
Fueling Sales at EuroPet

Half the money I spend on advertising is wasted; the trouble is I don't know which half.

—John Wanamaker, 1838–1922

The words of John Wanamaker, the father of modern advertising, were running through Hugh Blanchard's mind as he absentmindedly dropped his jacket on a chair in his office and made his way to the cluttered desk, contemplating his latest advertising quandary. Blanchard had been an executive for fifteen years in the retail marketing department of EuroPet S.A., a multinational company operating gas stations in many European countries. His current role involved allocating the convenience store (c-store) advertising budget in European markets where EuroPet operated c-stores in its gas stations. Two days ago Blanchard had endured a rather unpleasant meeting with Emily Tyler, one of EuroPet's senior marketing executives. Tyler had been very disappointed—to put it mildly—by the slumping sales at the c-stores. Despite a recent increase in the advertising budget, EuroPet continued to lose market share to some competitors that did not advertise nearly as much. Tyler ended the meeting by giving Blanchard an ultimatum: –It's quite simple, Blanchard. You either give me proof that our advertising has actually boosted c-store sales and that the increase justifies the advertising spend, or you and the rest of your department had better be prepared to start tightening your budgetary belts.‡

EuroPet

EuroPet's core business was the sale of fuel to retail customers. The company operated predominantly in continental Europe. Until ten years previously, EuroPet's gas stations had only sold fuel. In the mid-1990s they began to develop and brand their own convenience stores. These c-stores, which were co-located with EuroPet gas stations, were developed for two reasons. First, additional profits could be generated by attracting customers who had a need for both convenience items and gas. Second, there was a growing propensity for supermarkets to attach gas stations to their retail operations. This practice was developing into a major threat to EuroPet.

Despite being part of the same organization, EuroPet fuel marketing and c-store marketing were carried out by separate departments. The fuel marketing wing was responsible for developing and marketing products sold on the forecourt (predominantly premium unleaded fuel, regular unleaded fuel, and diesel). The retail marketing wing, of which Blanchard was a part, was responsible for the c-store marketing.

There were three different types of EuroPet c-stores. EuroPet Compact (comprising 45 percent of all EuroPet's stores) provided only –essential‡ convenience items and generally occupied less than fifty square meters. EuroPet Regular (35 percent of all EuroPet's stores) had a



capacity of up to 180 square meters. EuroPet One-Stop (20 percent of all EuroPet's stores) had the largest selection of goods and was typically more than 180 square meters in size. Business at c-stores was brisk and profitable. Customers were willing to pay a considerable mark-up for buying convenience items while getting gas. The weighted average margin was 30 percent on c-store sales (i.e., €100 of revenue yielded €30 of profit).

Traditionally, EuroPet's main competitors had been supermajor energy companies such as PetroAmerica, InterOil, and RoyalScandia. More recently, however, home-branded gas stations, operated by supermarkets such as MarcheLocal and Metra had been winning market share. Despite taking a low fuel price position similar to that of the supermarkets, EuroPet had been unable to reverse this trend. In an effort to increase c-store sales, Barry Panayi, the EuroPet chief marketing officer, had increased the continental Europe c-store advertising budget by 50 percent to €12 million. When this decision failed to show an immediate positive impact on c-store sales, Panayi hired Tyler, a seasoned marketing executive from the United Kingdom with experience in turnarounds and a reputation for financial prudence, as an additional watchdog over the retail marketing department.

C-Store Sales

It had not taken Tyler long to immerse herself in EuroPet's gas station and c-store business. At the meeting with Blanchard two days earlier, Tyler had criticized the size of the c-store advertising budget. "MarcheLocal and Metra hardly advertise at all!" she exclaimed. "And yet look at their market share. It's growing as steadily as ever. We, on the other hand, are spending €12 million per year advertising our convenience stores in continental Europe and our market share is dwindling. The supermarket gas stations in particular have all but swallowed up our business! It begs the obvious question: is all this advertising really worth the effort and costs?"

