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# WHERE TO PRESENT THE ADVERTISEMENT IN A BLOCK?

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## ABSTRACT

It is expected that a commercial is more effective if the audience are exposed to it when the break starts. This study investigates whether the first presented advertisement in a block is more effective than the subsequent ads or not and how the order of a commercial in a block affects the impact of the commercial. The impact of advertisement is measured by means of incoming calls at a national call center. The data cover 31 months. During this time period, 5,172 radio commercials are broadcasted and a total number of 261,167 incoming calls are recorded. In this study, a logarithmic distributed lag model is estimated. Differential effects of the radio channel, time of broadcast, commercial duration and order of a commercial in a block are estimated. The main focus of the paper is to investigate how the place of a commercial in a block affects the advertisements' impact.

**Keywords:** Order effect, sequence effect, advertising effectiveness, advertising response model, distributed lag model
**JEL Classification:** M31, M37

## 1. INTRODUCTION

Marketers have spent high amounts of money on advertising, which motivates the need for a careful assessment of the effectiveness, careful media planning both in terms of timing and medium selection, and ultimately for a sufficient return on the investment in advertising. However the estimation of advertising effectiveness might be difficult. According to Tellis (2004), the arguments related to the estimation difficulty are explained by the following reasons. Firstly, consumers may have various reasons to buy the products. Secondly, advertising for one particular brand may take place in various media. Thirdly, advertising has not only immediate effects but also long-term effects. Next, advertising may have varying effects during the campaign period. Also, sequential advertisings have overlapping effects and overlapping decays. Lastly, advertising response may differ according to the target segments or people.

Clarke (1976) is one of the classic papers dealing with the carryover effect of advertising on sales. He concludes out that the level of intertemporal data aggregation is the focal issue that affects the estimates of the duration of advertising carryover effects. The relevant levels of data aggregation considered by Clarke (1976) are weeks, months, quarters or years. From his study it appears that the inter-purchase time intervals are the most suitable data interval and the duration of advertising impact is found to be less than a year. Leone (1995) concludes that the advertising effects last 6 months. Dekimpe and Hanssens (1995) work on the long-term effect of advertising and they apply a unit root test on monthly sales data. They use the unit root model to determine if advertising causes a trend in the data. They find that some of the advertising has a persistent effect. Little (1979) provides a survey paper on aggregate advertising models. In his paper, he reviewed a large amount of material on the sales effects of advertising for established products. He concluded that, advertising is rich with phenomena, many of the models are rearrangement of a few key ideas, and the commonly used econometric models are of limited value in advertising. He also stated that there is an underused of separate calibrations for different parts of a model.

These results are relevant mostly in the context of 'brand building' advertising, where advertising is seen as a tool in building brand awareness, leading to the inclusion of the brand in the consideration set and eventually the purchase of the brand. Recent years have seen the emergence of direct response advertising, characterized by an immediate call to action. Examples are mainly in web based advertising, where impact measures are based on behavioral responses such as click through rates, site registration, requests for information and possibly actual purchases. In traditional advertising direct response has also gained importance, by linking the advertising to 0800 numbers, leading to a direct registration of the impact on the basis of higher numbers of incoming calls. Thus, the response can be measured by means of incoming number of the calls (Verhoef, Hoekstra, and Van Aalst, 2000). Direct-response commercials can be applied for different purposes such as selling of products or services, providing information to customers or building customer databases. According to Verhoef, Hoekstra, and Van Aalst (2000), there is a growing knowledge of the role of radio on direct-response. The effectiveness of direct-response commercials might be varied by broadcasting in different radio channels, with the different length of the commercials, at different hours of the day and on different days of the week. In sum, the success of the commercial depends on well designed media plans. In this context, advertising effectiveness is composed of an immediate or direct response effect and a long-term or advertising goodwill effect.

The data relate to a fast repair service of a consumer durable good, with very low incidence or purchase frequency. The advertiser is the market leader and brand awareness is very high. Therefore, the long term effect is mainly in terms of maintenance of the existing level of brand awareness. To the extent this assumption holds, long term effects are hard to measure. Hence the focus is on the direct effects, short data intervals or high measurement frequency are desirable. The data cover 31 months. During this time period, 5,172 radio commercials are broadcasted on six radio stations at various times of the day, with different commercial lengths and different orders in the blocks. The data are aggregated from 15 minute intervals to hourly data resulting in a dataset of 22,416 observations. In addition to radio commercials, there are a limited number of TV commercials aired (254). This study investigates the effectiveness of direct-response advertisements on incoming calls at a call center. Differential effects of radio channel, time of broadcast, commercial duration and order of a commercial in an ad break are estimated. Advertisements are placed in different order in a block. Advertisers believe that the first placed advertisement in a block is more effective than the subsequent advertisements. Therefore they pay more to broadcast their ad as the first one during an ad break. In this paper, it is studied that whether the order of an advertisement affects its impact or not. The structure of the paper is as follows. In the first section I discuss the literature review, next data collection process is discussed, followed by an overview of the model specification. Later section deals with the estimation results. In the last section the main conclusions of the analysis are discussed.

## 2. LITERATURE REVIEW

A well-known example related to this study is Tellis, Chandy and Thaivanich (2000), where a similar advertising response model is used to analyze data based on hourly observations. A distributed lag model is specified and this model takes into account the effect of advertising exposure (GRPs), channels and time of day. They use a linear model. While they model a day cycle and a weekly cycle, longer seasonal cycles and calendar effects such as bank holidays are not taken into account. It is found that baseline calls show a bell-shaped curve over the day, with a mid-morning peak. The number of calls shows a weekly cycle, with the highest level on Mondays and a systematic decline throughout the week. They consider that the average carryover effect lasts 8 hours and it changes according to the time of broadcasting. Additionally, the model takes into account the effects of wearin and wearout of ads. Wearin is the increase in advertising effectiveness during the first weeks after an advertising campaign is started and wearout is the decrease in advertising effectiveness by campaign age. It is concluded that wearin leads to a fast increase in effectiveness, whereas wearout which is more gradual in nature, sets in rapidly. In Chandy et al. (2001), it is found that the effect of advertising on sales varies according to markets, channels and creative aspects or advertising appeals. This study addresses similar issues as the ones dealt with in the study of Tellis, Chandy and Thaivanich (2000). They categorize the appeals as argument-based (cognitive) or emotional. They find that argument-based advertising is more effective for new products. On the other hand, emotion-based advertising is more effective in mature markets.

