure by the amount that will maximize profit. For instance, the manager for company A can predict the 6th year sales at any given advertising expenditure x, e.g. at 80m Naira (N) advertising level by using its respective equation y = 118.59 + 21.704x → y = 118.59 + 21.704 (80)

= N1854.91m

For company B, y (sales) = N6344.93m; and for
Company C, y (sales) = N 1879.375

The manager can further set a confidence limit for the sales target using the standard error, Se, (Table 5) for the respective company using the equation: y' = z± t Se; y' = forecast sales; z = y (sales) t = critical value of t at the chosen degree of freedom, df, range.

Since the sample size, (number of years), is small, a t-distribution with n-2 degrees of freedom (df) is used. Setting the confidence limit at 95% t-table value at 3df is 3.18. Hence, for company A, z (i.e. calculated y value) = 1854.91 (Table 6) Se= 8793-31 (Table 5), y' = 1854.91 ± 3.18 (8793.31) = 1854.91 ± 27962.73. Hence, sales can vary from N1854.94m to N1854.88m (Table 7).

Therefore, the respective manager can be 95% certain that the expected sales will lie within the range (assuming that past conditions apply in the future) for the chosen advertising effort.

Showing graphically, the 95% confidence limit for the analysis is shown as:
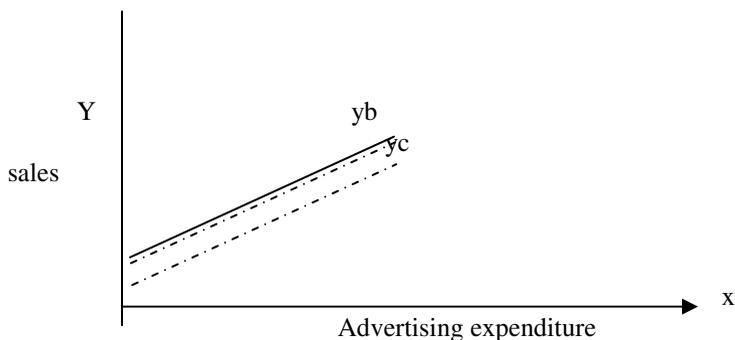
These limits are drawn on the regression lines y_b and y_c at a distance of 3.18 (8793.31) i.e. 27962.73 (Company A); 3.18 (524.35) i.e. 1667.43 (Company B) and 4.30 (9851.48) i.e. 42361.364 (Company C) above and below the regression line y_a.

Subjecting the values in Table 6 to chi-square (X^2) analysis, shows that the calculated X^2 value, 85.69 at 2df, is greater than the Table value 5.99 (95%). This shows that a significant difference exists in the sales of the companies at the same advertising level. Hence, factors other than advertising influence

sales differently for the companies even though there is association between sales and advertising expenditure.

On the other hand, the manager can also forecast the advertising budget to achieve a predetermined sales target. Thus, for a sales target, y, of 7000m (or 7 billion) Naira, calculated advertising expenditure is given by the equation y = a + bx

Thus for company A, y = 118.59 + 21.704x (Table 4)

       7000= 118.59 + 21.704x;

       ➔ x =N317.06m (Table 8)

: - Setting a confidence limit is as shown in Table 9.

The manager for each company can be 95% certain that the expected advertising expenditure to achieve the sales target will lie within the respective range (assuming the condition remain unchanged in the future.)

Also, subjecting the values in Table 8 to chi-square analysis shows that different advertising efforts are needed to achieve the same sales target by these companies. (X^2_{cal}= 153.51: $X^2_{.95}$ (2) = 5.99). Hence a significant difference exists in the advertising efforts of the companies to achieve the same sales target.

Factors other than advertising influence sales and these factors highly favour company B most, followed by company C and least for company A. Sales is, therefore, a function of a number of independent variables:

      $y = f(x_1, x_2 \dots xn)$ (Cannon, 1973).

Therefore, multi-co linearity is a common phenomenon. In pharmaceutical marketing, the influence of personal selling (through the sales force) plays a major role. These people mount pressures on the prescribers to influence their prescribing habit in favour of their company's product(s). The role of samples for trials and sponsorship for medical conferences and seminars can not be under-estimated. These are used to maintain or enhance brand prescription loyalty. The other variables affecting sales are the other elements of the marketing mix- price, product, place and promotion i.e. the 4P's.

Theoretically, there is no limit to advertising expenditure. The correlation analysis showed that increases (or decreases) in advertising expenditure were associated with increases (or decreases) in sales. Hence it could be inferred

that increases in advertising expenditure yielded increases in sales. In practice, this is not so because of the intervening variables (Buchanan, 1942).

Conclusion

In conclusion, advertising is necessary in any marketing concern and the budgeting must not be appropriated as though it is independent of competitive behaviour. Its effect on sales is not independent of the marketing mix in addition to its influence on the habits of the prescribers. All these affect advertising effectiveness.