Blanchard bristled. "I think you'll find the advertising is well worth the cost, actually, if you examine the effects of our campaigns. But in some ways marketing is an art: sometimes only an expert can fully appreciate the details that contribute to the overall effect. If you need evidence of our advertising's effectiveness, let's hire a media company to gather it."

There were many media companies that offered (for substantial fees) to measure the effectiveness of advertising—metrics such as breakthrough, preference, and trial record consumer insights, giving the marketer some indication of the impact of a specific advertising campaign. The problem was that it was notoriously difficult to translate these metrics into a reliable sales figure. Furthermore, a sales uplift that coincided with an advertising campaign might or might not have been caused by that advertising campaign (e.g., a heat wave that occurred at the same time as the advertising campaign could ultimately have driven the increase in sales).

"Blanchard," Tyler snapped. "If I wanted an independent assessment on the merits of Christmas dinner, I wouldn't hire a turkey farmer to provide input."

"Pardon me?" said Blanchard.

Tyler sighed, pinching the bridge of her nose in frustration. "If the media company proved that the advertising was having little effect, then we would cut the advertising budget, in effect cutting any future business we would have provided that company," she explained. "No, I think you had better examine the impact of our ad campaigns yourself."

Blanchard had little choice but to agree.

A certain degree of analytical rigor had to be maintained in order to conduct an effective examination of EuroPet's advertising. After some discussion, Tyler and Blanchard eventually agreed that regression analysis would be a good tool to examine the relationship between c-store sales and advertising spending.

Blanchard realized, however, that such an analysis would face a major obstacle. Regression analysis could measure the short-term effects of advertising on c-store sales, thereby potentially relating current c-store sales to current ad spending. But such an analysis would completely neglect any long-term effects of advertising, whose importance had been demonstrated by much market research. He realized that if he could account for such long-term effects then the impact of EuroPet's advertising would appear more favorable—perhaps not good enough for Tyler, but certainly much better than if he ignored any long-term effects.

Plans for his data analysis already running through his head, Blanchard turned to leave Tyler's office and begin work.

—Oh, and Blanchard?|| said Tyler.

He turned back questioningly.

Tyler smiled. —You have four days.||

Advertising Carryover

Over the preceding four decades many marketing research articles had been written analyzing advertising carryover. The difficulty of estimating long-term effects of advertising was a recurring topic. The magnitude of the carryover from short-term to long-term effects is inconclusive and dependent upon a wide variety of variables (product, quality of initial advertising campaign, media used, market size, competitor activity, etc.). An established standard transformation to get from short-term effects to long-term effects is

$$\text{long-term effect} = mf * \text{short-term effect}$$

where mf denotes a multiplication factor that is frequently estimated based on sales and advertising data. This relationship means that the overall long-term effect of advertising (including the immediate short-term effect) is larger by a factor of mf than the immediate short-term effect. For example, $mf = 3$ would mean that for each €1 of short-term benefit that is attributable to advertising, an additional €2 benefit is obtained later, for a total benefit of €3. That is, the long-term effect is three times the short-term effect.

Various studies had reported many different values for the factor mf . For example, a study by Lodish et al.¹ in *Marketing Science* reported an estimate of $mf = 2$ based on a large experimental study. The authors also cited previous publications with estimates for mf in the range from about

¹ Leonard M. Lodish et al., —A Summary of Fifty-Five In-Market Experimental Estimates of the Long-Term Effect of TV Advertising,|| *Marketing Science* 14, no. 3 (1995): G133–G140.

1.25 to more than 5. A paper by Leone² in *Marketing Science* estimated that about 90 percent of advertising impact was felt within the first six to nine months. The article surveyed the literature and found that estimates for mf depended strongly upon the chosen length of time intervals. Most reported estimates fell into a range of just above 1 to about 6 or 7. The article argued that the wide range of reported estimates was partially due to a bias in the aggregation of advertising and sales over time.

