Markdown Optimization

Modeling Markdowns to Maximize Revenue
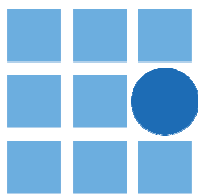
Executive Summary

Markdowns are omnipresent in retailing and play a significant role for any retailer's strategic decision making. A successfully implemented markdown optimization provides significant benefits in the form of higher revenues, increased margins, improved sell-through and reduced inventory. Despite the benefits it offers, many retailers find it difficult to implement the tool because of the complexities involved and adverse consequences that result because of sub-optimal markdowns. The challenges most retailers face today are threefold i.e. determining optimum markdown levels, determining timing of markdowns and identifying goods for markdown.

In this paper, we present a methodology that provides solutions to above challenges. The methodology enables a retailer to track performance of its merchandise and identify items that are under or over-performing. For underperforming referred to as slow-selling items in the paper, it presents a mechanism to check their viability for price markdown. This paper also discusses various best practices using which you can maximize value from markdown optimization.

Introduction

Retailers and CPG companies, irrespective of their size and market position apply markdowns to clear excess inventory. They leverage markdown strategies to optimize inventory in line with consumer demand. Shrinking product lifecycles, seasonal demand, diversified assortments, changes in variety and size of customer base, increase in store count and ever increasing competition have both necessitated and increased the use of markdowns.

The need for markdowns arises because of variations between predicted sales and actual demand in the selling season. On majority of the occasions, decision making regarding pricing and sales targets is made before the start of selling season ignoring factors that may alter after the initial decision making point. As a result, when total demand in the selling season falls below the inventory available, there arises excess inventory and consequently the need for markdowns.

Strategic Impact of Markdown Optimization

Facilitates Assortment Selection

Markdown optimization facilitates assortment optimization by comparing performance of different stock keeping units with historical point of sale data. It groups retailer's merchandise into fast and slow moving items and provides inputs as to what inventories to carry at what point of time and at which location.

Helps in Understanding Customer Preferences

Markdown optimization helps in understanding customer preferences by providing insights based on identifiable attributes like colors, style and brand. It helps a retailer design unique markdown strategies for each store or zone based on what customers want at each stage of product lifecycle.

Facilitates Scenario Analysis in Real Time

Optimization tools provide real time data about sales, inventory, profitability and pricing levels across multiple locations. What-if analysis using real time data facilitates selection of most optimal strategy as it is based on latest trends and most recent data.

Strategic Impact of Markdown Optimization

Improves Decision Making

It enables managers and C-level executives to make better decisions faster by facilitating analysis such as performance of different SKUs, comparison of store-level performance with overall business performance and providing insights into shopper behavior.

Higher Realization per Unit Sold

Optimal markdown strategies involve estimation of price elasticities at various stages of product lifecycle. It allows a retailer to design an optimal markdown strategy by conducting what-if analysis of decisions such as "15% & 60% markdown at end of weeks 3 and 8 respectively" V/S "20% and 35% markdown at end of weeks 3 and 8 respectively".

Improves Working Capital Position

Optimizing markdowns in line with customer demand improves sell-through and optimizes inventory value. Optimal inventory levels reduce carrying costs as well as ordering costs leading to improvement in working capital position.

Maximizing Value from Markdown Optimization

A carefully implemented markdown optimization provides big rewards in terms of improved sell-through rates, higher revenues and consequently increased net margin. To gain maximum benefits, retailers should consider the following factors:

Define Markdown Scope

Defining the scope i.e. deciding on timing and setting markdown limits for each phase of product lifecycle enables a retailer to drive inventory goals consistent with pre-defined sell-through rates.

Integrate Optimization Goals

It is essential to align markdown down goals with overall business strategy in order to make the tool forward looking and respond to any changes in strategy or seasonal plans.

Reconcile Competing Performance Motivators

At the start of selling season, it is essential to recognize goals of all demand stimulators viz. discounts, marketing and promotion strategies including markdowns to ensure that they don't conflict with broader organization goals of revenues and profitability.

