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**MODELING MARKETING RESEARCH EFFICIENCY  
– SOME THEORETICAL NOTES**

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**Abstract:** In this article the author refers to the problem of modeling the marketing research efficiency based on a theoretical description of GMREM model. The issues include the nature and functionality of the GMREM. In the first part of the text a one-equation model was constructed in which the effects of companies business activities are dependent on marketing activities, including marketing research. The second part presents a model of interdependent multiple equations. Ultimately a model in which the model parameters change over time is also considered.

**Keywords:** marketing research, efficiency, GMREM model.

## 1. Introduction

A proper description of the market (according to information on conducted research) is a basic foundation for the design and modification of marketing strategies and the evaluation of a company's performance. The market is a basic unit of analysis and a good starting point for companies in running an effective business [Assmus 1977; March Sutton 1997; Czubała Niestrój 2004, p. 100], provided it delivers a high quality of market information at a moderate or (at least) low cost.

The concept of efficiency is borrowed from the subject of mechanics (productivity) from the science of physics and is defined as the ratio of the effect produced to energy expended. In the present context, marketing research efficiency might refer (in its simplest form) to the ratio of net profits (effects produced) to costs (expenditures) for a specific explored or researched segment of the market. Thus the relationship between marketing research efficiency and marketing research efforts is influenced by iterative mechanisms, and usually marketing research will influence results (profits levels) *indirectly*.

The efficiency of marketing research can be viewed in one of the following five ways:

- 1) an increase in net profits proportionately greater than the corresponding increase in marketing research costs,
- 2) an increase in net profits with the same level of marketing research costs,

- 3) an increase in net profits with a decrease in marketing research costs,
- 4) the same net profits with a decrease in marketing research costs,
- 5) a decrease in net profits proportionately less than the corresponding decrease in marketing research costs.

If marketing research efficiency impacts on company performance indirectly, therefore a better understanding of the nature of research efficiency must be based on the appropriate (selected for analysis) **mediating parameters** beside profit. Still in many cases marketing research is not only a profit-generating function. As a result one faces the problem as for what other input and output measures should there be used? Dividing profits by the marketing research expenditures is not the only and sufficient option of the analysis. Unlike advertising or sales force expense, marketing research does not directly touch only the financial dimension. Therefore its impact on company performance should be mediated by different marketing activities (e.g. marketing-mix) a company carries out, based on its research.

## 2. Input and output measures in GMREM model

Let us now assume that we have the following group of observations  $n$  (companies)  $\{x_i\}_{i=1}^n$  at variable  $X$  described in the vector of  $\mathbb{R}^p$  whereas at every observation  $x_i$  appears  $p$  dimensions:  $x_i = (x_{i1}, x_{i2}, \dots, x_{ip})$ , which are observable values of the variable vector  $X \in \mathbb{R}^p$ . As a result  $X$  will be composed of  $p$  variables, as follows:  $X = (X_1, X_2, \dots, X_p)$  where:  $X_j$ , for  $j = 1, \dots, p$ , is unidimensional structure of variables.

A metrical approach to marketing research efficiency analysis (GMREM – *Generalized Marketing Research Efficiency Model*) will be based on relations between independent variables, (e.g. costs for marketing research and other marketing mediating activities) and a dependent variable – profits (including the dynamics of independent variables affecting the dependent variable in the course of time) – which will be defined as a function [Dyduch 2007; Garbarski 2008; Tarka 2011]:

$$Y_t = \varepsilon^{b_0+u_t} X_{1t}^{b_1} + X_{2t}^{b_2} + X_{3t}^{b_3} + X_{4t}^{b_4} + X_{5t}^{b_5} + X_{6t}^{b_6} + X_{7t}^{\beta_7} + X_{8t}^{\beta_8} + X_{9t}^{\beta_9} + X_{kt}^{b_k}, \text{ for } t = 1, 2, \dots, T \quad (1)$$

where:  $Y_t$  – profits, or other: market share, ROI, cash flows etc.,

$X_{1t}^{b_1}$  – costs of marketing research, e.g. costs on the particular method:  
 \*design and preparation of the research, \*data collection, \*data analysis, \*transformation data structures into information and \*reports.