It has been shown that the model used in this study offers a better scientific technique for allocating advertising expenditure. A number of techniques enumerated in the review exist offering real foundations for practical application and further development. Though they do not offer any easy way of putting a value on advertising, they do show how firms, willing to obtain results and willing to invest time and money, can reap the benefit of advertising. Together, these techniques represent a continuing effort by researchers to bring out the implications of advertising on sales.

Recommendation

The manager must take cognizance of the fact that advertising is not the only factor that affects sales of any marketing organization. The influence of the sales force; as well as the variables of the marketing mix, must be aware of and be encouraged. Hence, sales force management is crucial to sales enhancement. A univariate phenomenon of sales enhancement is merely hypothetical. A significant relationship exists between advertisement and the other elements of the marketing mix. The manager must also be able to estimate the limit of advertisement in enhancing sales.

Advertising is considered to be a stimulus and sales a response to it following the general nature of the stimulus-response functions. As a result, the effect of advertising decreases and flattens out once the respondents are saturated and responses to further increases in advertising effort remains relatively unchanged until the respondents reach super-saturation stage, a point beyond which they respond negatively. This position is supported by the product life cycle concept especially the decline of the cycle where no advertisement can save the product from extinction. Moreover, pharmaceutical sales can not be improved beyond the level necessitated by illness in the society. This is the

necessity effect. Hence, managers must know that there is a limit to advertising and its effort.

For the advertising effort to be effective, companies must do more than offer good products or services. Apart from moving the consumers through the purchasing process, must carefully position these benefits in the minds of the consumers (or prescribers for ethical products). Hence, the manager must make sure that the product meets the physical and psychological need of the consumer for it to sell. The underlying purpose of drug advertisement is to provide a cure for the patient of his/her ailment upon application of the drug product; if not, the advertising budget will not be effective in enhancing sales no matter how perfect the advertising budget was set. This is in consonance with the "means-end chain" model which focuses on the connection between product attributes, consumer consequences (i.e. the result occurring to the consumer especially positive consumer consequences), personal values (desired end states) through the process called "laddering".

Because of the competitive nature of the market, the affordable method of allocating advertising expenditure should be jettisoned because it is crude (not scientific). The use of regression analysis in addition to any of the methods like the fixed percentage of sales forecast, objectives and task method and competitive parity method will allow the company to determine the level of advertising expenditure needed to achieve a particular sales target or the level of sales expected from a given advertising expenditure. The response analysis offers a better scientific technique for identifying the factors which the firm can control and their impact upon factors which the firm does not control and it also affords expressing their results in quantitative terms. Inability to do this is the central problem of simulation. Hence simulation is not an effective method of allocating advertising expenditure. It should be noted that even though the single equation model y = a+ bx assumes a unidirectional flow between advertising and sales, and fails to take into account the two way interaction between these variables (advertising affects sales which in turn affects future advertising) it nonetheless gives a more scientific approach to allocation of advertising expenditure when compared with the 'crude' affordable method. Because of this unidirectional deficiency, the simultaneous equation model is more advantageous in predicting the pattern of behaviour over time on sales.

References
Aaker, A. David and Carman M. James (1982): "Are you overadvertising?" *Journal of Advertising Research* Aug. – Sept. 57-70.

Bass F.M. (1969): 'A simultaneous –equation regression study of advertising and sales of cigarettes' *Journal of Marketing Research,* Vol. 6.

Batra, R. Meyers, J. and Aaker D. (1996). *Advertising Management*, Prentice Hall, N.J.

Buchanan, N.S. (1942): 'Advertising expenditure: a suggested treatments'. *Journal of Political Economy* Vo. 50.

Cannon, T. (1973): *Advertising Research.* Intertext Textbook Co. Bucks, U.K.

Carfman, K.P. and Lehman, D.R. (1994): 'The Prisoners' dilemma and the role of information in setting advertising budget.' *Journal of Advertising,* June.

Dyson, P. (2002): Setting the communications budget. *Admap,* November.

Engel, J.F (1964): 'Allocating advertising dollars by linear programming' *Journal of Advertising Research*, Sept.

Erickson, G.M. (1985): 'A model of Advertising Competition' *Journal of Marketing Research,* 22; (August), 297-304.

Harper, G and Bridges, D. (2003): Budgeting for healthier ROl. *Admap*, July/August.

Jones, J.P (1990): "Ad Spending: Maintaining Market Shares" *Harvard Business rEview;* 68 (Jan-Feb); 38-48.

Killian & Company (2005): 'Setting Ad Budgets: The Strategic Approach' A White Paper for Marketing Professionals. Killianadvertising.com.

Kotler, P. Lilien, G.L and Moortly, K.S. (1992): *Marketing Models.* Upper Saddle River, Prentice Hall N.J. Ch. 6)

Meyer, H.A (1956): *Symposium on Monte Carlo Methods:* John Wiley & Sons Inc.

