



“Advanced data analysis techniques with marketing applications”

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Published online: 30 May 2022
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Globalization and digitalization drive a rapidly increasing amount of all kinds of data, e.g., customer reviews from online shopping platforms, posts on social media, store-level sales data, or promotional data, that are particularly relevant for marketing applications. The increasing availability of marketing data poses a huge challenge for marketing managers. In particular, marketing managers are nowadays expected to rely on marketing data in order to derive and/or improve marketing decisions. Beyond managerial experiences, it is therefore necessary to continuously develop advanced data analysis techniques to extract the relevant information from marketing data for further use in quantitative marketing models, which in turn serve as decision support systems for final marketing decisions. Especially, the estimation of data using appropriate models and the development of accurate predictions based on the estimated model outcomes build the basis for successful marketing activities.

All these research issues can be bundled in so-called quantitative marketing research, and especially data analysis with marketing applications gained in popularity over the last decades. Overviews of discussions of quantitative marketing models can be found in several textbooks, e.g., Franses and Paap (2001), Franses and Montgomery (2002), Diamantopoulos, Fritz and Hildebrandt (2013), Moutinho and Huarn (2015), and date back to the 1980’s with textbooks of, for example, Maddala (1983) or Lilien and Kotler (1983).

In general, data analyses can be categorized into three kinds of analyses, i.e., descriptive analyses, predictive analyses and prescriptive analyses (Akerkar 2013;

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Šikšnys and Pedersen 2016). Descriptive analyses focus on data mining techniques and the aggregation of data. This kind of analyses helps marketing managers to review past situations, e.g., the number of consumer purchases in a particular time period or in a particular store.

Descriptive analyses focus on data from the time period between an event root cause and an event indication (cp. Figure 1). Predictive analyses rely on forecasting techniques and statistical modelling, i.e., contrary to controlling past marketing activities, these kinds of analyses help marketing managers to predict certain events. Prescriptive analyses incorporate the output from predictive analyses and use optimization methods, decision trees etc. to proactively suggest the best marketing decision option and its implementation.

Predictive analyses significantly contribute to business value, as is revealed by the temporal sequence of data analyses steps in Fig. 1. However, a loss in business value between the event prediction and the proactive (marketing) decision becomes obvious. This loss results from a particular time interval between these two dates. Hence, timely predictions of emerging events are key for marketing managers in order to minimize the potential loss of business value over time (cp., Lepenioti et al. 2020, p. 58). To facilitate this, advanced data analysis techniques are mandatory.

Besides the categorization of data analysis techniques, marketing data itself can be classified according to several dimensions: on the one hand, they can represent either revealed preferences from real purchasing activities of consumers (e.g., based on scanner data or click stream data), or stated preferences gained from experimental settings (e.g., based on conjoint or discrete choice approaches). On the other hand, marketing data can be collected at the disaggregate consumer level (e.g., household panel data) or at the aggregate consumer level (e.g. sales data). Once the marketing data is thoroughly analyzed, the results can be used for descriptive or predictive analyses and for improving or optimizing marketing decisions, i.e., prescriptive analyses.

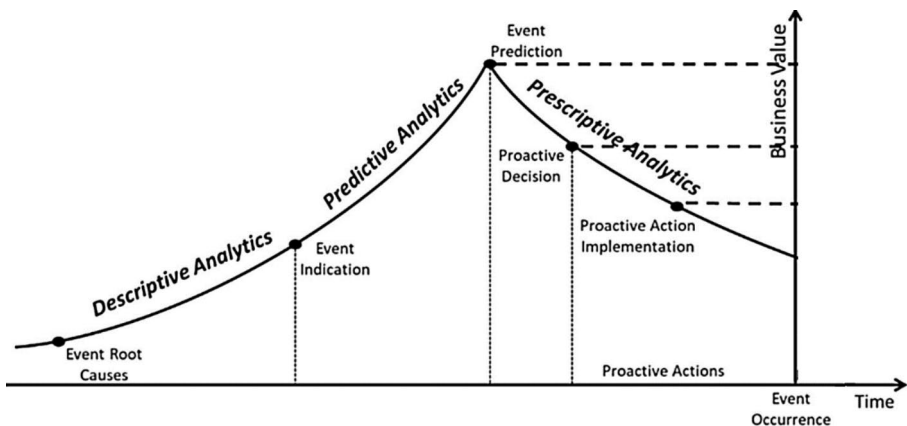


Fig. 1 Gained business value of data analytics with respect to time. (Modified source: Adopted from Lepenioti et al. 2020, p. 58 and Krumeich et al. (2016), p. 265)

Sophisticated models, that are able to process complex data, e.g., high volume data or data with missing values, are nowadays state-of-the-art in marketing theory and practice. Besides the application of these established models to new data sets, e.g., data from new application fields, further development of advanced model estimation techniques is highly crucial to improve parameter estimates. Those estimates build the basis for further predictions and marketing actions. Hence, research in these fields is highly valuable for sound managerial implications.