And simultaneously **mediating costs** are:  $X_{2t}^{b_2}$  – costs of advertisement,  $X_{3t}^{b_3}$  – costs of promotion,  $X_{4t}^{b_4}$  – costs of public relations,  $X_{5t}^{b_5}$  – costs of “customers education”,  $X_{6t}^{b_6}$  – costs of market development,  $X_{7t}^{b_7}$  – costs of sales representatives,  $X_{8t}^{b_8}$  – costs of offices,  $X_{9t}^{b_9}$  – costs of client services,  $X_{kt}^{b_k}$  – other costs of marketing,  $t$  – process in the course of time.

As observed, the output measure/s, e.g. **marketing or global company’s results measures** (such as profits, market share, ROI, cash flows etc.) considered from the prospect of time, are strongly connected to marketing research costs and also other marketing mediating activities – that is efforts undertaken by a company that complement each other. For example, in the case of marketing research costs – a well selected analytical methods used for data analysis – make the generated marketing information more reliable, credible and useful for decision makers which have a further impact on the financial aspect of running the company’s activity. Thus we usually would expect here a positive (in plus) relation between that input variable which is part of the whole research process and which plays significant role for the final “product” e.g. marketing research efficiency [Mynarski 2006; Pociecha 1996, pp. 190, 191; Palmatier et al. 2006].

### 3. Specification of parameters in GMREM

By specifying the parameters function we describe the way in which the marketing research efficiency model is created. Therefore, the parameters function should reflect the theoretical knowledge about the subject being the focus of our investigation. The assumption, however, is that we specify a *model a priori*, on the basis of theoretical knowledge, rather than use adaptive or data-driven modeling. And in order to accommodate a priori knowledge, the marketing research efficiency parameters need to meet the following three conditions:

1. It should be based on *interactions* (e.g. complementarity between marketing research efficiency e.g. profits and support of data analysis, data collection, etc. as marketing research costs and other marketing mediating activities such as: promotion, advertisement, etc.). This condition is met by performing a predictive test on the marketing research efficiency parameter function. For example, a positive regression parameter may imply complementarity.

2. The parameters should be preferably differentiable.

3. It also should be tractable for statistical estimation. Working with functions that can be transformed to nonlinearity from linearity seems to be desirable.

Then the marketing research efficiency parameters are analyzed with one or more interaction based measures. To examine the issue in some detail, let us consider for example of two hypothetical marketing research activities  $X_1$  (“data analysis”) and

$X_2$  (“data report”) – described as expenditures (research costs), and additionally – one environmental marketing mediating activity  $Z$

$$Y = cX_1^{b_1} X_2^{b_2} Z^{b_3} e^u, \quad (1a)$$

$$b_1 = f_1(X_2, Z, \varepsilon_1), \quad (1b)$$

$$b_2 = f_2(X_1, Z, \varepsilon_2), \quad (1c)$$

where  $f_1$  and  $f_2$  are continuous.

The use of a marketing research parameters function implies a causal statement about marketing research effects. For example, a good “data analysis” increases “final product” (that is “data report”) which will further impact on the decision making process and thus generated profits in company.

In order to accommodate more input and output measures in the model, one must specify a multiple-equation function (as partly indicated in (1) [Tarka 2011]:

$$Y = f_1(X, Z; b, g; u) \quad (2a)$$

$$b = f_2(X, Z; c, d; \varepsilon) \quad (2b)$$

where:  $Y$  – output measures of marketing research efficiency,  
 $X$  – input measures of marketing research costs (expenditures) influencing  $Y$ ,  
 $Z$  – other marketing mediating activities hypothesized to influence  $Y$ ,  
 $b$  – the efficiency parameter of the marketing research and  $g$  – marketing mediating activity parameter,  
 $c, d$  – marketing research, and marketing activity being *explained in the process* that is equal or related to efficiency parameter  $b$ ,  
 $u, \varepsilon$  – disturbance terms in the standard assumptions of the model.

