RESEARCH PAPER: 1995-1

MEASURING EXPOSURE TO ADVERTISING: A LOOK AT GROSS RATING POINTS: REVISITED

BY
Jonq-Ying Lee
Mark G. Brown
Senior Research Economists

FLORIDA DEPARTMENT OF CITRUS
Economic and Market Research Department
P.O. Box 110249
Gainesville, Florida 32611-2049 USA
Phone: 352-392-1874
Fax: 352-392-8634
Email: jonqying@ufl.edu

www.floridajuice.com

Measuring Exposure to Advertising: A Look at Gross Rating Points: Revisited

Jonq-Ying Lee and Mark G. Brown

*Jonq-Ying Lee and Mark G. Brown are research economists of the Economic and Market Research Department of the Florida Department of Citrus.

Measuring Exposure to Advertising:
A Look at Gross Rating Points: Revisited

How to measure advertising effort has been a problem in studies of the impact of advertising on demand. Many alternative measurements have been recommended, such as advertising expenditures, gross rating points (GRP), and advertising recall. GRP is a measure of the average number of times a target audience is exposed to an advertising message during some specific time period (Aaker and Myers[1]; Sachs[2]; Chang and Kinnucan[3]) and is the product that an advertiser purchases. As such, one would expect GRP to be a good measurement of advertising effort and an appropriate variable for studies of the impact of advertising on demand. However, due to a variety of reasons, the use of GRP in advertising impact studies is scarce (see Lee and Brown[4] for an example of using GRP in an advertising impact study). Instead of using GRP, most advertising impact studies have used advertising expenditures as the measurement for advertising effort.

Chang and Kinnucan[3] explain why advertising expenditure has been used as the measurement of advertising effort instead of GRP. Chang and Kinnucan present a discussion about the strengths and weaknesses of GRP in comparison to advertising expenditures, focusing on the correlation between GRP and expenditures using information on butter television advertising programs provided by the Dairy Bureau of Canada. In our study, we revisit the similarities and differences of using GRP and advertising expenditures using Florida generic orange juice advertising data for the period from July 1991 through September 1994 as an example, and demonstrate that one should not expect that a close association exists between GRP and advertising expenditure as found in the CK study.

GRP Versus Advertising Expenditures

Chang and Kinnucan presented three types of association between advertising expenditures and GRPs in terms of simple and Spearman rank correlations: (1) between advertising expenditures and GRPs, (2) between deflated advertising expenditures and GRPs, and (3) between percentage changes in advertising expenditures and GRPs. Chang and Kinnucan found that the correlation between GRP and advertising expenditures was general low. In addition, Chang and Kinnucan made the following observations: (1) the correlation between GRPs and expenditures appears to be highest when the expenditure data are not deflated and (2) correlation coefficients derived from levels and percentage changes lead to different conclusions about the association between expenditures and GRPs.

Chang and Kinnucan explained that the low correlation between GRP and deflated advertising expenditures was because deflating expenditures with either the consumer price index (CPI) or the media cost index (MCI) vitiated their attempts to remove the effects of inflation from the nominal expenditure series. Moreover, the deflated advertising expenditure series may not have coincided with the unknown advertising effort while the GRP series did. Chang and Kinnucan also indicated that percentage changes are scale-independent and more informative for detecting a nonlinear relationship between variables; a low correlation in terms of percentage changes, regardless of the reasonably high correlations in terms of levels, led them to believe that expenditures and GRPs in practice may not be equivalent measures for advertising exposure.

In general, GRP and advertising expenditures should have a close correlation. However, due to the differences in the target audience, media used, and the time the advertising activities were executed, the correlation between GRP and advertising expenditures may not be as high as

CK expected. The simple correlation between GRP for an audience comprised of individuals between 18 and 49 years old (or homes) and advertising expenditures for the Florida Department of Citrus (FDOC) orange juice television commercials during the study period are 0.72 (or 0.80). The reason for the less than perfect correlations between GRP and advertising expenditures can be explained as follows.

First, the target audience of each advertisement may differ. For example, milk advertising targets different age groups with different messages, e.g., children are targeted using a theme that indicates milk helps growth or older females are targeted using a theme that indicates milk strengthens their bones. Different targeted audiences may have different preferences regarding when and what programs to watch; e.g., children may watch cartoons during Saturday mornings and older women may watch soap operas during afternoon hours. As a result, the per GRP cost may differ depending on when and where the commercial is aired. For example, the average per home GRP costs for the afternoon (between 12 noon and six o'clock in the afternoon) and prime time (between six o'clock in the afternoon and eleven o'clock in the evening) for the study period are $2,214 and $4,945, respectively. Advertising cost per GRP may also differ depending on the media used. For example, the average per home GRP cost for the ABC and NBC networks during the study period were $4,737 and $3,293, respectively.