The differences between these studies and this study might be explained by the following issues. Firstly, instead of a linear distributed lag model, a logarithmic distributed lag model is estimated in my study. Secondly, in addition to the differential effects of radio channels, time of broadcast and duration of the commercials, the multiple seasonality (daily, weekly, yearly), a long term trend, holiday effects (day before, day after, and same day effects) and order effect are also specified in my model. In the literature it is reported that the order of placed messages affects the consumers' receptivity (Schiffman, Kanuk, and Hansen, 2011). In this aspect, placement of an ad in a block may be very important. There are studies supporting this opinion. For instance, Aaker et al. (1986) examined and showed what the impacts of the sequences of commercials are on the audience.

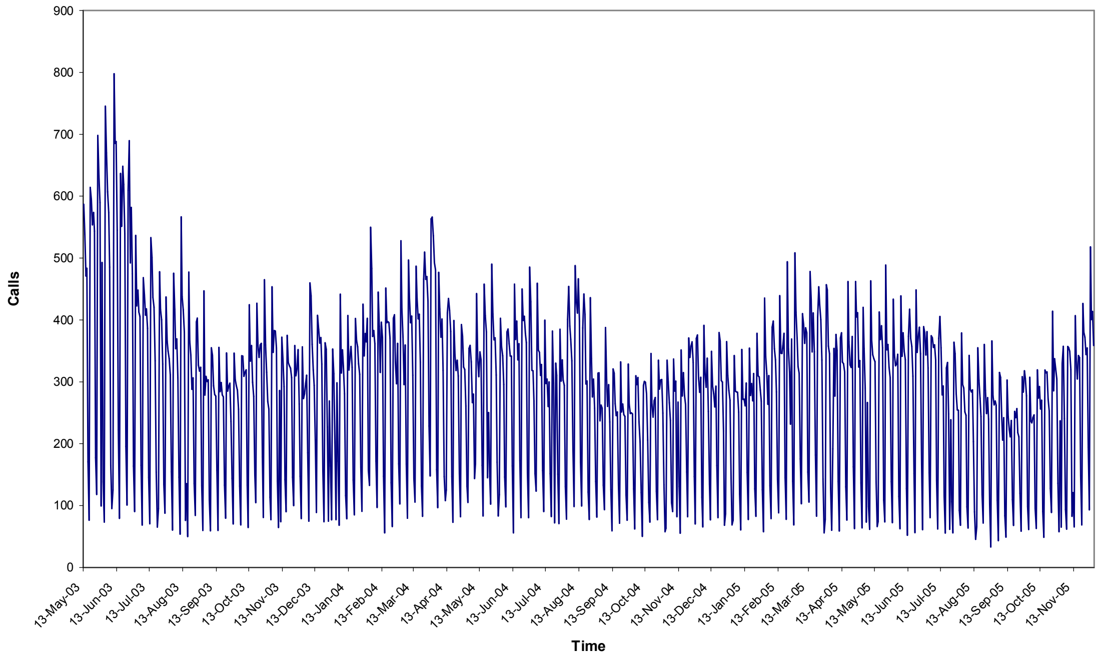
The firm's advertising is broadcasted through various radio stations at various times of the day. The objective of this study is to investigate the differential effects of radio channels, time of broadcast, duration and sequence of the commercials. The results indicate that advertising has a marked impact on calls registered with highly divergent effects according to time of broadcast and channel. Furthermore, it is founded that the sequence of an ad does not affect the impact of the commercial.

## 3. DATA AND METHODOLOGY

In this study, through radio commercials listeners are directed to dial a 0800-number and made an appointment for a service center. The number of incoming are recorded in real time, and later aggregated into fifteen minutes intervals. Several variables measure incoming calls: (a) Incoming 0800 calls, this is the calls to the call center number advertised. In earlier periods several numbers were in use, gradually replace by one centralized system; (b) all relevant calls, meaning calls involving an actual request for information, whether resulting in an appointment at one of the service centers or not; (c) relevant 0800Calls, meaning direct calls to the call center resulting in a request for an appointment. The distinction between relevant and non-relevant calls is not available in earlier periods. However, managerially the relevant calls data are more interesting. The 0800Calls covers 31 months. One managerially relevant issue is the relationship between (all) relevant calls, relevant 0800 calls and total 0800 calls. Since the 0800Calls series spans the complete observation period, it is used as the dependent variable in this analysis.

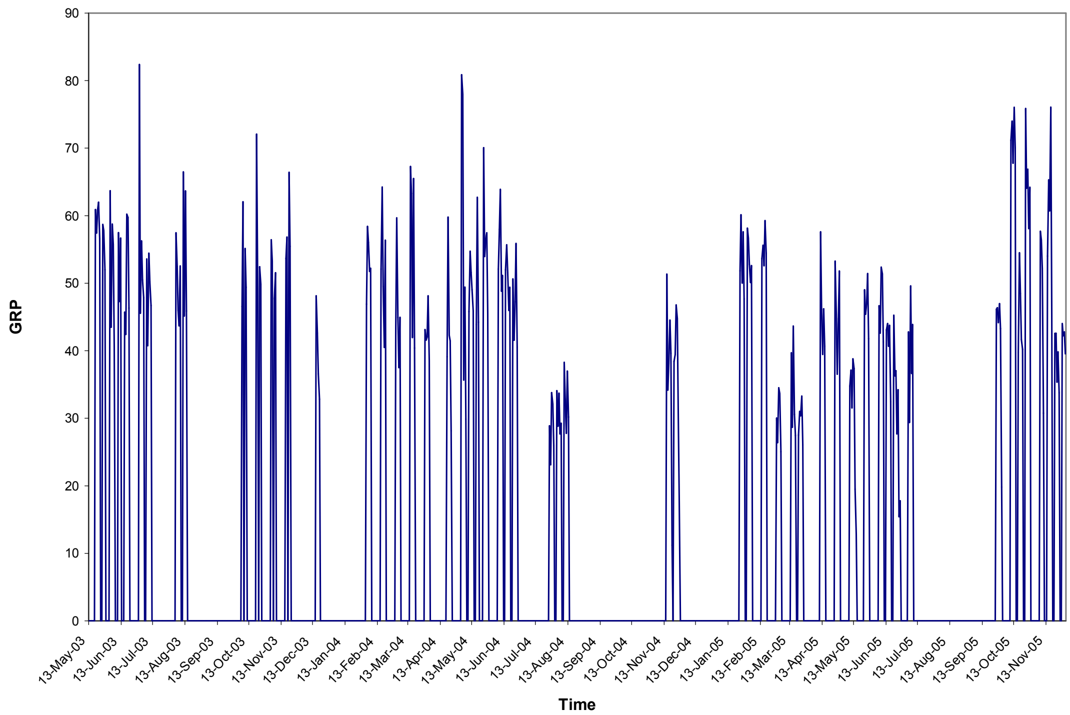
In total 261,167 0800Calls are recorded. Figure 1 shows the time evolution of the 0800Calls. As discussed earlier, for practical reasons, the data are aggregated from 15 minute intervals to hourly data resulting in a dataset of 22,416 observations (or hours). From the data, it can be concluded that the number of calls is higher on Monday than the other days. During the observation period, 5,172 radio commercials are broadcast on six radio stations at various times of the day (from 6 a.m. to 9 p.m.) and at with different commercial lengths (5'', 10'', 15'', 16'', 20'', 21'', 25'', 30'', 35'', 40'' or 41''). Because of their limited occurrences, 16'' commercials will be pooled with the 15'' commercials. Likewise 21'' commercials are added to the 20'' commercials. Finally; 35'', 40'' and 41'' are considered as a single category, labeled 30" since this is the dominant length. Preliminary estimation results indicate a lack of significant estimation for 5'' and 10'' commercials; consequently they are dropped from the model.

