ST2187 : Business Analytics, applied modelling and Prediction

Coursework

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Table of Contents

Executive Summary

A superstore spread across 7 markets: EU, APAC, US, LATAM, EMEA, AFRICA and CANADA have a four-year comprehensive transaction data (2011-2014 period). In this day and age of data, the Superstore and it’s management want to make intelligent decisions based on the analysis of the data at their disposal to maximize on their profits & cut down on their loss making ventures by deriving key insights.

Profit Ratio (Profit / Sales) and Profit Distribution (Interquartile Range of Profits) were the principal factors selected for earmarking the mammoth revenue generating markets for the superstore. EU stood out as a major profit-making market for the superstore’s product line.

The strengths and weaknesses of the successful EU market, after the analysis the Superstore data stands in a better position to make intelligent decisions and replicate the model in other markets.

To understand the weaknesses in the EU market it is vital to dissever the Loss-Making Economies/Countries from the profit-Making Economies.

Further, it is noted that Table as a Sub-category is the only loss generating Sub-category in the EU market. Hence a meticulous analysis of the Table as a Sub-category is done.

Amongst the Profit Generating economies Italy has the least Profit Ratio but the Italian market is significant in Sales volume and offers a great deal of diversity after categorization into different Clusters (based on carefully chosen common characteristics among the Sub-categories).

Among the loss generating countries Netherlands is generating heavy losses for the superstore and has the most significant sales volume amongst the loss generating economies. Adding to the woes, the losses generated by the superstore have grown over the years in the Netherlands economy and the Sales showing stagnation.

Global Scenario

A superstore spread across 7 markets: EU, APAC, US, LATAM, EMEA, AFRICA and CANADA is trying to maximize on its profits & cut down on it's loss making ventures by deriving key insights from previous years (2011-2014 period) transaction data.

The superstore sells a smorgasbord of products (sub-categories) like Appliances, Art, Accessories, Bookcases, Blinders, Copiers, Chairs, Envelopes, Furnishings, Machines, Labels, Phones, Paper, Storage, Supplies and Tables.

The top three markets for the superstore's products are [1]:

Market	Profit	Sales
APAC	436,000	3,585,744
EU	372,830	2,938,089
US	286,397	2,297,201

Out of the top three markets for the superstore's products, EU market recorded the highest Profit Ratio (Profit/Sales). The Profit Ratios for the top three markets are [2]:

Market	
EU	0.126895
US	0.124672
APAC	0.121593

Apart from recording the highest Profit Ratio, the EU market is particularly very vital from an analysis perspective as it has the largest interquartile range for profit distribution and the widest distribution of profits across all markets [3].

Market Focus: EU

- EU is one of the most significant markets for the superstore having recorded the highest profit ratio of 0.126895.
- To further solidify its hold on the EU market, it is essential to dissect the market based on Profit Making Economies (EU Profit Makers) [4] and Loss-Making Economies (EU Loss Makers) [5].
- The following countries (amongst EU) are generating losses:

Count..	
Denmark	-4,282
Ireland	-7,392
Portugal	-8,703
Sweden	-17,519
Netherlands	-41,070

- The following three countries are the most significant for the superstore from the Sales as well as from the Profit perspective:

Country	Profit	Sales
France	109,029	858,931
Germany	107,323	628,840
United Kingdom	111,900	528,576

- Out of the loss generating countries Netherlands is generating heavy losses for the superstore and has the most significant sales volume amongst the loss generating economies[5].

Country	Profit	Sales
Netherlands	-41,070	77,515
Sweden	-17,519	30,491
Ireland	-7,392	16,640
Portugal	-8,703	15,105
Denmark	-4,282	8,638

- Add to the woes of the superstore apart from generating heavy losses (highest amongst the Loss-Making Economies), the Losses in Netherlands have only increased over the years [5]:

Year of Ord..	
2011	-9,138
2012	-8,527
2013	-11,851
2014	-11,554

- Another important economy for the superstore from the Sales Perspective is Italy. Though the Italian economy is a Profit generating economy for the superstore’s products, it is worthwhile to note that it records the lowest profit ratio (0.0684) amongst the EU economies [6].
- Amongst the products (sub-categories) being offered by the superstore in the EU Market, it is generating losses in the table sub-category [7].

