Optimal Dynamic Portfolios for Most-Valuable-Products

Problem Statement

Context: Every year, the Revenue Growth Management team at CCSB defines a priority portfolio of beverages, known as Most-Valuable-Products (MVPs), for sales teams to focus on. MVPs include products that have high sales volume and profitability, as well as strategic products that help grow the business.

Current Approach
- Back Channel
- Updated Weekly

Opportunities
- What if 2 supermarkets have different demand?
- What if we want MVPs to adjust seasonally?
- How can we use Big Data to inform MVPs?

Project Charter

Methodology

Clustering

Each Trade Channel
- Supermarkets
- Superettes
- Drug Stores
- Convenience Stores

1. Clustering stores based on demographic information:
   - Sales Office
   - Population
   - Income
   - Age Distribution

2. For each area, cluster stores based on past sales:
   - Last year sales volume/gross profit
   - % of sales in each beverage category
   - % change in sales across years

Models Used
- Random Forest
- Linear/Logistic Regression
- XGBoost

Evaluation
- AUC
- R²

Best Model

Optimization

Input:
- \( p_{ij} \) Profit Forecast = Predicted gross profit by product for each store
- \( p_{ij} \) Propensity Forecast = Probability of purchase by product for each store

Formulation:
\[
\text{Maximize} \quad \sum_{c \in PC} \sum_{i \in \{1, \ldots, n_c\}} x_{cij} \cdot \gamma_i \cdot \eta_{i} \cdot \eta_{i} \cdot (1 + \delta_{cij}) \quad \text{subject to constraint, } c \in PC, \eta_{i} \in \{1, \ldots, n_{clusters}\}
\]

Output:
List of core products to be included in a store’s portfolio

Opportunity:
Using the optimization allows us to have a smaller size of core products that captures the same percentage of profit – leaving space for strategic products that have high potential to grow.

Results

Expected Gross Profit Captured

Trade Channel
<table>
<thead>
<tr>
<th>% of Expected Gross Profit Captured in June 2021</th>
<th>Optimization Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>supermarkets</td>
<td>87.5%</td>
</tr>
<tr>
<td>superettes</td>
<td>92.0%</td>
</tr>
<tr>
<td>convenience</td>
<td>86.9%</td>
</tr>
<tr>
<td>drug</td>
<td>85.6%</td>
</tr>
</tbody>
</table>

Example: New MVPs suggested (for mature customers, Supermarkets)

Solution Validation

Backtesting for June 2021 and December 2021:
Run our models 2x to obtain optimal MVP portfolios for June and December

Apply June portfolio from June 2021-2021 December portfolio from December 2021-May 2022

Comparison of the current solution and the current approach

Impact

Since our optimal MVPs capture more profit with the same number of MVPs, the company can choose between strategies:

Option 1
Continue pushing the same number of products

Option 2
Operate profitable MVPs that are more likely to be purchased

More flexibility to include seasonal packages, innovation SKUs, or high potential products, with same profitability as current MVPs