The cost per GRP may differ depending on the length of the commercials; e.g., 15-second commercials or 30-second commercials. GRP is a measure of the percentage of targeted audience reached by the advertisement and does not provide information on the length of the commercial. For example, for a given number of GRP for a specific audience, the per GRP cost for a 30-second television commercial is higher than a 15-second television commercial. The average cost

per home GRP for 15-second and 30-second commercials are $2,738 and $3,930, respectively, for the CBS network during the study period.

A simple regression analysis was conducted to explore the factors which determine the cost of television commercials for FDOC orange juice advertising programs. Since GRP is the commodity that advertiser purchases, the following relationship is assumed between GRP and advertising expenditures

$$(1) \quad Exp_{it} = \alpha_0 + \alpha_1 Aft_{it} + \alpha_2 Prime_{it} + \alpha_3 Time_{it} + \alpha_4 CBS_t + \alpha_5 ABC_t + \alpha_6 NBC_t + \alpha_7 ONW_t + \alpha_8 D30_{it} + e_{it},$$

where Exp_{it} is the advertising expenditure for orange juice using network i during time t; Aft_{it} is a dummy variable for afternoon commercials (12 noon through 6:00 pm) on network i during time t; $Prime_{it}$ is a dummy variable for prime time commercials (6:00 pm through 11:00 pm) on network i during time t (morning, 6:00 am through 12 noon, is used as the base for comparison); $Time_{it}$ is a time trend variable for commercial i during time t; CBS_t is the estimated GRPs for orange juice on the CBS network during time t; ABC_t is the estimated GRPs for orange juice commercials on the ABC network during time t; NBC_t is the GRPs for orange juice commercials on the NBC network during time t ; ONW_t is the estimated GRPs for orange juice commercials on the networks other than CBS, ABC, and NBC during time t; $D30_{it}$ is a dummy variable which equals unity if the ith commercial took 30 seconds to finish, otherwise (i.e., 15-second commercials) it equals zero; e_{it} is the disturbance term; and αs are parameters to be estimated.

Advertisers usually do not purchase advertising time directly from networks or independent stations. Instead, advertising agencies purchase blocks of advertising time from networks or independent stations then resale the time in pieces to advertisers. The cost of

advertising, therefore, depends on the advertising agency's bargaining ability to purchase advertising time from networks or stations and how the advertising agency sells the advertising time to advertisers. After an advertising agency is hired, the advertiser usually asks the agency to recommend a commercial schedule. The recommendation from the advertising agency usually includes a schedule of estimated GRPs for the advertising period and how much it is going to cost the advertiser. Generally, the total number of GRPs during the advertising period is guaranteed, i.e., if the actual GRPs are lower than the estimated GRPs, then the advertising agency would give free commercial time to the advertiser to make up the shortage. Therefore, the estimated GRPs and actual GRPs should be almost identical. As a result, the estimated GRPs were used in the regression. Additionally, there may be quantity discounts, i.e., the more advertising time an advertiser purchases the less per GRP cost the advertiser has to pay.

The data used in this study cover generic orange juice television commercials for the period from July 1991 through September 1994. There are about 1,500 usable observations, i.e., observations with complete information on the date and time of the televised commercial, the network used, the cost of the commercial, GRPs for homes reached, GRPs for audiences between 18 through 49 years old reached. The data used in this study cover a period of three years. Over this period, inflation in advertising expenditures occurred. Because it is difficult to develop a media cost index such as the one used in the CK study, a time trend variable is included to capture the inflation in advertising expenditures over time. The ordinary least squares method was used to estimate (1) using daily individual commercial data. Two models were estimated in the first model: GRPs for homes reached were used, while, in the second model GRPs for audiences between 18 to 49 years old were used (the different types of GRPs are used in

measuring the network variables --- CBS, ABC, NBC, and ONW). The results are presented at the top half of Table 1.