**Figure 1: 0800Calls over time**




Advertising pressure of a spot is measured by means of Gross Rating Points (GRPs) (Tellis, 2004). Figure 2 shows that the distribution of commercials and related GRPs for the entire dataset. In the data, there are 254 aired TV commercials.

**Figure 2: Radio GRPs over time**



**Specifications**

In the specification, the effect of advertising is modeled by means of a logarithmic autoregressive distributed lag model for incoming 0800-calls. All variables in logarithms, 0800-calls and GRPs, for which zeros occur in the data are augmented by one.

Specification of the model Equation (1):

$$
\begin{aligned}
y_t = \beta_0 + \sum_{l=1}^{3} \lambda_l y_{t-l} + &+ \lambda_{168} y_{t-168} + \beta_{sin} S_t + \beta_{cos} C_t + \beta_{Trd} Trend_t + \beta_{M4} D_t^{M2} \\
&+ \beta_{M7} D_t^{M5} + \beta_{M18} D_t^{M16} + \beta_{M33} D_t^{M31} + B_{hol} D_{hol,t} \\
&+ \beta_{pre\,hol} D_{pre,t} + \beta_{post\,hol} D_{post,t} + \sum_{we\,h=1}^{47} \beta_{we\,h} D_{we\,h,t} \\
&+ \sum_{wd\,h=1}^{24} \beta_{wd\,h} D_{wd\,h,t} + \sum_{wd=2}^{7} \beta_{wd} D_{wd,t} + \sum_{h=6}^{19} \sum_{l=0}^{4} \beta_{h,l}^{grp}\, GRP_{t-l} \\
&+ \sum_{Ch=1}^{5} \sum_{l=0}^{4} \beta_{h,l}^{Ch}\, Channel_{t-l} + \sum_{Lgth=1}^{5} \sum_{l=0}^{4} \beta_{h,l}^{Lgth}\, Lenght_{t-l} \\
&+ \sum_{l=1}^{4} \beta_{h,l}^{TV} TVGRP_{t-l} + \sum_{h=7}^{24} \beta_h^{TV-1} GRP_t^{TV-1} + \sum_{h=7}^{24} \beta_h^{R-1} GRP_t^{R-1} \\
&+ \sum_{l=0}^{4} \beta_{h,l}^{WE} GRP_{t-l}^{WE} + \sum_{l=0}^{4} \beta_{h,l}^{fb} GRP_{t-l}^{fb} + \varepsilon_t
\end{aligned}
\tag{1}
$$

Where

$y_t = \log(0800Calls + 1)$

$S_t = Sin\,(2\pi \frac{t}{Hours/year})$

$C_t = Cos\,(2\pi \frac{t}{Hours/year})$

$Trend_t = (\frac{t}{Hours/year})$

GRP related variables:

$GRP_t = \log(RadioGRP_t + 1)$

$TVGRP_t = \log(TVGRP_t + 1)$

$GRP_t^{TV-1}$ = The next day effects of TVGRPs

$GRP_t^{R-1}$ = The next day effects of radio GRPs

$GRP_t^{WE}$ = The total of weekend GRPs

$GRP_t^{fb}$ =The total of GRPs of the first ads in the block

$\varepsilon_t = Disturbance\ term$

${D_t}^{M2}$ = Month2

${D_t}^{M5}$ = Month5

${D_t}^{M16}$ = Month16

${D_t}^{M31}$ = Month31

$D_{hol,t}$ = Bank Holidays

$D_{pre,t}$ = Pre-holidays

$D_{post,t}$ = Post-holidays

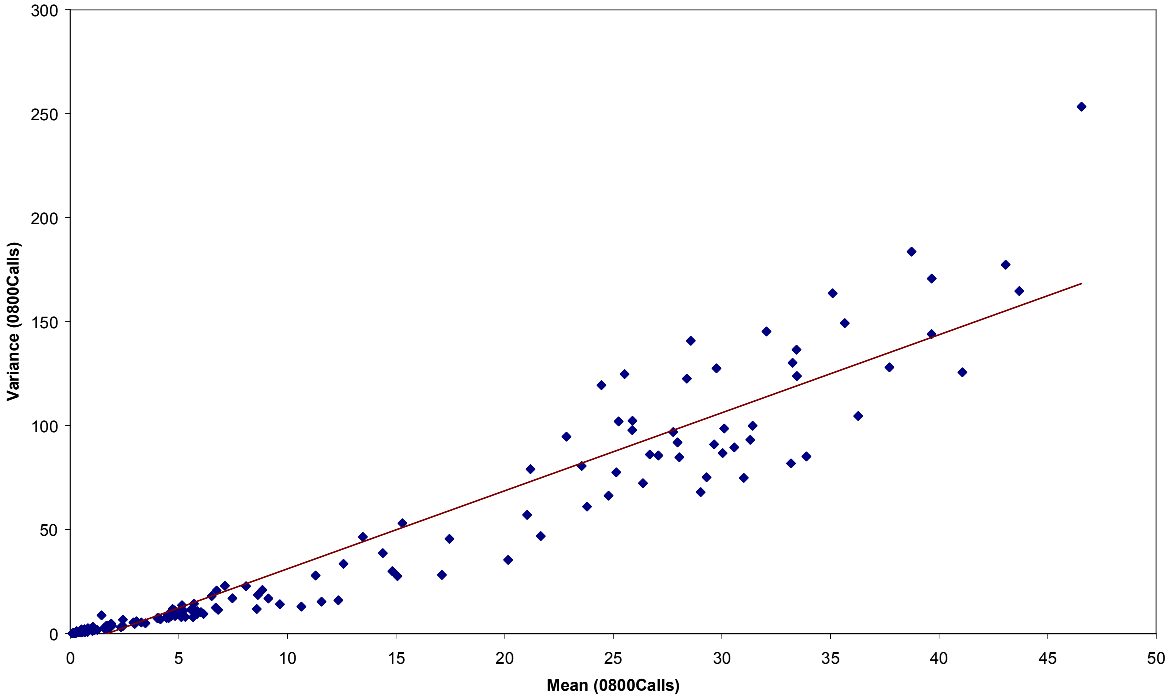
$D_{weh,t}$ = Hour of week during weekend

