REPLY*

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REPLY TO FARRIS AND BUZZELL'S COMMENT ON ADVISOR 2 PAPER†

GARY L. LILIEN‡

Farris and Buzzell's [4] comment on my [5] paper on the ADVISOR studies and its relationship to their work with the PIMS data calls for clarification of the methodology, objectives and results of both studies. We will show that the ADVISOR models present strong evidence in favor of a descriptive model of advertising/sales expenditures that is *not constant* with the dollar level of sales. This directly addresses the contention by Farris and Buzzell that modeling the A/S ratio as a constant is theoretically and empirically valid. We then explore some of the differences between the Farris-Buzzell analyses and ADVISOR that are important in understanding where and why the results differ. Next we elaborate on some of the validation analyses done for ADVISOR. Finally, we discuss in more detail the reasons for handling product profitability through a variable called product plans in the ADVISOR model.
(INDUSTRIAL MARKETING)

1. Objectives and Methodology

The objectives of the ADVISOR study were to provide descriptive models of industrial marketing budgeting practice [5, p. 192]. As such, we first must ask if product sales should be considered as a dependent or independent variable in an equation of advertising budgeting for industrial products. This point was addressed in an earlier paper: "Percent of sales decision rules are a pervasive influence in setting advertising budgets," [6, p. 22].

Buzzell and Farris' key question addresses the structure of that percentage: is it appropriate to model it as a constant modified by effects from other independent variables? In the ADVISOR analysis, the following functional form for advertising is used:

$$\text{Advertising} = f(X_1 \cdots X_n) \cdot \text{Sales}^{\beta} \cdot \epsilon \tag{1}$$

where $X_1 \cdots X_n$ are product and market characteristics and ϵ is a random disturbance term, and where we assume $\log \epsilon$ is normal with mean zero and constant variance. (1) is equivalent to a model of the following form:

$$\text{Advertising/Sales} = f(X_1 \cdots X_n) S^{\beta - 1} \cdot \epsilon \tag{2}$$

Assume that sales and one of the X_i's (market share, say) are highly related. If

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‡ Massachusetts Institute of Technology.

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model (2) were mis-specified so that $S^{\beta-1}$ was left out, then the coefficient of market share would be different than if S were included in the model. The least squares estimates for the market share coefficient would be biased due to the model mis-specification. (This argument is, in fact, made in [5, p. 200]). Thus we must carefully consider whether industrial advertising spending reflects constant returns to scale in order to avoid model mis-specification.

But what does constant returns to scale from industrial marketing activities mean? By definition, constant return to scale means that, ceterus paribus, as the sales level goes up, the advertising to sales ratio should remain constant. Three possible situations are illustrated in Figure 1. In the form suggested in (2), then, the hypothesis of constant returns to scale is equivalent to the hypothesis that $\beta - 1$ is not significantly different from zero. In the advertising equation [5, Table 3], β was estimated as 0.618 with a standard deviation of 0.107. The hypothesis of constant returns to scale is then *rejected* at the 0.0001 level.

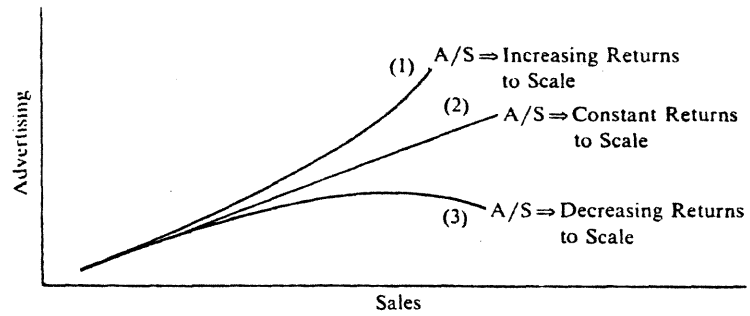

FIGURE 1. Increasing, Decreasing and Constant Returns to Scale.