Results presented in Table 1 show that the set of explanatory variables used in the analysis explained 70 to 75 percentage of the variations in advertising expenditures (note that, GRP alone explains between 51 to 53 percentage of the variations in advertising expenditures). This result supports the conclusion in the Chang and Kinnucan study that there is a some degree of association between GRP and advertising expenditures. In addition, the results show that the cost per GRP differs depending on the target audience, when the commercial was televised, and which network was used. The cost per GRP for homes reached is the highest for NBC, followed by other networks, CBS, and ABC; however, the cost per GRP for audiences between 18 and 49 years old is highest for NBC, followed by CBS, ABC, and Other. This result, perhaps, suggests that the audiences differ across networks. The cost per GRP for commercials televised during evening hours was more expensive than commercials televised during morning and afternoon hours. In addition, the coefficient for the 30-second dummy variable indicates that 30-second commercials are more expensive than 15-second commercials. The positive time trend coefficient indicates that there was an inflation in advertising expenditures.

Aggregation over Time

Although GRP and advertising expenditure information is usually available on a daily basis, retail sales information may be available only on a weekly (e.g., A. C. Nielsen scanner data) or monthly (e.g., MRCA and NPD consumer panel data) basis. A common practice to match time series advertising and sales data is to aggregate daily advertising GRPs across time and media into weekly or monthly observations so that both advertising and sales data have the

same time interval. For any given target audience, the impact of one GRP on the demand for orange juice using the ABC network during superbowl Sunday may not equal the impact of one GRP on the Fox Cable Network during the same Sunday. This is because ABC and Fox have different audiences. When one aggregates GRP over networks and over time, one will loss the detailed information (such as total commercial time, frequency, and network or station used) which may be important for assessing the effectiveness of advertising on sales.

The following relationship was used to explore the factors which determines the weekly aggregated cost of television commercials for FDOC orange juice advertising programs:

$$(2) \quad Exp_{it} = \alpha_0 + \alpha_1 Aft_{it} + \alpha_2 Prime_{it} + \alpha_3 Time_{it} + \alpha_4 Second_{it} + \alpha_5 ABC_t + \alpha_6 NBC_t + \alpha_7 CBS_t + \alpha_8 ONW_t + \alpha_9 N_{it} + e_{it},$$

where all variables are defined as before except $Second_{it}$ (the total commercial time in seconds for network i during week t) and N_{it} (the total number of commercials for network i during week t). Regression results of (2) are presented at the bottom part of Table 1.

The results derived from aggregated data are similar to those found using daily individual commercial data; i.e., weekly advertising cost is affected by total advertising time, when commercials were aired, which network used, and inflation in advertising cost. In addition, the results show that the total number of commercials had a negative impact on advertising cost. This result may suggest quantity discounts as discussed previously.

Sales Response to Advertising

Past research indicates that the impact of advertising is affected by advertising frequency, length of the advertisement, and the strategy used in the advertisement. A good measure of advertising should embody these characteristics. For example, a television commercial can be

measured by its estimated GRP (by targeted audience), its actual GRP, the length of the commercial (e.g, 15-second, 30-second, or infomercials), the purpose of the commercial (e.g, increase awareness, gain trial, remind consumers to buy, impact repeat purchases, reinforce present users' attitudes, or resolve doubts), how many commercials per week, and the technique and strategy used in the commercial (e.g., problem solution, humor, use of relevant character or personality, new products, new uses, new ideas, new information, candid camera testimonials, or demonstrations). Therefore, GRP or advertising expenditures alone, is perhaps, insufficient to capture all these facets of a commercial.

Chang and Kinnucan indicate that using advertising expenditures allows one to directly examine returns to advertising measures; they believe there is a lack of transparency in using GRPs to measure the returns to advertising. In contrast, we view GRP in context to production theory and returns to inputs. Note that GRP is a physical measure, the marginal impact of GRP on demand can be interpreted as the marginal product of GRP; accordingly, a GRP elasticity and a value of marginal product for a GRP can be derived and an economic interpretation can be attached.

As mentioned above, there are many different purposes for commercials. Therefore, in order to assess the effectiveness of an advertiser's commercials, one needs to know the purposes of the commercials and use these particular purposes as the criteria to assess the effectiveness of the commercials. The purpose of most agricultural commodity commercials is, perhaps, to increase the use of advertised commodity at a given price.

There are many postulations about how advertising increases sales. One may argue that advertising has both a direct and an indirect effect on the sales of advertised commodity. The

direct effect can be traced to impulse purchases, repeated purchases caused by advertising as a reminder, or reinforced attitudes which push consumers over the threshold and decided to purchase. The direct effect results in immediate purchases. The indirect effect can be traced to the advertising impact which increases consumers' awareness of the advertised commodity, resolves consumers' doubts about using the commodity, or changes consumers' attitudes toward the commodity; these changes only happen over a long period of time and after many exposures of the commercials. The indirect effect may not result in immediate purchases.