$D_{wdh,t}$ = Weekday hour

$D_{wd,t}$ = Weekday

The specification in equation (1) is obtained from a preliminary investigation, which allowed to establish a clear superiority of a logarithmic specification over a linear one, and which allowed to establish the nature of seasonality, trend and other systematic influences. In the model, all the variables except the dummy, seasonality and trend variables are in logarithms.

**Figure 3: Mean-Variance Plot of 0800Calls**




The choice of a logarithmic model is related to the issue of stationarity of the data, which can be evaluated by constructing a mean-variance plot (McLeod, 1983). Due to the lack of stationarity in the original data (See Figure 3), a logarithmic model is considered to be more appropriate. For the logarithmic model the mean-variance plot shows a substantial improvement in stationarity (See Figure 4).

Further, the specification in equation (1) is a simplification of one in which dummy variables for each of the months in the sample are included, giving rise to the presence of 31 dummies. These dummies show a clear trend and seasonal pattern as can be seen in Figure 5. When fitting a sinusoidal wave in combination with a trend to these dummies, an R2 of 0.67 is obtained. Therefore, the 31 monthly dummies are replaced by a sinusoidal wave, modeled by means of $S_t$ and $C_t$, in combination with a trend ($Trend_t$). In addition to this wave and trend, four significant monthly dummies ($D_t^{M2}$, $D_t^{M5}$, $D_t^{M16}$ and$D_t^{M31}$) are found, indicating month-specific swings in the number of calls.

A dummy variable ($D_{hol,t}$) variable explains the difference between holidays and ordinary weekdays. In order to avoid doubling up weekend effects and holiday effects, holidays are not specified on weekend days. The days before ($D_{pre,t}$) and after holidays ($D_{post,t}$) yield significant deviations from the normal number of calls for the corresponding weekdays, therefore dummies for pre-holidays and post-holidays are added.

