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Impact of media investments on brands' market shares: a compositional data analysis approach

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Resume

The aim of this CIFRE thesis, realized with the market research institute BVA in collaboration with the automobile manufacturer Renault, is to build a model in order to measure the impact of media investments of several channels (television, outdoor, etc.) on the brands' market shares, taking into account the competition et the potential cross effects and synergies between brands, as well as controlling for average price and regulatory context (scrapping incentive).

Market share models have been developed in the marketing literature, especially the GMCI model (generalized multiplicative competitive interaction model), inspired from the aggregated conditional MNL (multinomial logit) model. In the statistical literature, the compositional data analysis (CODA) allows to analyze share data respecting their nature (a vector of D shares subject to the unit sum constraint is a composition and belongs to the dimension D simplex space). Regression models for dependent and explanatory compositional variables exist but are rarely used in practice. Finally, the Dirichlet covariate model allows to model a simplex valued dependent variable.

In the first chapter, these different models avec compared from a theoretical and empirical point of view. It is shown that all of them can be expressed with a similar formulation using the notions of attraction and of simplicial expected value. The GMCI model appears to be a particular case of the CODA model, such that these two specifications can be combined into a unique model. The complexity of Dirichlet and CODA models turns out to be necessary in order to capture the diversity of competitive relationships.

In the second chapter, emphasis is given to the interpretation of models which is not very well developed in the CODA literature. Different types of interpretations are presented, but it is demonstrated that the calculation of the elasticities of market shares relative to media investments in particularly relevant from a mathematical point of view and from a practical perspective. Indeed, we prove that elasticities are consistent with C-derivatives of simplex valued functions of another simplex. Moreover, these elasticities can be easily interpreted by car manufacturers and can be used for advertising budgeting optimization (Dorfman-Steiner theorem).

In the third chapter, a practical application to the B segment of the French automobile market is presented for the purpose of measuring the impact of the different advertising channels on the market shares of the three leaders of this segment and of the group of other brands, taking into account the lagged effects of advertising (adstock function) and the competitive cross effects. The media investments elasticity of the brand market share varies from one brand to another and from one channel to another. Synergies between some brands can be highlighted.

The last chapter opens the discussion on different directions to be explored in order to improve the proposed model and to provide further answers to the considered issue.