Assumptions

After much deliberation regarding what was and was not quantifiable, Tyler had finally accepted a number of assumptions for the approach Blanchard would take, based upon the published estimates for the mf and mindful of the need to preserve mid-term and long-term sales.

Blanchard would carry out a regression analysis with market data from one large metropolitan area in Europe. The data would consist of weekly observations with no less than one hundred data points. In his final report to Tyler, Blanchard would only include variables that were statistically significant at a 10 percent level of significance. Tyler had also insisted that the explained variability (the infamous R-squared) of Blanchard's regression had to exceed 85 percent for her to accept it as a valid basis for the analysis. Blanchard had tried to explain that the R-squared is often misinterpreted and thus a grossly overrated number, but he quickly realized that any such attempt was fruitless. Tyler obviously had fallen prey to the myths of R-squared.

Blanchard would then use the predictions for the short-term effects of advertising on c-store sales to estimate total sales generated by the advertising. They agreed to use an mf of 3. That is, if Blanchard could demonstrate €1 of sales generated by advertising using regression analysis, then Tyler would accept this as evidence of €3 of sales overall. They also decided that all media would be treated equally (despite Tyler's arguments that radio advertising might have less of a long-term impact than TV advertising).

Marketing (other than advertising), opportunity, and other costs would not be considered in the final assessment of whether c-store advertising was economically effective. The mechanics of the calculation would therefore be as follows:

- | | |
|---|-------|
| (1) Amount spent on c-store advertising in market X: | €50 |
| (2) Short-term (regression) revenue impact of advertising: | €30 |
| (3) Overall revenue impact (mf = 3): | €90 |
| (4) Overall profit generated by c-store advertising (@ 30% margin on store) | €27 |
| (5) Net impact of c-store advertising: (€27 – €50) | – €23 |

Because of the time constraints, Blanchard picked the metropolitan area around the city of Marseille for his analysis. He knew from experience that some variability existed in the c-store advertising spend in Marseille, and he suspected that it might make regression analysis more meaningful.

² Robert P. Leone, "Generalizing What Is Known About Temporal Aggregation and Advertising Carryover," *Marketing Science* 14, no. 3 (1995): G141–G150.

Marseille³

Marseille is the second largest city in France, with a population of about 820,000. The city is the nucleus of the third largest metropolitan area in France, with slightly more than 1,600,000 inhabitants (called *Marseillais*). Only the populations in the areas around Paris and Lyon are larger. Marseille is located on the southeastern coast along the Mediterranean Sea (see **Exhibit 1** and **Exhibit 2**), and is France's largest commercial port. Marseille is the capital of the *Provence-Alpes-Côte d'Azur région* as well as the *préfecture* (capital) of the *Bouches-du-Rhône département*. The city's motto is *Actibus immensis urbs fulget Massiliensis* (By her great deeds, the city of Marseille shines). The city's major industries are petrochemical and chemical, steel, food, aeronautics, microelectronics, and textiles.

The average January temperature is about 6.6°C and the average July temperature is 23.9°C. The coast around Marseille, which reflects a Mediterranean climate, is sunny on average 320 days per year. During the hot, dry summer, the temperatures are often the highest in the country. The combined effects of the sun, dry air, and permeability of the limestone make the city and its surroundings one of the driest regions in France. Average annual precipitation is about 60 centimeters. Rainfall peaks during autumn and winter, sometimes falling up to four inches an hour. In spring the weather alternates unpredictably between mild and cold days, and frost can occur as late as April or May. Winter is generally mild, although the Mistral, a very cold, dry, northwesterly wind, blows on average 107 days per year.

EuroPet had a strong market presence in Marseille, with one hundred c-store locations. Both the oil supermajors (PetroAmerica, InterOil, RoyalScandia) and the hypermarkets (MarcheLocal, Metra) were active in the market, making c-store competition fierce.