Educate All Stakeholders

Provide adequate training and coaching to all the stakeholders involved in the optimization process. It is necessary to gain cross functional buy in early and often.

Implement, Learn and Refine Strategies

Markdown optimization is not an intermittent affair but a recurring process. Retailers need to continuously learn from past experiences and refine strategies to adapt to changing business needs.

The Model

In this paper, we discuss a heuristic procedure[1] that allows a retailer determine the timing and magnitude of price markdowns. Before we start explaining the procedure, it is essential for us to understand some of the notation and the following terms used in the paper:

- Slow-Selling Items
- Economically Viable for Markdown

For a slow-selling item, if the total sales after applying markdown is greater than that without applying markdown and the ratio of "sales with markdown to sales without markdown" is greater than or equal to the retailer's desired critical ratio at the end of season, then the item is defined as economically viable for markdown.

Notation used

n = Length of selling season

I_0 = Initial inventory

j = index of week prior to price markdown

I_j = Inventory at end of week j

k = index of current week

P_c = Current unit Price

P_m = Markdown Price

F_c = Inventory proportionality factor

$i(k,I_k,F_c,n)$ = End of season inventory

Slow-Selling Items

A slow-selling item is defined as one such that at the end of week k, with inventory I_k and sinventory proportionality factor F_c, the forecast for the inventory level at the end of the season $i(k,I_k,F_c,n)$ is greater than a retailer's desired upper bound for ending inventory, $i*kn$. Thus, if at the end of week k,

$$i(k,I_k,F_c,n) > i*kn \ ,$$

then the item is defined as a "slow-selling item" and highlighted for review.

Economically Viable for Markdown

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[1] www.sbaer.uca.edu/research/icsb/1998/11.pdf

An item is economically viable for price markdown if at the end of week k, the forecast of revenue $r(k, I_k, P, F, t)$ over the remaining n-k weeks of the season, given a unit price markdown P_m, is greater than or equal to that given by the current unit price P_c.

Let forecast of revenue with current price P_c be denoted by $r(k, I_k, P_c, F_c, n)$

Let forecast of revenue with markdown price P_m be denoted by $r(k, I_k, P_m, F_m, n)$

For an item to be economically viable for price markdown,

$$r(k, I_k, P_m, F_m, n) \geq r(k, I_k, P_c, F_c, n)$$

i.e. forecast of revenue after markdown should be greater than or equal to the forecast of revenue without markdown.

For the proposed markdown, if the total sales after applying markdown are greater than that without applying markdown and the ratio of "total sales with markdown to total sales without markdown" is greater than or equal to the retailer's desired critical ratio, then the item is defined as economically viable for markdown.

$$\text{i.e. } (k, I_k, F_m, F_c) \geq \sigma(n, k, F_c, P_m/P_c)$$

Where (k, I_k, F_m, F_c) represents ratio of total sales with markdown and without markdown

$\sigma(n, k, F_c, P_m/P_c)$ represents a retailer's desired critical ratio for a given price markdown

The above analysis shall be carried at the end of each week. For any given week, if an item is identified as slow moving and also economically viable for price markdown, then the item can be taken up for review.

Decision Making

The procedure explained above allows for identification of following categories of items:

- Slow-selling and economically viable for price markdown &
- Slow-selling but not economically viable for price markdown

If a slow seller is identified sufficiently early in the selling season, it may be possible to return or exchange the item with the vendor. This situation is suitable especially for second category of items where it is not economically viable to provide markdown.

Also, the procedure allows for sequential markdown of slow-selling items particularly in situations where increased sales achieved by earlier price markdowns are not sufficient to remove slow mover status in remaining weeks.

Perceptive Analytics

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We provide analytics solutions for optimizing marketing decisions. We offer solutions such as demand forecasting, promotion modeling, mark-down optimization, customer segmentation, and competition analysis. We adopt the right strategy and create marketing edge so you can create winning products, enhance sales and convert traffic into customers.

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