**Figure 4: Mean-Variance Plot of logarithmic 0800Calls**

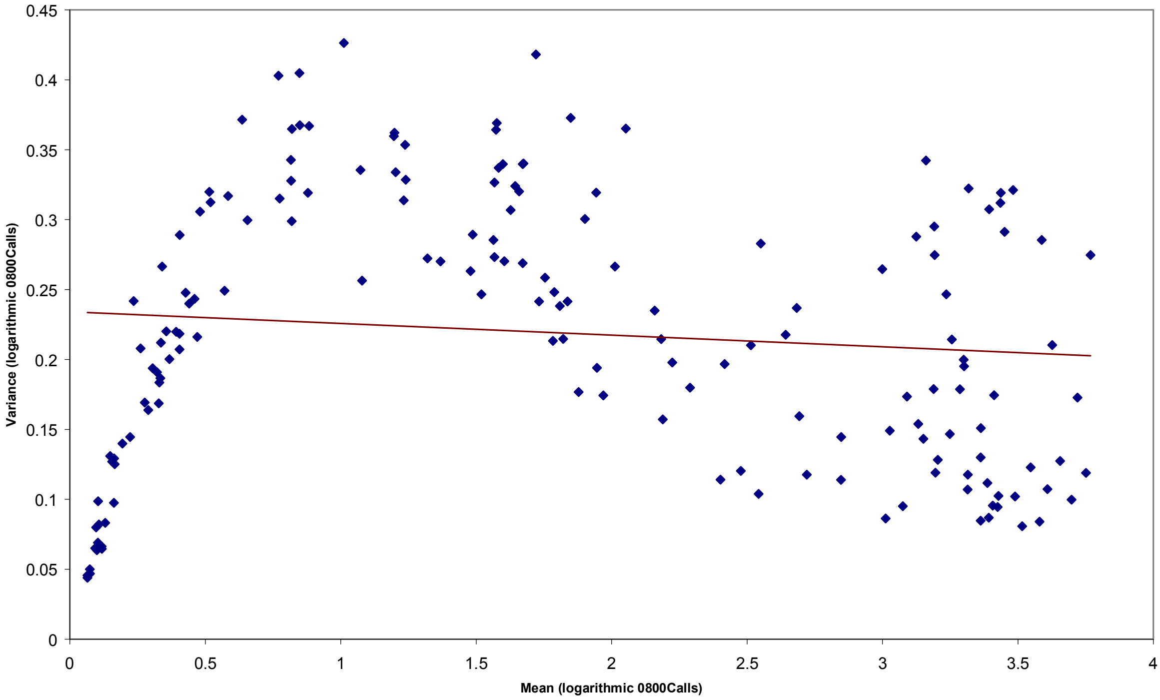



**Figure 5: Fitting of Sinusoidal Wave/Trend and Monthly Dummies (Equation (1))**

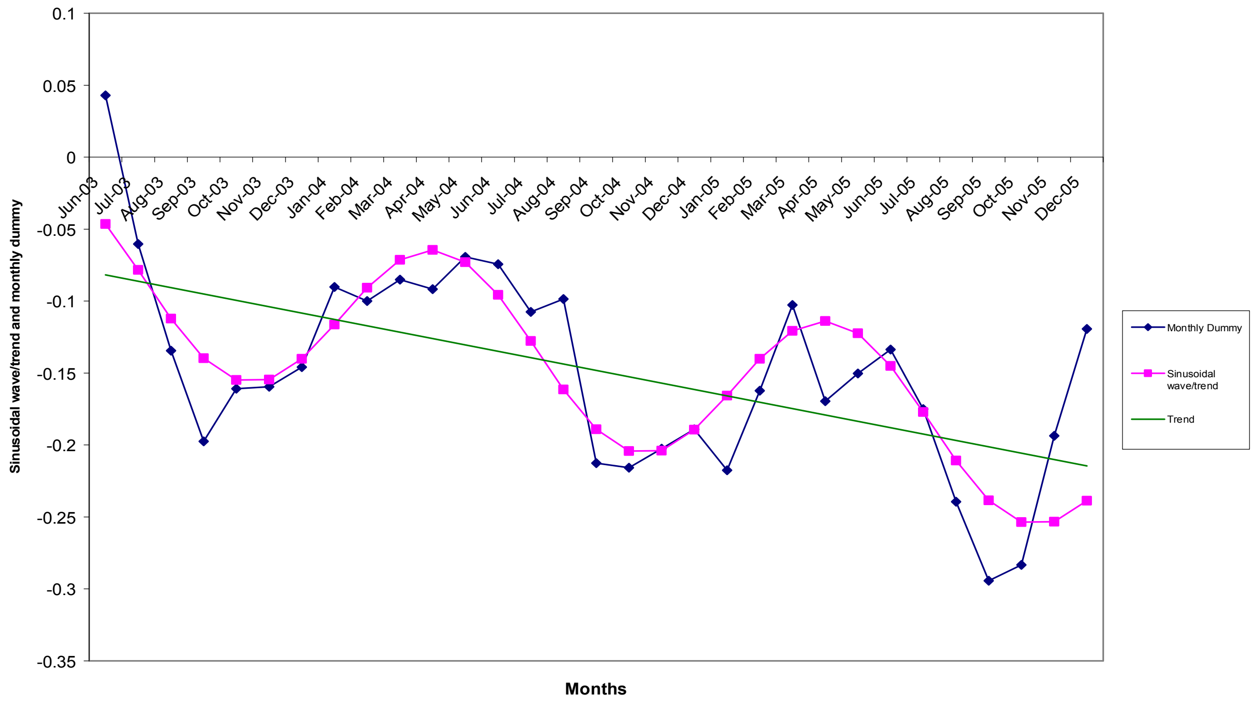
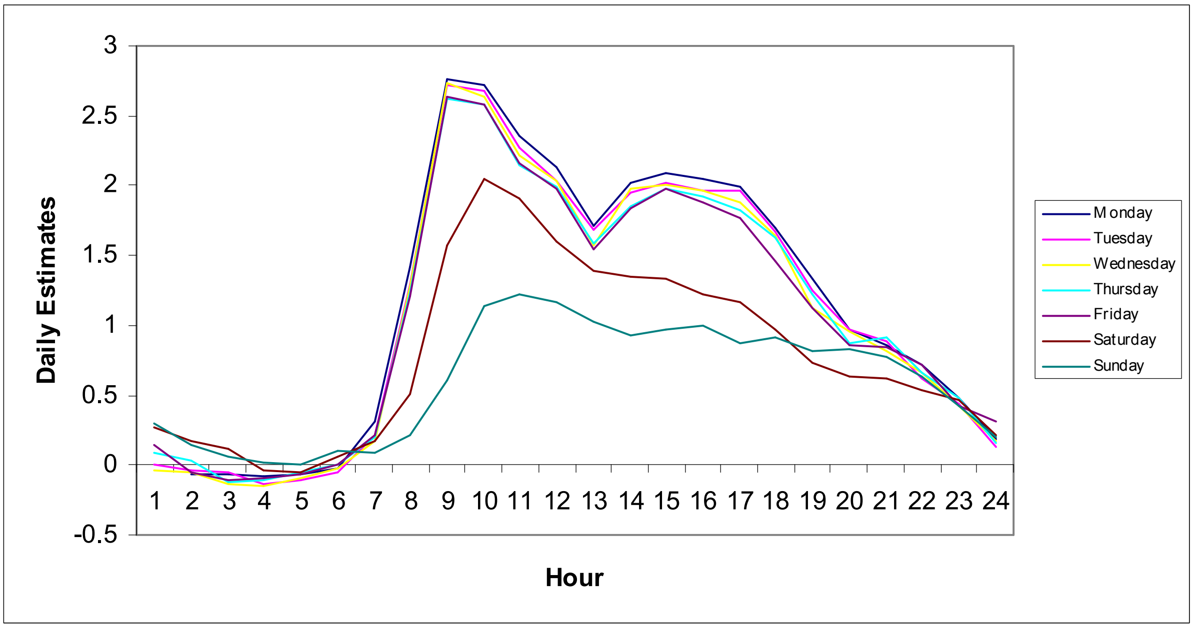


**Figure 6: Day cycle**




In the preliminary model I also specified a full weekly cycle, involving 167 hourly dummies. The results show that a significant simplification can be achieved. In Figure 6, the weekly cycle obtained is shown, with the dummy variables for each weekday overlaid. From this figure, it is concluded that the daily cycles for the weekdays are very similar, apart from a systematic decrease in the level of calls from Monday to Friday. On the other hand weekend days show a different pattern. Therefore, the 167 dummies modeling the weekly cycle, are replaced by 23 weekday hours ($D_{wdh,t}$) completed by 48 weekend hours ($D_{weh,t}$) and daily dummies ($D_{wd,t}$), which capture the differences in call levels for weekdays.

The impact of radio commercials fluctuates according to time of broadcast, the length of the commercial spot, the radio channel on which the spot is broadcast and the sequence of the broadcasted advertising during an ad break. I integrate these effects as follows: The variable $GRP_t$ relates to the total radio GRPs (all channels) on hour t. The impact is different depending on the hour of broadcast. The differences in impact of each of the radio channels, relative to Channel 6 are included through the variable $Channel_t$. Further, the impact of the commercial lengths relative to 20'' commercials is taken into account by including $Lenght_t$, which captures the incremental effect of 15'', 25'' and 30'' commercials, again these are assumed independent of the time of broadcast.