Data

Given his time restrictions and the difficulty of obtaining data from EuroPet France on short notice, Blanchard decided to focus on getting data for Marseille relating to a few relatively straightforward variables. He collected week-by-week data from EuroPet's one hundred c-stores for the preceding two years and compiled it in an Excel file (see **Exhibit 3**). An explanation of the variables is as follows:

<i>Week</i>	Running count of the week of the year. 1 = first week in January, 2 = second week in January, ..., 52 = last week in December.
<i>Sales</i>	The average c-store sales (in €) per week per c-store location.
<i>TV</i>	Total TV GRPs; measures the total volume of delivery of the message to the target audience. One GRP represents 1 percent of EuroPet's target audience being reached one time. The total can exceed 100 if portions of the target audience are reached repeatedly within a week. The price of a GRP varies widely. The average cost of a TV GRP in Marseille was €300.
<i>Radio</i>	Total radio GRPs. The average price of a radio GRP in Marseille was €25.

³ Information about Marseille taken from "Marseille," Wikipedia, <http://en.wikipedia.org/wiki/Marseille>, and Marseille Convention and Visitors Bureau, <http://www.marseille-tourisme.com>.

Fuel Volume Average volume of fuel sold per EuroPet facility in Marseille per week (all fuel types, in liters).

Fuel Price Average price of fuel in the market (all fuel types, in cents per liter).

Temp Average high temperature recorded in a given week in Marseille (in °C).

Prec Precipitation, or rainfall (in millimeters).

Holiday Dummy variable; has a value of 1 if during that week there was at least one day of public or school holiday; has a value of 0 if during that week there was no public or school holiday.

Visits (1 or 2) EuroPet conducts marketing surveys on a weekly basis. One of the questions in the survey is: –In the past week, how many times have you shopped at a EuroPet convenience store? Possible survey responses were 0 times, 1–2 times, or 3 or more times. This variable is the percentage of respondents who answered that they had visited a EuroPet c-store 1–2 times in the past week.

Pleased, Blanchard looked over his spreadsheet. The data for EuroPet’s c-store operations in Marseille was all there; now he had to make sense of it. There was only a short amount of time left before Tyler expected his report. It was time to get to work.

Questions

1. To obtain an initial overview of the data, calculate the minimum, average, and maximum value of the variables *Sales*, *Fuel Volume*, *TV*, and *Radio*.
2. Customers visit EuroPet's gas stations to buy gasoline and convenience items at the co-located c-stores. For an investigation of the relationship between c-store sales and gasoline sales run a regression of sales against fuel volume.
 - a. Is there a statistically significant relationship between c-store sales and fuel volume?
 - b. Provide estimates for average c-store sales in the data set for weeks when fuel volume levels were at the smallest, average, and largest observed value, respectively.
 - c. Provide respective 95 percent intervals for your three estimates in part b. Comment on the widths of the three intervals.
 - d. Comment on the relationship (cause and effect) between c-store sales and fuel volume.
3. Run a regression of c-store sales against TV and radio GRPs.
 - a. Do the two advertising variables have a statistically significant effect on c-store sales?
 - b. Provide an estimate for c-store sales for a particular week with 40 TV GRPs and 80 radio GRPs.
 - c. Provide a 95 percent interval for your answer in part b.
 - d. Emily Tyler demands proof of the profitability of c-store advertising. Based on your regression, does advertising appear to sufficiently boost c-store sales to justify the advertising spend? Provide an estimate for the net impact of c-store advertising.
4. When Blanchard shows your previous regression to Tyler to make his case for c-store advertising, she flat-out rejects your analysis. She argues that you omitted an important variable, namely the average high temperature in a week. –As we all know,|| she says, –we advertise more during the warm weather periods in Marseille. So the seemingly large effect of advertising in your regression is not truly due to the positive impact of advertising but instead reflects the impact good weather has on driving and on the demand for gas and convenience items.||

To address Tyler's criticism include temperature in your previous regression.

- a. Compare your new regression (with three independent variables) to your previous regression. Does Tyler's criticism appear to be justified? Explain.

