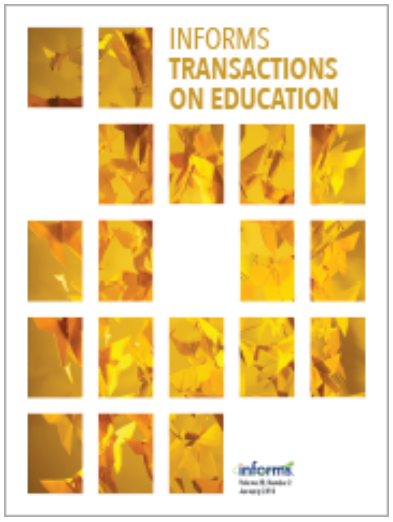

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Case Article

Forecasting Beer Demand at Anadolu Efes

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In this case study, the students are required to build a multiple linear regression model that explains the monthly beer demand in Turkey to help Efes Beverage Group in its beer demand predictions. The students are expected to study the factors affecting the beer demand, work on sets of raw data to transform them into relevant variables for the model, select the variables that are meaningful in explaining the demand, test the assumptions of regression, and validate their models, using variable transformations if necessary to obtain a valid model. They are also required to predict the future demand by the help of their models. They should try different scenarios of uncontrollable predictor variables and test the effects of changes in price-related controllable predictor variables. There are alternative approaches the students may take in carrying out various parts of the case.

Key words: forecasting; regression model; demand estimation
History: Received: January 2009; accepted: February 2010.

1. Synopsis of the Case Study

Efes Beverage Group is the beverage division of one of Turkey's leading corporations and it has a share of about 78% in the Turkish beer market. Efes forecasts the monthly demand for the coming year during the fall of the current year. Historically, high-level sales managers, based on input from their sales personnel, have done this forecasting mostly subjectively. They now want to formalize this process so that significant factors on beer demand can be identified and used to predict the monthly demand. This is done in this case study by developing a multiple linear regression model to explain and predict the nationwide beer demand of price-based variables, tourism, seasonality, etc. Constructing a valid regression model, selecting relevant variables, interpreting the results, and making predictions are important aspects that need to be addressed. The students can take alternative approaches to study the case.

2. Teaching Objectives

The main objective of this case study is to help students analyze, model, validate, and interpret the outputs of a multiple linear regression model. As discussed in the case, the problem to be solved is a part of a larger problem in operations management and marketing. This helps students understand that regression models are useful to explain, control, and predict the demand.

We aim to help students improve their skills to

- handle data sets and convert raw data into relevant variables;
- construct a real-life multiple linear regression model and solve it using a statistical package or spreadsheet software;
- validate the model by testing the assumptions of the multiple linear regression model and making the necessary changes;
- make predictions using multiple linear regression and answer what-if questions by experimenting with the future values of predictor variables.

Besides these core objectives, we also aim to inform students about

- the beer industry by providing general information on the sector and the leading company in this sector in Turkey (Anadolu Efes);

• possible decision-making processes in companies through realistic dialogues between managers at various levels and analysts.

3. Case Analysis

The analysis of the problem discussed in this case requires developing a multiple linear regression model. The case does not require prior knowledge of the beer industry. The students learn about many potential factors through the dialogues in the case. They are also provided with hints on how to carry out a multiple regression study. We expect these hints to lead students to think about various aspects, review the necessary topics, and discover how to handle the whole problem of forecasting beer demand.

The analysis includes studying the data, creating the necessary predictor variables, running the multiple linear regression models, validating by testing various assumptions and making necessary changes in the model, deciding which predictor variables are relevant, interpreting the results, and making predictions and what-if analyses. There could be alternative ways of approaching the problem in terms of transformations, variable selection, and possible use of the results of the models.

4. Possible Extensions

The scope of this case study can be extended by considering several additional issues. Some of the immediate extensions can be listed as follows:

• The students could be asked to develop time-series-type models to predict some of the independent variables (such as tourism) that can be used in the predictions of beer demand.

• The students could be asked to discuss the possibilities and difficulties in including promotions (such as handing out beer glasses with six packs) and advertisements as predictor variables in the model.

5. Teaching Suggestions

The case can be assigned after studying multiple regression and time-series models. The students are led to use multiple linear regression through case dialogues. We tell the students to play Selin's role. We leave it up to the instructors whether to provide discussion questions or not. We find it more useful, for higher-level students, to have them deduce what analysis is needed from the text of the case themselves. However, it may be helpful for less experienced students to be guided in a more structured manner. The teaching note provides a sample of possible discussion questions.

The case can be assigned to teams of two to three members. Our experience with teams has been very positive. Team work is especially important in MBA programs where students typically have diverse backgrounds and work experiences. Complementing their different skills in the team, the students not only produce better case results, but they also learn substantially from each other.

We suggest giving three weeks to the students for doing the analysis in a regular course that meets three hours a week. We also find it useful to allocate some class time during which the teams work on their cases. The instructor would be available during these periods to discuss with teams. This allows further guidance to the students, and, at the same time, the instructor can keep track of the students' progress. Some students have difficulty in the subjective aspects of interpreting the graphs and making transformations at the early phases of the assignment. They usually overcome these difficulties through teamwork and discussions with the instructor. The instructors may find it useful to go over their graphs and other diagnostic tools with each team to help them better understand and justify the assumptions of multiple regression.

This case covers many aspects that are important in a real-life forecasting problem. After doing this case, the students are expected to gain the necessary skills to conduct multiple linear regression studies that are encountered in various industries.

The dialogues in this case are designed to guide the students in building a valid multiple linear regression model. They are realistic because they reflect our interactions with the managers during our consulting projects with Efes. The students find the dialogues interesting, educating, and entertaining. They appreciate the fact that the case uses real data that had been used by the company for the same purpose. They also enjoy and are motivated by the context of the problem.

This case may be used in introductory-level undergraduate or graduate statistics or operations management courses after covering multiple regression. Incorporating the extensions explained in the teaching notes, this case can be enriched and used in higher-level courses as well.

We find it useful to ask one of the teams to volunteer to present its results followed by a discussion session. This session usually takes about one hour and gives students the opportunity to see different approaches to the same problem and learn from each other as well as from the instructor. The discussion session may become even more creative if it is further continued in a relaxed environment over some Efes beer.

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