In this study, only the direct advertising effects will be estimated. The indirect effects of advertising, in our opinion, are difficult to estimate. The per capita demand for orange juice is assumed to be a function of its own-price, the prices of substitutes for orange juice, per capita income, in-store advertising activities (such as displays and newspaper advertisements), a time trend, seasonality, and FDOC generic advertising activities. The relationship can be expressed as

$$(3)\quad \log(q_t) = \alpha_0 + \sum_j \alpha_j \log(p_{jt}) + \beta_1 \log(Inc_t) + \beta_2 \log(Time_t) + \beta_3 Disp_t + \beta_4 A/B_t + \beta_5 D_{1t} + \beta_6 D_{2t} + \sum_j \gamma_{t-j} Adv_{t-j} + e_t,$$

where q_t is the per capita orange juice consumption in gallons during week t; p_{jt} is the retail price in dollars per gallon for juice j during week t (the juices include orange juice (oj), grapefruit juice (gj), apple juice (aj), grape juice (rj), and juice drinks (jd)); Inc_t is the real per capita income during week t; $Time_t$ is a time trend variable; $Disp_t$ is the percentage of all commodity volume (ACV) which had displays for orange juices; A/B_t is the percentage of ACV which had A/B advertising; D_{1t} and D_{2t} are dummy variables for seasonal variation; and Adv_{t-j} is the advertising effort measure (three measures were used, i.e., GRP for homes, GRP for adults between 18 and

49 years old, and advertising expenditure) of orange juice during week t-j (j = 0, 1, . . 4); e_t is the disturbance term, and αs, βs, and γs are parameters to be estimated. The ordinary least squares method was used to estimate the demand parameters. Polynomial distributed lag structures for the lagged advertising variables were used in specifying the model. Based on the t-statistics, R^2 values, and the expected decay structure for the advertising impact (see Lee and Brown, pp. 145-50), the current advertising variable and advertising variables lagged up to four weeks were included in the analysis. The impact of advertising effort lagged five weeks on orange juice demand was restricted to be zero. The Park and Mitchell[5] procedure was used to correct for the first-order autocorrelation. Results are presented in Table 2.

There are two observations which are worth mentioning. First, when there were no restrictions imposed on the lagged advertising coefficients, the coefficient estimates for both current and lagged advertising measure were statistically not different from zero, regardless of which advertising variable was used. The demand parameter estimates became statistically different from zero when a first degree polynomial was used and the end point (i.e., advertising variable lagged five weeks) was restricted to be zero. Second, the advertising variables Second and N in equation (2) were also included in (3) to estimate the demand parameters. Results show that the total advertising time in seconds had a positive impact on the demand for orange juice; however, advertising frequency had a negative impact on the demand for orange juice. These results are difficult to explain, and thus, were only reported in the appendix without further discussion.

Results presented in Table 2 show that regardless which advertising variable was used in the regression (i.e., GRPs for adults, or GRPs for homes, or advertising expenditures), the

resulting demand parameters have about the same magnitudes. The own-price elasticity was either -0.56 or -0.57 depending on the model, cross-price elasticities between apple juice and orange juice were between 0.19 and 0.21 and between juice drinks and orange juice were between 0.38 and 0.39; income elasticities were between -1.46 to -1.51; there was a positive time trend and seasonality in the demand for orange juice; and the independent variables explained 88% of the variation in the per capita demand for orange juice.

The estimated advertising elasticities at the sample means were 0.009, 0.008, and 0.005 for GRPs for homes, GRPs for adults, and advertising expenditures, respectively. The differences in the advertising elasticities based on the different advertising variables can be explained as follows. According to previous discussion, the use of GRPs in regression assumes a product-product relationship while the use of advertising expenditures assumes a product-cost relationship. Therefore,

(4) $\partial q/\partial GRP = (\partial q/\partial Exp)(\partial Exp/\partial GRP)$, or

$(\partial q/\partial GRP)(GRP/q) = [(\partial q/\partial Exp)(Exp/q)][\partial Exp/\partial GRP)(GRP/Exp)]$, or