Mitchel, L.A. (1993): 'An Examination of Methods of Setting Advertising Budgets: Practice and the Literature' *European Journal of Marketing,* Vol. 27 Number 5.

Mohr, J.J (1999): 'Setting Advertising and Promotion Budgets in Multi-Brand Companies'. *Journal of Journal Advertising Research Jan.*

Schultz, D.E., Martin, D. and Brown, W.P. (1984): Strategic Advertising Campaigns, Chicago, Grain Books, pp 192-97.

Shrivastava, R. (2003): 'Optimizing Advertising Budgets and Estimating Returns on Investments'. School of Broadcasting and Communication. research@sbc:

Stewart, M.J. (1978): 'The long-term effects of econometrics' *Admap,* Feb. 64-69.

Weaver K and Merrick, D. (2004): 'Budget Allocation revisited' *Admap:* July/August.

Table 1 shows the sales and advertising expenditure of the three companies A, B and C.

Year	Company A (Nm)		Company B (Nm)		Company	
	Advert. Exp. (x)	Sales (y)	Advert. Exp. (x)	Sales (y)	Advert. Exp. (x)	Sales (y)
1	35.5	927.980	24.00	2370.00	0.25	5.8
2	40.25	1037.625	33.00	2580.00	0.35	8.2
3	45.10	1052.000	40.00	2600.00	0.40	9.3
4	61.32	1247.000	54.00	4000.00	0.50	11.7
5	70.27	1780.448	65.00	5600.00	-	-
Total	252.44	6045.053	216	17150	(1.5m)	(35m)
Mean	50.49	1214.41	43.20	34.30	0.38	8.75

Table 2: The advertising expenditures for the three companies as percentage of sales

	Company A	B	C
1	3.83	1.3	4.3
2	3.88	1.3	4.3
3	4.29	1.5	4.3
4	4.92	1.35	4.3
5	3.95	1.16	4.3

Tables 3 shows the correlation contingency tables for the three (3) companies
Company A

Year	X	Y	XY	X^2	Y^2
1	35.50	927.98	32943.29	1260.25	861146.84
2	40.25	1037.625	41764.41	1625.06	1076665.64
3	45.10	1052.00	47445.20	2034.01	1106704.0
4	61.32	1247.00	76466.04	3760.14	1555009
5	70.27	1780.448	125112.08	4937.87	316999508
n= 5	$\sum X$=252.44	$\sum Y$= 6045.053	$\sum XY$= 323731.01	$\sum X^2$= 13617.33	$\sum Y2$ = 7769520.60

Company B

Year	X	Y	XY	X^2	Y^2
1	24	2370	56880	576	5616900
2	33	2580	85140	1089	6656400
3	40	2600	104000	1600	6760000
4	54	4000	216000	2916	16000000
5	65	5600	364000	4225	31360000
n= 5	$\sum X=$ 216	$\sum Y=$ 17150	$\sum XY=$ 826020	$\sum X^2=$ 10406	$\sum Y^2=$ 66393300

Company C

Year	X	Y	XY	X^2	Y^2
1	0.25	5.8	1.45	0.0625	33.64
2	0.35	8.2	2.87	0.1225	67.24
3	0.40	9.3	3.72	0.1600	86.49
4	0.5	11.7	5.85	0.2500	136.89
n= 4	$\sum X=$ 1.5	$\sum Y=$ 35	$\sum XY=$ 13.89	$\sum X^2=$ 0.595	$\sum Y^2=$ 324.26

Table 4 shows the calculated values of the variable 'a' and 'b' for the companies respectively:

Company	a	b	Y=a+bx
A	118.59	21.704	y = 118.59 + 21.704x
B	8.13	79.21	y = 8.13+79.21x
C	-0.625	23.5	y = -0.625+23.5x

Table 5 shows the correlation coefficient and standard error of r

Company	r	r^2	Se of r
A	0.924	0.854	8793.31
B	0.944	0.891	524.35
C	0.999	0.998	9851.48

Table 6 showing the expected sales for the fixed adverting expenditure

Company	Sales (Z)	Advertising exp.
A	1854.91	80
B	6344.93	80
C	1879.38	80

Table 7: The comparative sales range for a pre0determined advertising effort.

Company	y= a+bx	z+t (Se) (or y')	t
A	1854.91	1854.94 to 1854.88	3.18
B	6344.93	6344.932 to 6344.928	3.18
C	1879.38	1879.42 t 1879.33	4.30

Table 8: Showing the expected advertising expenditure to achieve a sales target

Company	Sales (Nm)	Advertising
A	7000	317.06
B	7000	88.27
C	7000	297.99

Table 9: The comparative advertisement expenditure confidence limit for a predetermined sales target

Company	y=a+bx (for x)	Z+t(Se) (or x^{1}value	t
A	317.06	317.09 to 317.03	3.18
B	88.27	88.272 to 88.268	3.18
C	297.90	297.94 to 297.86	4.30