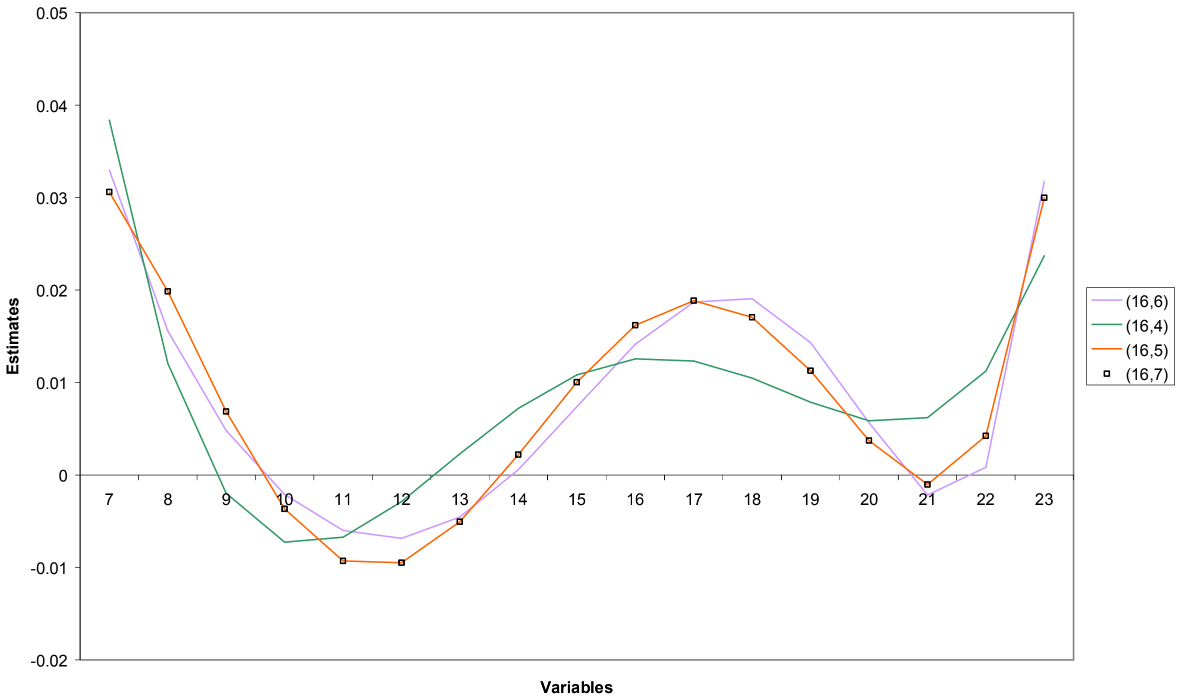
The $GRP_t^{fb}$ variable relates to the total radio GRPs of first broadcasted advertising during an ad break. In addition to the hour of broadcast and of the commercial length, it is expected that the effectiveness of a commercial will be different on normal weekdays compared to weekend days. As a result of this, the incremental effect of airing in the weekend ($GRP_t^{WE}$) is also included in the model.

In addition $TVGRP_t$ measures the GRPs for TV commercials at hour t. As mentioned before the occurrence of TV commercials is relatively small. Therefore, differential effects of TV channels or hours of broadcast of TV-spots are not taken into account.

Commercials do not only affect call frequency in the hour of broadcast, but will also generate extra calls in subsequent hours and possibly during the next day. Conceptually the effects may last even longer, but it is observed that the direct response effects die out quite fast. A distinction is made between the 'within day' effects and the 'next day effects'. For the within day effects of the commercials, carry-over effects are measured by means of distributed lags for four subsequent hours following the time of broadcast.

The next day effects ($GRP_t^{R-1}$ and $GRP_t^{TV-1}$) derived from the total of the GRPs of the previous day for all channels combined are also estimated. For the next day effects total Radio and TV-GRPs of the previous day, are added to the model by means of Almon lags of order 16 and degree 6. These lags are assumed to kick in at 6 in the morning, therefore next day effects for radio and TV run throughout the next day, from hours 6 to 22. No channel or spot specific differences are modeled for the next day. In order to find the best order and degree for the Almon lags for the next day effects, different lag structures are compared to each other: Almon lags of order 16 and degrees 4 to 7 are analyzed. From a visual inspection (see Figure 7), it can be concluded that Almon lags of different order lead to similar reaction patterns. Based on the AIC-criterion, the Almon lags of order 16 and degree 6 provide the best lags structure for the model.

**Figure 7: Next Day Effects' Almon Lags Comparison**




Furthermore, there are significant but small autoregressive effects, which lead to the introduction of lagged calls up to three hours, and also to a 168-hour or one week autoregressive lag. In equation (1), $\mathrm{GRP}_t^{fb}$ is the total GRPs of the first ads in the blocks. We consider the first broadcarted advertisements in order to measure their effects on incoming calls to the call center. The result is a specification which contains a total number of parameters equal to 248 with 22,416 observations. In order to evaluate the order effect for an advertisement, the following model is used and the effectiveness of an ad that is not broadcasted in the first place in a block is determined:

$$
\begin{aligned}
y_t = & \beta_0 + \sum_{l=1}^{3} \lambda_l y_{t-l} + + \lambda_{168} y_{t-168} + \beta_{sin} S_t + \beta_{cos} C_t + \beta_{Trd} Trend_t + \beta_{M4} D_t^{M2} \\
& + \beta_{M7} D_t^{M5} + \beta_{M18} D_t^{M16} + \beta_{M33} D_t^{M31} + B_{hol} D_{hol,t} \\
& + \beta_{pre\,hol} D_{pre\,,t} + \beta_{post\,hol} D_{post\,,t} + \sum_{we\,h=1}^{47} \beta_{we\,h} D_{we\,h,t} \\
& + \sum_{wd\,h=1}^{24} \beta_{wd\,h} D_{wd\,h,t} + \sum_{wd\,=2}^{7} \beta_{wd} D_{wd\,,t} + \sum_{h=6}^{19} \sum_{l=0}^{4} \beta_{h,l}^{grp}\, grp_{t-l} \\
& + \sum_{Ch=1}^{5} \sum_{l=0}^{4} \beta_{h,l}^{Ch}\, Channel_{t-l} + \sum_{Lgt\,h=1}^{5} \sum_{l=0}^{4} \beta_{h,l}^{Lgth}\, Lenght_{t-l} \\
& + \sum_{l=1}^{4} \beta_{h,l}^{TV} TVGRP_{t-l} + \sum_{h=7}^{24} \beta_h^{TV-1} GRP_t^{TV-1} + \sum_{h=7}^{24} \beta_h^{R-1} GRP_t^{R-1} \\
& + \sum_{l=0}^{4} \beta_{h,l}^{WE} GRP_{t-l}^{WE} + \sum_{l=0}^{4} \beta_{h,l}^{rest} GRP_{t-l}^{rest} + \varepsilon_t
\end{aligned} \tag{2}
$$

Where

$GRP_t^{rest}$ = The total of GRPs of the ads which are not broadcasted in the first place in the block

## 4. FINDINGS AND DISCUSSIONS

The first model above yields a coefficient of determination of 0.9047. The R2 is slightly higher than for the linear model, but of course the R2 for logarithmic and linear models are not readily comparable. Also the mean square errors confirm the superiority of the logarithmic model. The MSE for the linear model is 21.6. For the logarithmic model, after back transforming to original units, it is 19.87. More importantly, the face validity of the results, as evident from signs and magnitudes of the coefficients found, is much better for the logarithmic model than for the linear one.