The five papers of this special issue cover such developments in quantitative marketing research by addressing key theoretical and practical aspects that are highly relevant for marketing managers to derive the best marketing decisions in varying application fields in marketing. The articles cover the fields of predictive and prescriptive analytics as well as proceed varying kinds of marketing data. The topics of the contributions are therefore up-to-date to the ongoing stream in the relevant marketing literature.

Filipe Sengo Furtado, Thomas Reutterer and Nadine Schröder's article "The carrot and the stick in online reviews: determinants of un/helpfulness voting choices" investigates the drivers of customer online reviews' (un-)helpfulness features. Using a hurdle regression model, they aim to disentangle the differential effects of what drives reviews to receive any votes, how many votes they receive and whether these effects differ for helpful against unhelpful review voting behavior. The authors find that revealed review (un-)helpfulness is consistently guided by the sentiment of review texts. Furthermore, reviewers tend to be less critical for lower priced products. Interestingly, the findings only suggest partial support for a confirmation bias with differential effects for the level of controversy on helpfulness versus unhelpfulness review votings. As one conclusion, the effects of voting disagreement are more complex than expected so far.

Philipp Aschersleben and Winfried J. Steiner's article "A semiparametric approach to estimating reference price effects in sales response models" deals with price response effects in the context of store-level brand sales data. The authors develop a new dynamic price response model by combining nonparametric price response modeling and behavioral pricing theory. In particular, they propose a semiparametric approach to flexibly estimating price-change or reference price effects based on store-level sales data. Subsequently, they apply their new model to different representations of capturing symmetric vs. asymmetric and proportional vs. disproportionate price-change effects following adaptation-level and prospect theory. Using an empirical study, they demonstrate that the new semiparametric dynamic model provides more accurate sales forecasts compared to competing benchmark models.

Daniel Baier and Björn Stöcker's article "Profit uplift modeling for direct marketing campaigns: approaches and applications for online shops" proposes profit uplift modeling approaches to select best recipients for direct marketing campaigns. The new models are based on one-stage ordinary regression and random forests as well as two-stage Heckman sample selection and zero-inflated negative binomial regression for parameter estimation. In comparison to traditional approaches, the new

approaches perform superior in two empirical studies, i.e. for a dataset that reflects recent discount offers of a large online fashion retailer and for the Hillstrom dataset that describes two Email campaigns.

Theresa Maria Rausch, Tobias Albrecht and Daniel Baier's article "Beyond the beaten paths of forecasting call center arrivals: on the use of dynamic harmonic regression with predictor variables" develops a new forecasting method for call center arrivals that is able to capture the dynamics of a time series and to include contextual information in form of predictor variables by extending a dynamic harmonic regression (DHR) approach. In an empirical study, it is shown that the multivariate DHR model outperforms traditional models with regard to forecasting accuracy for a broad spectrum of lead times. Further, the authors give contextual insights into the selection and optimal implementation of marketing-relevant predictor variables, e.g., catalog releases, mail and postal reminders, or billing cycles.

Lydia Simon and Jost Adler's article "Worth the effort? Comparison of different MCMC algorithms for estimating the Pareto/NBD model" challenges three different Markov Chain Monte Carlo (MCMC) procedures for parameter estimation of the Pareto/NBD model in two simulation studies. They demonstrate that the algorithms differ in their sensitivity towards the hyper distributions and identify one algorithm that outperforms the other procedures. Furthermore, they provide deeper insights into individual level forecasts when using MCMC methods and enhance extant data set limitation guidelines by considering both the cohort size and the calibration period's length.

The five articles in this special issue give an impression on the variety of theoretical issues in quantitative marketing research as well as on the broad spectrum of applications in marketing practice. Furthermore, they highlight the importance of research for advanced data analysis techniques in different fields of data analysis.

We would like to sincerely thank all authors as well as all reviewers for their contributions to this special issue and wish readers an insightful reading.

Funding Open Access funding enabled and organized by Projekt DEAL.

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