- b. Drop all variables from your regression that do not meet Tyler's desired level of significance. Based on the resulting regression, does advertising appear to be profitable? Provide an estimate for the net impact of c-store advertising.
 - c. What needs to be true in order for the coefficients in your regression for c-store advertising to be profitable? Can you prove that advertising is profitable?
- 5. When you show your latest regression to Blanchard, he becomes rather concerned that you have not accounted for many other factors that could affect c-store sales. Surely Tyler will sooner or later complain about that fact. He asks you to extend your analysis.

To address Blanchard's concerns include all other variables (excluding the week of the year).

- a. Drop again all variables from your regression that do not meet Tyler's desired level of significance. Report your final regression equation.
 - b. Carefully interpret the meaning of each slope coefficient in the context of this case. Comment on the signs of the coefficients. Do you observe any seemingly unintuitive signs? Provide possible explanations for any such signs.
 - c. Provide a 95 percent interval for the increase in c-store sales if TV GRPs rise by 5 rating points.
 - d. Based on this new regression, does advertising appear to be profitable? Provide an estimate for the net impact of c-store advertising.
- 6. When Blanchard shows your new regression to Tyler she gripes about the low R-squared. She suggests that you include three new dummy variables in your data set, namely dummies for Weeks 7, 21, and 49. (For example, the dummy for Week 7 is 1 for the two data points from Week 7 of a year and 0 for all other weeks.) Tyler believes that these new dummy variables will increase the R-squared and make the regression more meaningful and the resulting predictions much better.

Construct these three new variables and run a new regression including all variables in your data set (excluding the week of the year).

- a. Drop again all variables from your regression that do not meet Tyler's desired level of significance. Report your final regression equation.
 - b. Are the coefficients of the new dummy variables significant? What is the new R-squared?
 - c. Provide a simple and intuitive explanation for the effect of the three new variables.
 - d. Do you believe that the new regression will yield better predictions than your previous regression? Comment on Tyler's arguments in favor of the new variables.
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7. Blanchard believes your analysis for Question 5 does not properly account for the effects of the advertising variables. He argues that TV GRPs and radio GRPs affect c-store sales differently during weeks with a holiday than during weeks with no holidays. In particular, he believes that TV and radio advertising have a significantly larger influence on c-store sales in weeks without holidays than in holiday weeks.

Modify your regression from Question 5 to address Blanchard's concerns. Can you prove his claims?

8. You notice that temperature has a statistically significant effect on c-store sales in all of your recent regressions. You believe that the coefficients of temperature in your regressions somewhat overstate the effect of temperature on c-store sales for weeks in which there is a holiday. You know that the French love their holidays and often take advantage of their free time by taking car trips. That means they will be visiting c-stores during holidays even if the weather is bad. Therefore, you believe that temperature will have a significantly stronger effect on c-store sales in weeks without a holiday than in weeks with a holiday.

Modify your regression from Question 5 to examine your hunch.

- a. Again, drop all variables from your regression that do not meet Tyler's desired level of significance. Report your final regression equation.
 - b. Can you prove your hunch?
 - c. Calculate estimates for c-store sales for weeks with, and without, a holiday when the following conditions exist: TV GRPs of 50 and radio GRPs of 40; a fuel volume of 63,000 liters; a fuel price of €1.20; an average high temperature of 20°C and precipitation of 1 cm; and 6 percent of survey responses indicating 1 or 2 visits.
9. Based on your analysis of the case, what is your overall conclusion regarding the economic effectiveness of EuroPet's advertising in the Marseille area? Discuss.