There are significant but relatively small autoregressive components in the model, leading to the inclusion of three hourly lags and a one-week lag, which results in a total autoregressive impact of 0.35. Significant multiple seasonality (daily, weekly, yearly), coupled with a long term trend ($Trend_t$) and day after holiday effect ($D_{post,t}$) are found.

The number of calls is decreasing at a rate of approximately 6% per year. The number of calls on days following a holiday is approximately 8% less than the number of calls on normal days. Similar to the effect observed by Tellis, Chandy and Thaivanich (2000) there is a 7% decrease in daily calls from Monday to Friday. Call frequency reaches its peak between 8 am and 11 am on working days, and between 9 am and 11 am on weekends.

The incremental impact of each of the radio channels, relative to the effect of the total GRPs, is again measured by means of distributed lags for four hours following the broadcast. As discussed earlier, these effects are assumed to be unrelated to the time of broadcast. The reaction patterns for the five channels are shown in Figure 8. From this figure, it can be concluded that the patterns of the radio channels effects are highly similar and -0.02, respectively. For TV commercials, the impact is very high at the moment of the broadcast. However, the impact is dramatically decreasing at the other lags.

**Figure 8: Impact of Radio Channels**

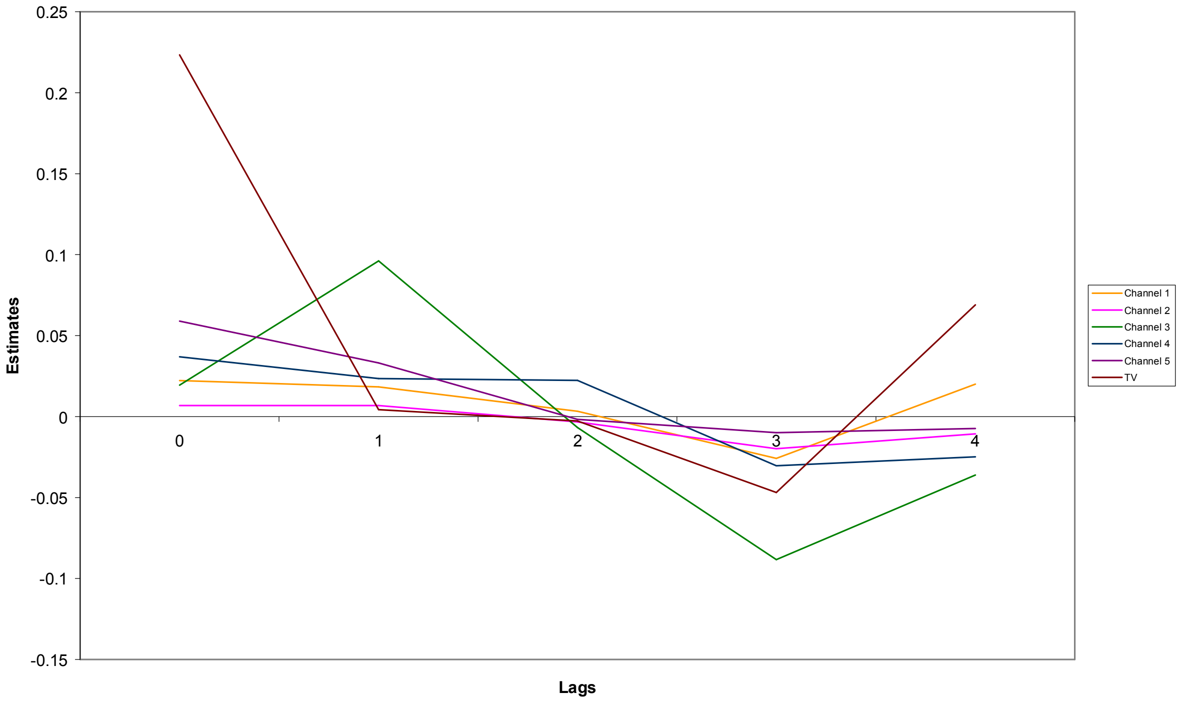
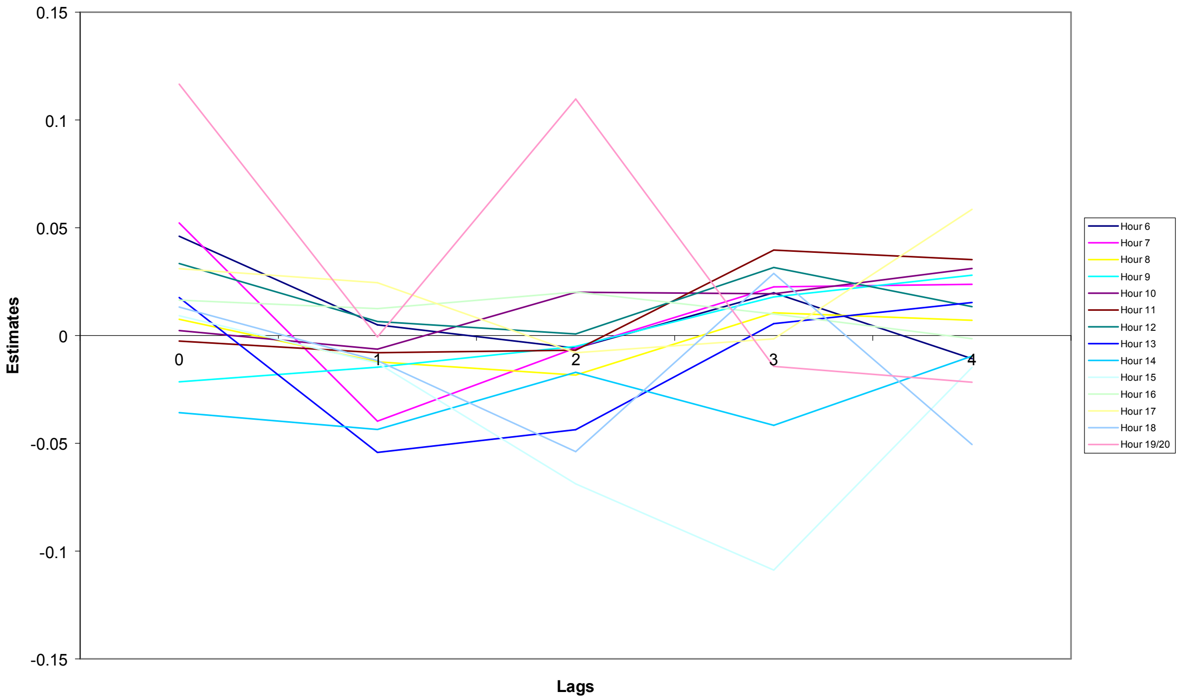



**Figure 9: Impact of Hour of Broadcast**




except for Channel 3. The distributed lag impact is at the highest level at the moment of broadcast for the other four radio channels. Channel 5 is the most effective channel, with a short term (total distributed lag) elasticity of 0.07 followed by Channel 1, Channel 4, Channel 3 and Channel 2, with effects of 0.04, 0.03, -0.015

The response patterns for radio GRPs at different hours of broadcast show substantial variation in effectiveness per GRPs (See Figure 9) over time and with respect to lags. No systematic decay pattern is observed. Spots at lunch time (13 and 14) do not show a positive incremental impact, but rather a negative one. Typically, the impact is higher at the hour of broadcast than at the four subsequent hours.