Thus we obtain a complete **marketing research model for efficiency with interactions**. Equation (2a) describes simply the relation between marketing research costs, and also other marketing activities along with marketing research results (profits). Equation (2b) is the selected **efficiency parameter function** of marketing research, which is describing the process of generating impact on marketing research efficiency. In other terms, introduction of marketing research function will result in a varying-parameter model with efficiency equation (2a), and parameter equation (2b).

#### 4. Estimation of GMREM with interactions based on time series

There are possibly a few types of marketing research efficiency functions with interactions. One of them in the context of linear models is the well-known classical

regression. For instance for multiple set of measures it can be related to (2a) as follows:

$$Y = b_0 + b_1X_1 + b_2X_2 + u, \quad (3a)$$

$$b_1 = c_0 + c_1X_2. \quad (3b)$$

And the multiplicative efficiency model is constructed:

$$Y = b_0X_1^{b_1}X_2^{b_2}e^u, \quad (4)$$

which incorporates marketing research based on interactions directly in the efficiency function, as the effect of  $X_1$  (e.g. “data analysis”) on  $Y$ , which is a function of the levels of  $X_1$  and  $X_2$  (e.g. “data presentation”).

The estimation of a model with interactions is greatly facilitated by using the general linear model. This approach is not overly restrictive, as one can often linearize a complex but realistic market model. As the efficiency of marketing research will be estimated here based on time series, then interactions can be assumed by specifying the marketing research parameters function to vary over time. When the marketing parameters function varies over time, the model is specified as a pure time-varying parameter model.

More importantly with the time series, the marketing research parameter function (when that function is estimated over time) shows dynamics of marketing research efficiency which can be modeled. However, the variability of the data should be relatively large to avoid collinearity problems in estimating interactions. By incorporating the time subscripts into the model, we can accept the **time-varying parameter model**.

$$Y_t = \sum_k X_{kt} \beta_{kt} + \mu_t, \quad (5a)$$

$$\beta_{kt} = \sum_m z_{mt} \alpha_{km} + \varepsilon_{kt}, \quad (5b)$$

where:  $Y_t$  – output measure of marketing research efficiency (profit) for time period  $t$ ,

$X_{kt}$  – input measure (cost) of  $k$  of marketing research for time period  $t$ ,

$z_{m,t}$  – input measure of marketing activity for time period  $t$ ,

$b$ 's and  $a$ 's – parameters;

$u_t$  and  $\varepsilon_{kt}$  – disturbance terms.

## 5. Conclusions

As marketing research budgets increase, the need for a thorough cost/benefit analysis becomes urgent. In a company before the marketing research expenditures (costs)

will be approved, it should be compared in advance with the return that can be made or at least expected from conducting the proposed research. The application of the GMREM model is one of many solutions and it is recommended for those companies that want to evaluate its marketing research efficiency in order to see if the benefits from its application will outweigh its costs. Still in marketing research there appears a problem of costs distribution and their evaluation from the viewpoint of efficiency.

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## MODELOWANIE EFEKTYWNOŚCI BADAŃ MARKETINGOWYCH – KILKA UWAG TEORETYCZNYCH

**Streszczenie:** W artykule autor nawiązuje do problematyki modelowania efektywności badań marketingowych poprzez teoretyczny model GMREM. Omawiane zagadnienia dotyczą istoty i funkcjonalności modelu GMREM. W pierwszej części niniejszego tekstu skonstruowano model jednorodnaniowy, w którym efekty działań przedsiębiorstwa uzależnione są od działań marketingowych, w tym badań marketingowych. W części drugiej przedstawiono model wielorodnaniowy o równaniach współzależnych, w którym pojawiają się równania parametrów będących miarami efektywności badań marketingowych. Ostatecznie rozważany jest także model, w którym parametry modelu są zmienne w czasie.

**Słowa kluczowe:** efektywność, badania marketingowe, model GMREM.