Farris and Buzzell present several arguments why modeling the A/S ratio, separate from the sales level, is reasonable. The references they use to support their arguments (Comanor and Wilson [2] and Ornstein [7]) come from studies at the firm or industry level, not for individual products, the focus of the ADVISOR studies. As the PIMS data base only includes ratios and not raw advertising or sales figures, the ADVISOR results cannot be checked by analysis on the PIMS data.

The data and analysis performed by Farris and Buzzell and reported in two separate papers ([1] and [3]) differ somewhat from that performed in the ADVISOR study. First, the analyses are not directly comparable, as a PIMS business can cover more than a single product, and is generally a broader business unit than an ADVISOR product.

Next, the Farris-Buzzell (FB) sample includes product manufacturers who "reported less than 50% of their sales were used by individuals or households." Thus, some businesses included in the FB study might have substantial activities in consumer markets. ADVISOR products were developed as products that were exclusively industrial. Products that used pull-through advertising to consumers for more than 10% of their advertising budget were excluded from analysis.

2. ADVISOR Validation Analyses

In critiquing the ADVISOR work, Farris and Buzzell point out the need for reporting split sample results for regression studies. Validation results are reported

here for the advertising equation. The means and standard deviations of the variables in the ADVISOR model are given in Table 1, along with comparable statistics for two sample splits, developed following suggestions by Snee [8]. Table 2 gives the associated correlation matrices, and Table 3 compares the regression results. The analysis suggests that the parameters of the model are quite stable. Similar results have been developed for the other ADVISOR models.

TABLE 1

Full and Split Sample Means and Standard Deviations: Advertising Model Variables

	Full Sample		Split A		Split B	
	Mean	S.d.	Mean	S.d.	Mean	S.d.
LADV	4.35	2.08	4.27	1.97	4.65	1.45
LSLS	9.25	1.83	9.21	1.74	9.42	1.82
LUSERS	7.35	3.96	7.51	3.99	7.20	3.76
LCONC	0.17	0.18	0.18	0.17	0.16	0.20
LSPEC	0.26	0.26	0.26	0.24	0.24	0.23
LCYCLE	0.62	0.49	0.60	0.44	0.62	0.24
PLANS	0.27	0.48	0.28	0.46	0.26	0.44
	$N = 110$		$N_A = 55$		$N_B = 55$	

TABLE 2

Correlation Matrices—Advertising Model

Full Sample, $N = 110$

	LADV	LS74	LUSERS74	LSPECIAL	LCONC	LCYCLE
LADV						
LS74	0.524					
LUSERS74	0.307	0.136				
LSPECIAL	− 0.128	0.188	− 0.083			
LCONC	− 0.242	− 0.195	− 0.122	− 0.060		
LCYCLE	− 0.001	0.317	0.207	− 0.040	− 0.228	
PLANS	− 0.273	0.103	0.030	− 0.149	− 0.092	0.084

Split A, $N = 55$

	LADV	LS74	LUSERS74	LSPECIAL	LCONC	LCYCLE
LADV						
LS74	0.53					
LUSERS74	0.32	0.12				
LSPECIAL	− 0.11	0.19	− 0.09			
LCONC	− 0.26	− 0.18	− 0.10	− 0.08		
LCYCLE	0.05	0.29	0.18	0.02	− 0.24	
PLANS	− 0.26	0.12	0.02	− 0.16	− 0.13	0.06

Split B, $N = 55$

	LADV	LS74	LUSERS74	LSPECIAL	LCONC	LCYCLE
LADV						
LS74	0.54					
LUSERS74	0.28	0.17				
LSPECIAL	− 0.14	0.16	− 0.04			
LCONC	− 0.22	− 0.21	− 0.14	− 0.03		
LCYCLE	0.03	0.32	0.24	0.06	− 0.18	
PLANS	− 0.22	0.08	0.07	− 0.11	− 0.11	0.09

