Measuring the impact of marketing on sales has long been seen as an essential planning tool for marketers. Understanding the return on marketing investment (MROI) of one promotional activity over another, in terms of sales generated, helps allocate budget and shape campaigns. Intuitively, marketers know that the effectiveness of each marketing activity in driving sales varies within its execution timeframe. But since measurement calculations are typically averaged across the entire period analyzed, they are unable to give strategic insights at specific points in time. To overcome these limitations, marketers are exploring alternative approaches to MROI.

Until recently marketers relied heavily on constant parameters regression (CPR) modeling to understand the impact of marketing investments on sales. Ads were bought on long lead times, the analysis of data was on a six-month cycle or more, and media plans were prepared on an annual basis. However, in today’s always-on, always-connected world, where ads are bought and sold in minutes, analysis is done in real time and planning is an ongoing activity, marketers are looking to understand the effectiveness of individual marketing activities at a much more granular level and across multiple channels. Understanding the impact of specific campaigns around back-to-school week for example, or opening day of the holiday sales, provides opportunities for higher MROI. As such, marketers are starting to use more advanced econometric modeling techniques which involve time-varying parameters (TVP).

The techniques and benefits of TVP modeling are well acknowledged by scholars and analysts in various industries. For instance, the National Institute of Commodity Promotion Research and Evaluation applied this approach to the New York City’s fluid milk campaign data to understand the impact of generic advertisement wearout. Analysts have also used TVP techniques effectively to study environmental changes as well as stock movements.

In recent years, there has been a great deal of interest in applying this approach to better understand the effectiveness of marketing activities and to make strategic investment decisions.

Unlike the CPR technique, the TVP model can capture the finer movements of actual sales and determine the extent to which each marketing activity contributed to increased sales in a specific timeframe—daily, weekly, monthly or a longer duration. Since this approach reflects the actual response of consumers to marketing activities at a granular level, companies can use the data for making accurate investment decisions which may generate a higher return than would have been possible otherwise.


The ripple effect

At a time when chief marketing officers (CMOs) are under pressure to justify MROI, the TVP model helps increase accountability and drive marketing spend to higher levels of incremental value per dollar invested. This approach ensures precision of data and greater transparency in measuring the effectiveness of marketing initiatives in driving sales across media channels—key information that the finance department requires for business planning. In fact, as other departments become aware of the increased insight that more granular data brings to investment decisions, the ripple effects of this approach are likely to be felt throughout the company.
Assume that the marketing department at SuperiorBuy ran a series of marketing campaigns for two years across a number of offline and online media channels. At the end of the campaign, the CMO at SuperiorBuy wanted to quantify the effectiveness of its marketing activities across media channels on a weekly basis over the two-year period. Based on the insights gained, he wanted to plan the future marketing activities and allocate appropriate budget to various media channels. Which approach should the CMO use to achieve his objective—TVP or CPR?

Going beyond consistent baseline
Available studies show that both approaches are able to capture a company's baseline sales (that is, loyal sales) accurately. In addition, the CPR modeling approach provides an acceptable estimate of the weekly average sales attributed to marketing activities at a regional or national level. The TVP modeling approach, however, goes a step further and provides precise estimates of the effectiveness of marketing activities across media channels in driving sales at a local level on a week by week basis.

Definitions

**Constant Parameters Regression (CPR) model.**
A statistical (regression) model which provides advertising effectiveness estimates under the assumption that effectiveness is constant over time.

**Time-varying Parameters (TVP) model.**
A statistical (regression) model where multiple instances of advertising effectiveness (i.e. regression coefficients) can be defined over time.
Calibrating effectiveness of marketing activities in driving sales

As SuperiorBuy has a large number of stores across multiple markets with different local sales patterns, it is important that the CMO gain insight into the effectiveness of marketing activities across media channels at a granular, rather than regional or national levels. As revealed in Figures 1a and 1b, a comparative analysis shows that in such instances, the TVP model is more appropriate than the CPR technique.

Average versus actual

As reflected in Figures 1a and 1b, actual sales (white dotted line) showed a dramatic drop on a number of occasions, for example after the Holiday Sales or Spring break, when SuperiorBuy stopped investing in one of its key promotional activities, Circulars.

The CPR modeling approach is unable to capture the dip in sales (Figure 1a—1); on the contrary, it gives the impression that Circulars continued to contribute the most to sales. This is because the CPR model provides an estimate of sales activity by averaging results across the two year period, thereby smoothing out any substantial change in sales at a local level. By providing skewed estimates, the CPR technique masks the true relationship between marketing activities and both weekly and annual sales.

By contrast, the TVP modeling approach reveals that when SuperiorBuy stopped investing in Circulars, sales from this media driver came to a complete stop (Figure 1b—1). It also reflects that investment in other marketing activities (orange area) continued to contribute to sales but by a much smaller proportion than before. This type of additional insight comes from the ability of the TVP model to quantify uplifts and dips on a week by week basis.
Media Driver Sensitivity

When SuperiorBuy invested in several media drivers, leading to a boost in actual sales, for example, before the Holidays, the CPR modeling approach reveals that Circulars contributed only marginally to sales (Figure 1a-2). In addition, investment in other media channels appeared to continue to drive sales in a fairly constant manner.

By contrast, the TVP modeling approach reveals that Circulars helped boost overall sales very significantly, and that investment in other media channels added to the spike in sales (Figure 1b-2). With a focus on granularity and being adaptive to the movement of local sales, the TVP model gives the CMO at SuperiorBuy precise results. Furthermore, since the TVP model analyzes available data and also identifies gaps in that data, it mirrors the real situation.

The added value offered by TVP modeling over the CPR technique results from the fact that the projection of weekly effectiveness onto annual sales is closer to the long term average effectiveness (Figure 2). By gaining insight into the effectiveness of marketing activities on sales at a local level per media driver on a weekly basis, the CMO at SuperiorBuy can make intelligent decisions about budget allocation for the subsequent year.

Maximizing the impact of future marketing activities

The analysis of historical sales data using each approach has a direct impact on future decisions about marketing campaigns. Should the marketing organization invest in the same media drivers in the coming year or not? What is the most effective mix of media drivers?

When should the promotional activities begin in each marketing activity and how long should it stay active?

These questions are being asked by most marketing organizations aiming to reach consumers across a range of media channels and wanting to measure the effectiveness of each promotional activity. An accurate analysis of historical data in terms of marketing activities across media channels that proved more effective in driving sales (or not) can give marketing professionals invaluable insights for the future. This is exactly the promise of the TVP approach; it can guide CMOs and marketers to invest in a judicious mix of activities based on those activities’ past effectiveness in driving sales.
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