

Long Term Sales Forecasts of Innovations - An Empirical Study of the Consumer Electronic Market

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Principal Topic

Entrepreneurial action, whether undertaken by firms small or large, new or old, involves the ability to recognise and exploit opportunities. This is a risky activity. The consumer electronic industry (the focus of this study) is characterized by high development and launch costs of technological innovations as well as high failure rates. Moreover, technological innovation tends to be an ongoing pursuit of consumer electronic companies. Accurate long term forecasting of sales, and understanding the drivers of those sales, assists managers to better recognise and exploit opportunities over the life cycle of a product category.

In durable product categories such as consumer electronics, accurate long term forecasting models need to incorporate first and repeat purchases. This is important both because the latter represents a significant share of sales for durables over time, and because consumer requirements for product innovation develops as they become experienced, sophisticated users of the product. While traditional aggregate diffusion models for durables mostly consider first purchases only (e.g., Bass 1969 and its many extensions), less attention has been devoted to diffusion models considering repeat purchases. This is due to the fact that this research tradition has largely relied on secondary data which do not offer a distinction between first and repeat purchases. This makes it very difficult to assess the validity of any model incorporating repeat purchase. Therefore, our study undertakes a large primary data collection to address this issue.

In the diffusion literature, there is no consensus regarding which repeat purchase model is most suitable for forecasting purposes. Most of these models are developed on the basis of aggregate annual sales data which do not provide any information on the individual buying behaviour. One weakness of the repeat purchase models published so far is the failure to measure heterogeneity of consumer's repeat purchasing behaviour. Thus, modelling this component adequately might lead to a better overall forecasting performance. For this reason, individual consumer data, rather than aggregate sales data, was collected in this study.

Methodology/Key Propositions

The paper starts with a theoretical and empirical review of the published diffusion models considering repeat purchases. Based on the insights of this review process a new forecasting model is developed that builds on disaggregate data obtained from a survey. Several interesting research questions arise. For example:

1 What is the impact of ignoring repeat purchases on the long term forecasting performance of a diffusion model? 2 How well do the existing models predict sales patterns? 3 Is there any evidence of a consistent superiority of one of the models? 4 How can we incorporate individual level repeat purchasing behaviour from consumer surveys into aggregate level diffusion models? 5 How can heterogeneity in repurchasing rates across consumers explicitly be accommodated to offer better long term forecasts?

A survey has been designed which particularly accounts for the research questions mentioned above. Households of Germany took part in an online-survey which lasted for three months (Oct. till Dec. 2005). 8,077 out of nearly 13,000 responses can be used for further analyses. Households were asked as an example about their consumption behaviour concerning six products of the consumer electronic market. The products studied are: TV, VCR, DVD-Player, digital camera, laptop computers and desktop PC.

The paper provides an overview about published diffusion models considering repeat purchases for durables classified by criteria such as modelling of the repeat purchase process, validation of data set used for development and calibration of the models, data required for forecasting purposes, parameter estimation techniques employed etc.

Islam and Meade (2000) have already addressed some of these questions by comparing models using aggregate sales data. We extend their analysis using disaggregate survey data which allows much better insights into the relative merits of each model. Using the empirical data obtained from the survey, the models are compared in terms of both their explicit or implicit theoretical assumptions concerning consumer repeat buying behaviour and their forecasting performance.

Based on the insights from the evaluation process on disaggregate data we propose a new model that incorporates consumer heterogeneity.

Results and Implications

Our analysis shows that the models differ quite drastically in their modeling assumptions with respect to the replacement process, required data and the number of parameters to be estimated. By theoretical considerations, some of those models are not appropriate as a long term sales forecasting model. Not surprisingly there seems to be a clear trade off between keeping a model simple (e.g., small numbers of parameters) and getting accurate long term forecasts at the same time. As this is ongoing research, more specific results are not yet available.

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