TABLE 3

Advertising Model Fit—Validation Analysis

	Coefficient							
	Constant	LSLS	LUSERS	LCONC	LSPEC	LCYCLE	PLANS	*F*-RATIO
Full Sample	− 0.65	0.62	0.10	− 1.88	− 1.99	− 0.89	− 1.50	
$N = 110$		(9.1)	(3.6)	(3.1)	(4.4)	(3.7)	(6.0)	25.0
SPLIT A	− 0.90	0.69	0.12	− 2.35	− 2.88	− 0.91	− 1.73	
$N = 55$		(6.2)	(2.5)	(3.0)	(2.6)	(2.1)	(4.3)	11.8
SPLIT B	− 1.06	0.69	0.11	− 2.30	− 1.46	− 0.84	− 1.46	
$N = 55$		(5.5)	(2.1)	(2.4)	(1.3)	(1.8)	(3.0)	8.5

	R^2/FIT	R^2/PREDICTION ON OTHER SAMPLE HALF
FULL SAMPLE	0.59	—
SPLIT A	0.59	0.50
SPLIT B	0.52	0.46

Note: *t*-stat in (−)

3. Profitability and Product Plans

Areas that call for elaboration are the impact of profitability and the relationship of product plans on the models.

We were concerned about the lack of a positive relationship between marketing and product profitability in the pilot work on the ADVISOR study. Although dynamic economic theories exist to the contrary, we generally agreed with Farris and Buzzell that high profitability products ought to be promoted more heavily. We concluded that it might be a measurement problem and included detailed questions about channels of distribution so that we could calculate both gross product profitability and net profitability, calculated as price minus product cost minus marketing costs

TABLE 4

The PLANS *Variable*

"During 1972–1975 product plans and objectives might have been developed for the product (increase market share by 10%, enter new market area, leave certain unprofitable markets, etc.). If such plans were developed, please indicate their main emphasis by checking up to but no more than three items for each year below:

	1975	1974	1973	1972
a. Increase share	☐	☐	☐	☐
b. Maintain shares	☐	☐	☐	☐
c. Leave unprofitable market	☐	☐	☐	☐
d. Improve image	☐	☐	☐	☐
e. Retaliate against competitive action	☐	☐	☐	☐
f. More fully utilize capacity	☐	☐	☐	☐
g. Stimulate distribution channels	☐	☐	☐	☐
h. Support price	☐	☐	☐	☐
i. Decrease selling costs	☐	☐	☐	☐
j. Increase product quality	☐	☐	☐	☐
Other (Specify) _____	☐	☐	☐	☐

$X_a = \begin{cases} 1 \text{ if question } a \text{ above is checked,} \\ 0 \text{ if otherwise.} \end{cases}$

Likewise, for X_b, X_c, etc.

Let PL = $X_a + X_e + X_f + 0.5(X_d + X_g) - X_c$

If PL $\geq$ 0.5, PLANS = 1

If PL $<$ 0.5, PLANS = 0

minus dealer discounts for each product. Our analyses were unable to determine a relationship. We reviewed the problem on a case-by-case basis with the participating companies and learned the following: some products get high levels of spending because they are profitable. Others have low margins because of low utilization of production facilities. Here each unit of product either carries a larger amount of overhead or is produced in inefficiently small volumes. These products see higher levels of spending when their margins are low, in order to boost sales and raise those margins.

We developed a variable called PLANS to resolve those issues partially: Table 4 reproduces that question and shows the operational definition of the PLANS variable. This definition was developed in close consultation with the representatives from the participating companies. We remain unsatisfied with this tack, but we have found no objective way to separate these two effects relating to product margins. The problem might be relieved if we were to perform analysis at a slightly more aggregate level (such as a PIMS business versus an ADVISOR product) in line with the Farris-Buzzell analyses.

5. Conclusion

To summarize, ADVISOR is, as Farris and Buzzell suggest, one in a long line of studies. It derived from a need felt by industrial marketing practitioners to develop a base of knowledge that did not exist. As such it is limited in scope (industrial marketing) and in participation (a total of 29 companies over the two phases). Our objectives were to improve understanding in a limited area and to lay a foundation for future work. We feel we have succeeded to some degree.

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