МАРКЕТ



Exhibit 2: Marseille in the South of France

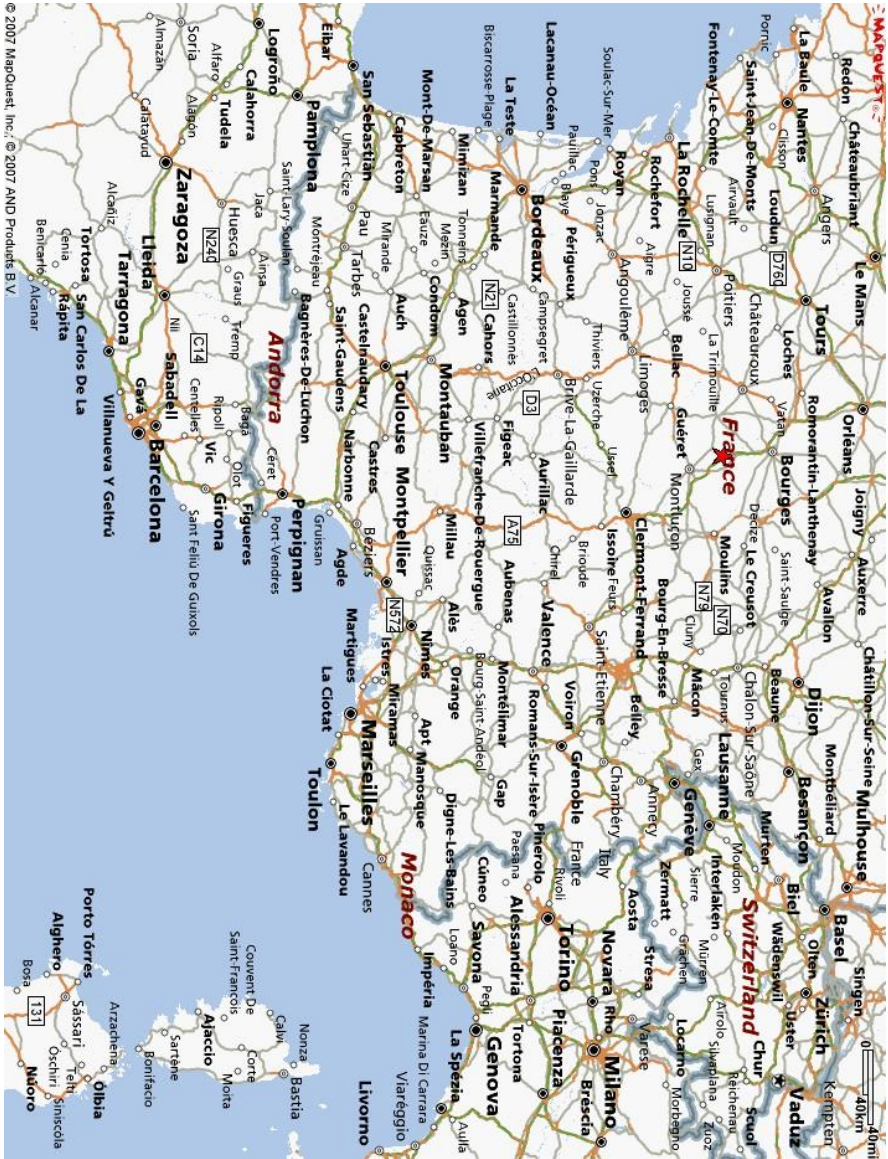


Exhibit 3: Excerpt of the Data Set

Week	Sales	TV	Radio	Fuel Volume	Fuel Price	Temp	Prec	Holiday	Visits (1 or 2)
26	24,864	74.5	66.5	61,825	104.24	27.9	0.9	1	7.0
27	23,809	74.5	66.5	62,617	103.97	27.7	1.3	1	7.0
28	24,476	90.0	75.0	60,227	107.48	29.1	4.8	1	5.9
29	25,279	90.0	75.0	63,273	111.75	30.0	3.1	1	5.9
30	26,263	90.0	75.0	65,196	109.08	29.3	0.0	1	5.9
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18	23 688	160.0	208.0	65 052	130.95	16.8	12.7	1	6.0
19	23 922	150.0	208.0	63 214	129.06	17.3	14.6	1	6.0
20	24 421	0.0	0.0	63 379	129.28	19.7	5.9	0	6.0
21	26,197	0.0	0.0	63,623	127.19	21.1	6.1	0	6.0
22	26,765	180.0	237.0	62,661	129.19	21.8	7.3	0	4.0