EU Table Sub-Category: Understanding Losses incurred

- Out of all the products (sub-categories) being offered by the superstore in EU Market, the Table sub-category is the only sub-category generating losses for superstore. The reasons for the same are probed.
- Following three countries account for majority of the Table sales in the EU market [8]:
    - France (31.07%)
    - United Kingdom (27.08 %)
    - Germany (23.08 %)
    - Italy (~10 %)
- Following countries have a negative profit ratio (incur losses) [due to high discount rates] being offered [9]:
    - Netherlands (Profit Ratio < -1)
    - Sweden (Profit Ratio < -1)
    - Spain (Profit Ratio < -0.5)
    - Italy (Profit Ratio < -0.5)
    - Germany (Profit Ratio < 0)
    - France (Profit Ratio < 0)
- Netherlands and Sweden offer the highest discounts in the table sub-category amongst the EU economies [9]. Further, out of the negative profit ratio countries listed above Netherlands and Sweden have an extremely low profit ratio (Profit Ratio <-1). Inspite of offering very high discounts of approx. 70%, the sales of tables remain dismally low. This indicates weak demand of products in table sub-category and hence table sub-category should be discontinued in Netherlands and Sweden.
- The Profits in the EU market for the table sub-category are extremely sensitive to discounts and the linear relation between the two variables (Average Profit and Average Discounts in the Table sub-category) is described by the equation:

<u>Average Profit = -1988 *Average Discount + 500.004</u>

- The Linear relationship described above has a R-Squared value of 0.49 implying that variations in discounts account for 49 percent of the variation in profits, hence implying the need for discounts to be capped. From the break-even point calculated from the equation described above, it is calculated that the discounts need to be capped at 25%.

- Spain accounts for about 4.5% of the Total Sales of the Table sub-category in EU market however it offers major discounts (60%). Hence the high discount rates being offered over the years to penetrate the market have not yielded significant results. Thus, it is recommended to discontinue the Sub-category table in the Spain market.
- As the Profits in the table sub-category are significantly affected by Discounts being offered, it is recommended to progressively lower the discounts (below 25% for break even) over the coming years in the following economies which have a significant sales volume for the table sub-category amongst the EU economies:
    - Italy (present discount at 50%)
    - France (present discount at 35%)
    - Germany (present discount at 40.45%)

Italian Economy and Scope for Improvement

Italian Economy

- An important economy for the superstore from the Sales Perspective is Italy. Though the Italian economy is a Profit generating economy for the superstore's products, it is worthwhile to note that it records the lowest profit ratio (0.0684) amongst the EU economies [6].
- The Profits in the Italian economy are extremely sensitive to discounts and the linear relation between the two variables (Average Profit and Average Discounts) is described by the equation [11]:

  Average Profit = -361.555 * Average Discount + 61.3879
- The Linear relationship described above has a R-Squared value of 0.2039 implying that variations in discounts account for about 20 percent of the variation in profits, hence implying the need for discounts to be capped. From the break-even point calculated from the equation described above, it is calculated that the discounts need to be capped at 17%.
- Owing to the complexity of the Italian economy it is important to dissect the Italian economy and four broad categories (Clusters) were realized for the products being offered in the Italian economy [12]:
  - Cluster 1: High Sales, Profit making, No Discount with a product (sub-category) line comprising:
    - Accessories
    - Appliances
    - Art
    - Bookcases
    - Copiers
  - Cluster 2: Low Sales, Profit making, No Discount with a product (sub-category) line comprising:
    - Binders
    - Envelopes
    - Fasteners
    - Furnishings
    - Labels