$\varepsilon_{grp} = \varepsilon_{exp}\ \varepsilon_{eg}$,

where ε_{grp} is the GRP advertising elasticity, ε_{exp} is the advertising expenditure elasticity, and ε_{eg} is the transition elasticity between GRP and advertising expenditure. The above advertising estimates indicate that the transition elasticities between GRP for home and advertising expenditure, and between GRP for adult and advertising expenditure are greater than unity. And indeed, the results from regressing advertising expenditure on GRPs suggest the transition elasticities are greater than unity (the estimates are 1.252 and 1.207 for GRP for homes and GRP for adults, respectively; which, because we are dealing with estimates, differ from the transition

elasticities derived directly from (4)). This particular relationship helps explain the differences in advertising elasticities when either GRPs or advertising expenditures are used as the measurement of advertising effort. Therefore, depending on the availability of advertising data, either GRPs or advertising expenditures can be expected to provide similar estimates for demand advertising parameter estimates.

Concluding Remarks

This study demonstrated the relationships between GRP and advertising expenditures. One should not expect that there is high correlation between GRP and advertising expenditures, because, other factors such as media selected, the length of the commercial, and the time that the commercial is aired also affect the cost of a commercial. In addition, the different interpretations required for using GRP and advertising expenditures in demand analysis were examined, i.e., physical-physical relationship and physical-cost relationship, respectively; and the relationship between advertising impact estimates derived from GRP and advertising expenditures. With this relationship in mind, either GRP or advertising expenditures can be used in demand analysis.

Table 1. Relationship between GRP and Advertising Expenditures

Variable	GRP for Homes		GRP for Adults of ages 18-49	
	Estimate	Standard Error	Estimate	Standard Error
	Daily Individual TV Commercial Expenditures ($1,000)			
Intercept	-25.2644**	1.3660	-20.2042**	1.1677
D30	14.4806**	1.0522	15.2650**	0.9633
Afternoon	-1.0666	1.5181	-1.9689*	1.3892
Prime	12.7052**	1.4286	6.9396**	1.3433
CBS	4.1001**	0.1424	7.8077**	0.2277
ABC	3.9603**	0.1911	6.9121**	0.2829
NBC	5.7338**	0.1874	9.8052**	0.2685
ONW	4.5645**	0.2456	6.5674**	0.3018
Time	0.0117**	0.0017	0.0118**	0.0015
R-square	0.7013		0.7508	
Adj R-sq	0.6997		0.7494	
	Weekly Aggregated TV Advertising Expenditures ($1,000)			
Intercept	-44.6380**	7.8735	-34.8358**	7.4511
Length	0.5775**	0.1006	0.5702**	0.0938
Afternoon	7.6015	8.6800	4.4385	8.1313
Prime	27.8189**	8.6809	13.8643*	8.3258
CBS	4.7411**	0.2327	8.2821**	0.3699
ABC	5.2016**	0.2706	8.4099**	0.4061
NBC	7.1410**	0.3338	11.4896**	0.4841
ONW	5.5387**	0.4375	7.2231**	0.5510
N	-20.2023**	3.2825	-15.3107**	2.9344
Time	0.1595**	0.0865	0.1847**	0.0808
R^2	0.9010		0.9138	
Adj R-sq	0.8987		0.9117	

*Statistically different from zero at $\alpha = 0.10$ level.
**Statistically different from zero at $\alpha = 0.01$ level.

Table 2. Estimated advertising impact on the demand for orange juice using different advertising measures

Variable	Estimates	Std. Err.	Estimates	Std. Err.	Estimates	Std. Err.
	GRP for Homes		GRP for Adults		Ad. Expenditures	
Intercept	4.618**	1.890	4.633**	1.896	4.883**	1.910
$\log(p_{oj})$	-0.561**	0.081	-0.570**	0.081	-0.572**	0.082
$\log(p_{gj})$	-0.056	0.116	-0.052	0.116	-0.042	0.120
$\log(p_{aj})$	0.187**	0.097	0.194**	0.097	0.208**	0.097
$\log(p_{rj})$	0.011	0.141	0.007	0.141	-0.003	0.140
$\log(p_{jk})$	0.375**	0.093	0.378**	0.093	0.393**	0.093
log(Time)	0.073*	0.053	0.071*	0.053	0.077*	0.054
log(Inc)	-1.457**	0.381	-1.457**	0.382	-1.514**	0.380
Display	0.002**	0.001	0.002**	0.001	0.002**	0.001
A/B Ads	0.001	0.001	0.001	0.001	0.001	0.001
Adv_t	5.200e-05**	2.251e-05	8.400e-05**	3.836e-05	6.744e-06*	4.430e-06
Adv_{t-1}	4.200e-05**	1.818e-05	6.700e-05**	3.059e-05	5.395e-06*	3.550e-06
Adv_{t-2}	3.100e-05**	1.342e-05	5.000e-05**	2.283e-05	4.046e-06*	2.660e-06
Adv_{t-3}	2.100e-05**	9.040e-06	3.400e-05**	1.553e-05	2.698e-06*	1.770e-06
Adv_{t-4}	1.000e-05**	4.520e-06	1.700e-05**	7.660e-06	1.349e-06*	8.870e-07
D_1	-6.588e-03**	1.086e-03	-6.557e-03**	1.091e-03	-6.718e-03**	1.093e-03
D_2	9.826e-05**	2.000e-05	9.738e-05**	2.000e-05	9.974e-05**	2.000e-05
ρ	-0.505**	0.054	-0.507**	0.054	-0.507**	0.054
R^2	0.8824		0.882		0.881	
DW Stat.	1.9194		1.921		1.920	

