Class 14 Workshop: Marketing Mix Modeling

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November 15, 2023

Section 1

Marketing Mix Modeling

Marketing Mix

What is Marketing Mix Modeling

Marketing Mix Modeling

Marketing Mix Modeling (MMM) is the use of statistical analysis to **estimate the causal impact** of various marketing **mix variables (especially pricing and promotions)** on **sales**.

- **Core idea**: find an appropriate statistical model that can characterize the relationship (DGP) between sales and marketing mix variables

Phase 1: Data Collection (What to Include in a MMM Model?)

SAMPLE MARKETING MIX MODEL SALES TACTIC

DISTRIBUTION & PRICING	PRODUCT	PAID MEDIA	PROMOTIONS	EXTERNAL FACTORS
Distribution	Product Life Cycle	TV	Merchandising	Seasonality & Weather Patterns
Pricing	Product Changes	Magazines	Couponing	Competitive Factors
CRM & Offers	New Products	Newspaper	Public Relations	Macroeconomic Inputs
Channel Incentives	Segment Trends	Radio	Loyalty Program Activity	
Retail Format Changes	Product Recalls	Outdoor/Out-of-Home	Event Marketing	
	Quality Metrics	Online Media	Sponsorships	
	Awards		Word-of-Mouth	
	Third-Party Reviews			
	Sampling			
	Inventory Levels			
	Sales Force Activity			
	Customer Satisfaction			
	Product Performance			
	Product Placement			

Phase 2: Statistical Modelling

- What functional forms and specifications to use for each variable?
  - More of an art than science
  - quadratic terms when diminishing returns are expected
- How to determine the "best" model
  - predictive accuracy (error of predicted sales)
  - model fit (R^2)

Classic Examples of MMM

Example 1: Model the relationship between **sales** and **price** as follows:

$$sales_t = \beta_0 + \beta_1 Price_t + X_t\beta + \epsilon_t$$

Example 2: Model the relationship between **sales** and **number of influencers** as follows.

- We would normally consider diminishing marginal return of marketing activities

$$sales_t = \beta_0 + \beta_1 NumInflu + \beta_2 NumInflu^2 + X_t\beta + \epsilon_t$$

Phase 3: Model-Based Optimization

The outputs from your MMM project – that is, the data and estimates that come out of your statistical model – need to address the profit maximization problem.

- The MMM model will produce a host of outputs that measure how each tactic (e.g., price) affects sales.
- We can then use the outputs to guide our marketing decisions.

Optimal Pricing to Maximize Profit

- We can utilize the outputs to compute the optimal pricing

$$sales_t = 1000 - 20Price_t + X_t\beta + \epsilon_t$$

- Then we know, conditional on X_t, the total revenue would be

$$profit = (Price - COGS) * sales = (Price - COGS) * (1000 + X_t\beta - 20 * Price)$$

- We can derive the optimal price to maximize profit.

$$\partial profit / \partial price = (1000 + X_t\beta - 20Price) - 20(Price - COGS) = 0$$

- The optimal price that can maximize the revenue/profit is $\frac{1000 + X_t\beta + 20COGS}{40}$
- In term 2's Operations Analytics module, you will systematically learn how to find the optimal pricing, given the estimated functional relationship between sales and marketing mix variables.

Section 2

Zalora Case

Zalora Case

- Please take out the Zalora quarto document. Let's go through how we can build a marketing mix model for Zalora to optimize its profit.