        - Paper
        - Supplies
    - <u>Cluster 3</u>: Low Sales, Extremely Negative Profit Ratio (-0.58), Highest Average Discount (0.5) with a product (sub-category) line comprising:
        - Chairs
        - Machines
        - Tables
    - <u>Cluster 4</u>: High Sales, High Negative Profit Ratio (-0.29), High Average Discount (0.4) with a product (sub-category) line comprising:
        - Phones
        - Storage

<u>Scope for Improvement / Recommendations</u>

- Cluster 3 (Low Sales, Extremely Negative Profit Ratio (-0.58), Highest Average Discount (0.5)): the high discount rates being offered over the years (Average Discount = 50 percent) to penetrate the market have not yielded significant results. Thus being plagued with low sales and extremely negative profit ratio (-0.57836) it is recommended to discontinue the product line (sub-categories) under the Cluster 3 in the Italian market.
- Cluster 4 (High Sales, High Negative Profit Ratio (-0.29), High Average Discount (0.4)): As the Profits in the Italian economy are significantly affected by Discounts being offered, it is recommended to progressively lower the discounts from present 40 % (below 17% for break even) over the coming years in the Cluster 4 product line which have a significant sales volume. This will help reap in the benefits from customer base acquired over the years.
- Cluster 2 (Low Sales, High Profit Ratio, No Discount): For increasing sales and customer acquisition the superstore may offer discounts (below 17% for break even) to attract new customers.

Netherlands: The Commercial Predicament

- Out of the loss generating countries Netherlands is generating heavy losses for the superstore and has the most significant sales volume amongst the loss generating economies.
- The Profits in the Netherlands economy are inversely proportional to discounts and the linear relation between the two variables (Average Profit and Average Discounts) is described by the equation:

  Average Profit = -742.929* Average Discount + 267.901
- From the break-even point calculated from the equation described above, it is calculated that the discounts need to be capped in at 36%.
- On further juxtaposing the Netherlands sales [13] with the French Sales (Highest Sales in the EU Market) [14], it is noted that the forecast yields stagnancy in the Netherlands Sales. Thus, a need to stop selling products (sub-categories) not yielding profit or not having significant sales, as Sales in Netherland's economy are not expected to pick up.
- It is important to dissect the Netherlands economy on the broad principle stated above. Three categories (Clusters) were realized for the products being offered in Netherland's economy [15]:
  - Cluster 1: (Low Sales, High Average Discount (51.7%), Loss making) with a product (sub-category) line comprising:
    - Accessories
    - Appliances
    - Art
    - Binders
    - Envelopes
    - Fasteners
    - Labels
    - Machines
    - Paper
    - Phones
    - Supplies
    - Tables

- Cluster 2: (High Sales, High Average Discount (50%), Loss making) with a product (sub-category) line comprising:
    - Book Cases
    - Chairs
    - Copiers
    - Storage
- Cluster 3: (Profit making, Low Average Discount) with a product (sub-category) line comprising:
    - Furnishings

Recommendations for Superstore: Netherlands in focus

- Cluster 1 (Low Sales, High Average Discount (51.7%), Loss making): the high discount rates being offered over the years (Average Discount = 51.7 percent) to penetrate the market have not yielded significant results. Even though the Cluster 1 forms a major chunk of the sub-categories being offered by the superstore, the Sales in the Netherlands economy are not expected to pick up based on the forecast data [13]. Thus, being plagued with extremely low sales and loss making [high negative profit ratio (-0.601)] it is recommended to discontinue the product line (sub-categories) under the Cluster 1 in the Netherlands market.
- Cluster 2 (High Sales, High Average Discount (50%), Loss making): As the Profits in the Netherlands economy are adversely proportional to the Discounts being offered, it is recommended to progressively lower the discounts from present 50 % (below 36% for break even) over the coming years in the Cluster 2 product line which have a significant sales volume. This will help reap in the benefits from customer base acquired over the years.