*Statistically different from zero at $\alpha = 0.10$ level.
**Statistically different from zero at $\alpha = 0.05$ level.

Appendix:

Estimated advertising impact on the demand for orange juice using total advertising and advertising frequencies

Variable	Estimates	Std. Err.	Estimates	Std. Err.	Estimates	Std. Err.
	GRP for Homes		GRP for Adults		Ad. Expenditures	
Intercept	4.330**	1.865	4.387**	1.874	4.772**	1.860
$\log(p_{oj})$	-0.547**	0.081	-0.561**	0.080	-0.569**	0.081
$\log(p_{gj})$	-0.081	0.116	-0.072	0.116	-0.053	0.120
$\log(p_{aj})$	0.203**	0.097	0.212**	0.097	0.227**	0.097
$\log(p_{gpj})$	0.006	0.140	0.000	0.141	-0.018	0.140
$\log(p_{jk})$	0.378**	0.092	0.383**	0.092	0.408**	0.091
log(Time)	0.070*	0.052	0.068*	0.053	0.079*	0.053
log(Income)	-1.400**	0.376	-1.408**	0.378	-1.494**	0.370
Display	0.002**	0.001	0.002**	0.001	0.002**	0.001
A/B Ads	0.001	0.001	0.001	0.001	0.001	0.001
Adv_t	7.300e-05**	3.080e-05	1.100e-04**	5.189e-05	6.603e-06	5.720e-06
Adv_{t-1}	5.800e-05**	2.447e-05	8.800e-05**	4.151e-05	5.282e-06	4.570e-06
Adv_{t-2}	4.400e-05**	1.857e-05	6.600e-05**	3.113e-05	3.962e-06	3.430e-06
Adv_{t-3}	2.900e-05**	1.224e-05	4.400e-05**	2.075e-05	2.641e-06	2.290e-06
Adv_{t-4}	1.500e-05**	6.150e-06	2.200e-05**	1.038e-05	1.321e-06	1.140e-06
D_1	-0.006**	0.001	-0.006**	0.001	-0.007**	0.001
D_2	9.663e-05**	1.900e-05	9.556e-05**	2.000e-05	9.822e-05**	1.900e-05
Seconds	6.287e-05**	4.100e-05	6.113e-05*	4.100e-05	7.070e-05**	4.100e-05
N	-0.002*	0.001	-0.002**	0.001	-0.002**	0.001
ρ	-0.495**	0.055	-0.497**	0.055	-0.490**	0.055
R^2	0.884		0.884		0.882	
DW Stat.	1.921		1.923		1.910	

*Statistically different from zero at $\alpha = 0.10$ level.
**Statistically different from zero at $\alpha = 0.01$ level.

References

1. Aaker, D. and J. Myers, *Advertising Management*, 3rd ed., Prentice-Hall, Inc., Englewood Cliffs, NJ, 1987.

2. Sachs, W., *Advertising Management: Its Role in marketing*, Penn Well Publishing Co., Tulsa, 1983.

3. Chang H-S and H. W. Kinnucan, "Measuring Exposure to Advertising: A Look at Gross Rating Points," *Agribusiness*, 8(5): 413-23, 1992.

4. Lee, J-Y and M. G. Brown, "Lag Structures in Commodity Advertising Research," *Agribusiness*, 8(2): 143-54, 1992.

5. Park, R. E. and Mitchell, B. M. "Estimating the Autocorrelated Error Model with Trended Data," *Journal of Econometrics*, 13: 195-201, 1980.