The most effective hours in terms of total distributed lag impact are hour 19/20, hour 17 and hour 12. The next-day effect of radio commercials on calls shows a wave pattern, but it is relatively small (total distributed lag effect of 0.14). It has to be kept in mind that this comparison, based on distributed lag impact has to be evaluated relative to the daily call pattern: a small impact per GRPs at a peak hour may have more effect than a relatively large impact on off-peak hours.

**Figure 10: Impact of Commercial Length**

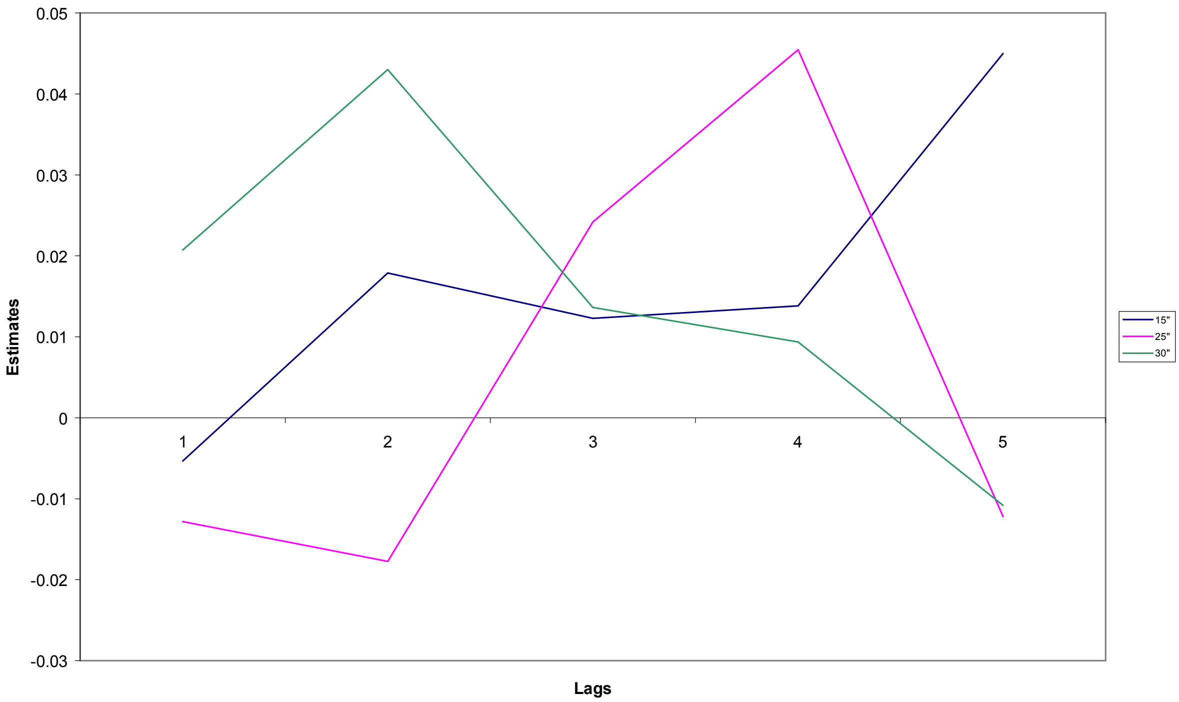



Figure 10 shows the incremental impact patterns of the commercial lengths. Again, the results show substantial volatility in the estimates. Further, the lag structure seems highly variable: for 15'' commercial, the highest impact is at lag 4, for 25" commercial this occurs at the third lag and 30" commercial has the highest impact at the first lag. Furthermore 15" and 30" commercials show a negative incremental impact at the moment of the broadcast but increase at later lags. The total distributed lag impacts, 15'' commercial is the most effective commercial with an effect of 0.08 and 30'' commercial is the second most effective one with an effect of 0.076 and 25" commercial has an effect of 0.03. The reason is linked to the different appeals associated with commercials of different length in the sample: the 15'' commercials are related to a price promotion, with a higher direct impact per GRPs than the other types of commercials. Concluding, it appears that, notwithstanding the substantial amount of data, the lag structure remains highly volatile.

The parameters in equation (1) related to the first placed ads in a block GRPs ($GRP_t^{fb}$) are not significant. It may be concluded that being the first one in an ad break does not affect the impact of the advertisement. Moreover, the parameters in equation (2) related to the ads which are not broadcasted in the first place in a block ($GRP_t^{rest}$) are also not significant. These results show that the place of an advertisement in a block does not affect the ads' impacts.

## 5. CONCLUSION

In this study, I evaluate the impact of direct-response commercials on incoming calls at a national call center. I focus on short-term response and thus do not measure any long-term shifts in brand awareness. Using call frequencies and commercial GRPs at the hourly-level, I estimate logarithmic distributed lag models. While linear and logarithmic specifications result in similar fits, the logarithmic specification results in better stationary. Due to the lack of TV commercials in the data, TV GRPs effectiveness is not split up. In this study, significant multiple seasonality (daily, weekly, yearly), a long term trend, significant calendar effects related to holidays, pre and post holiday effects are found. In addition to seasonality effects, there is also a substantial autoregressive component in the system (up to three hourly lags and a one-week lag).

The results indicate that advertising has a limited impact per GRPs with highly divergent effects according to time of broadcast and channel The main contribution of the paper is “to present an advertisement in the first place in a block does not contribute to the ad effectiveness” and also “the place of an ad during a break does not affect the advertisement impact”. In other words, the sequence of an ad in a block does not affect the impact of the commercial which proves the usefulness of the model in the context of media planning for the data provider. Although the advertisers pay approximately 10% more for the first or last placed advertisements in a commercial block, the results of this study indicate that there is no difference between the first placed advertisement and the others in terms of effectiveness. Therefore, I believe that this paper will certainly attract the attentions of advertisers and marketers.

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