PRICE OPTIMIZATION TO IMPROVE STORE PROFITABILITY

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We would like to thank Indian School of Business and Mindscape Computing for providing us an opportunity to work on such an interesting project. The project had various challenges right from data understanding and cleaning to forecasting and optimization, each step of project taught us different aspects of analytics. Challenges become motivators when you have right mentor and facilitators and we were fortunate in this regards.

Project Details

The objective of our project is to recommend Optimized Pricing to meet sell-through, revenues and margin goals. Manage potential end-of-season inventory built up to increase Inventory Turns. A fashion retailer can use its wealth of data to optimize pricing decisions on a Weekly basis. One of the main challenges is pricing and predicting demand for products and give discount as and when needed. In current scenario, retailer does not have an accurate demand prediction models and discounts are given based on business understanding rather than on any optimisation model, resulting in revenue loss.

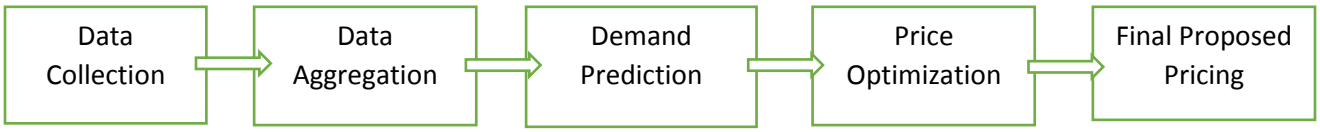
A retail customer of our Sponsor (Mindscape Computing) has multiple brands selling across various stores. We have chosen a premium men's casualwear brand for our Price Optimization Study. The stores get fresh merchandise every season, a season lasts for 26 weeks which is split into 20 weeks as full price period and six weeks as end of season (EOSS). Currently the Brand offers heavy discount on the old merchandise during the EOSS period. The buy for any season is done 6 months before the start of season to give ample time for manufacturing and distribution of the merchandise. The assortment plan is done by the brand planning team before the season start for introducing the new styles into the stores. During the course of our study we have found that

huge discounts during the EOSS erode the brand margins. The business constraints identified are the Maximum Retail Price (MRP) of each product calculated basis the multiple on purchase cost, the constraint on Margin is to generate a margin over and above the threshold of 50% during the complete selling season.

The project intends to facilitate the Merchandising and planning teams decisions by using analytics in improving the efficiency and ROI. This project will benefit the Brick and Mortar Retailers in revenue management. Demand Forecasting and Price optimization are very useful techniques for the given business scenario. The approach was two-fold and we have developed a demand prediction model for the merchandise during the selling season; we have then used this demand prediction data as input into a price optimization model to maximize revenue.

Daily sales are captured by the POS system against every store and item, inventory data is available as weekly closing. The end customer/ consumer data is very limited basis the Loyalty enrolment for the brand. Data is available for below product attributes and measures.

The various challenges we have identified are estimating lost sales due to stock outs as we did not have this information in the data, and predicting demand for items that have no historical sales data. To address this challenge we have aggregated the data at the Category and MRP buckets for demand forecasting. For demand forecasting we have used Regression techniques and Excel Solver for optimization, the final model has been selected based on business judgement, t-statistic and goodness of fit, details are given in the appendix. Brief process flow is as given below.



In conclusion, our work targets to propose the best markdown prices to the retailer and take informed decision. We intend to pilot test and implement this project in live environment and make it robust after field inputs.

LITERATURE REVIEW

There has been significant research conducted on price-based revenue management over the past few decades; we referred various case study and books to understand the approach and how that is applicable for our business scenario.

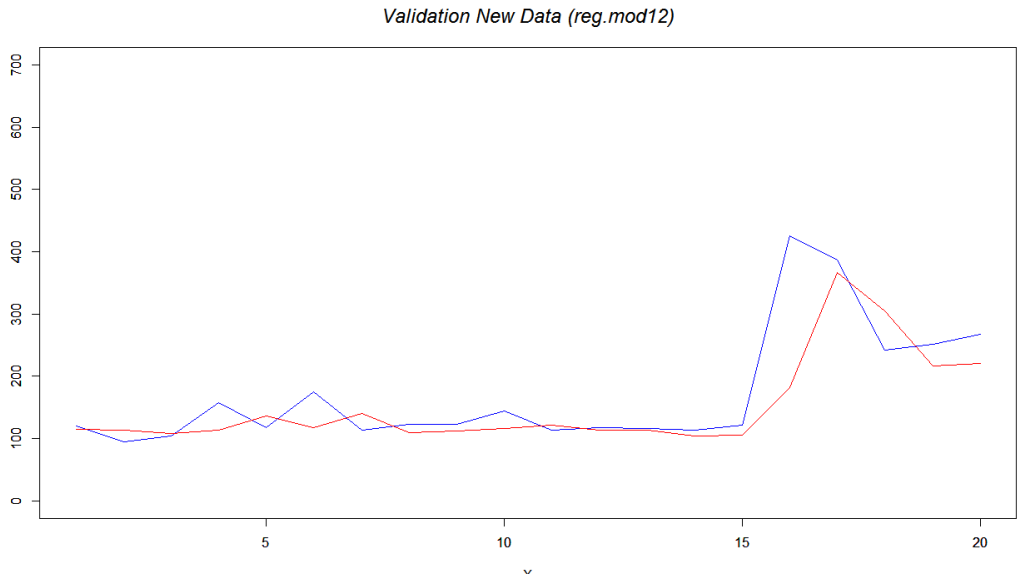
We went through publicly available research papers, current industry trends of which Zara and Rue La La case study match with our business scenario well. Critical difference is our focus on the implementation on category level markdown optimization model, whereas all the existing application-oriented pricing papers cited discuss single-product style based models, however, the references contain only limited explanation and do not discuss the methodology used for calculating the impact estimates provided.

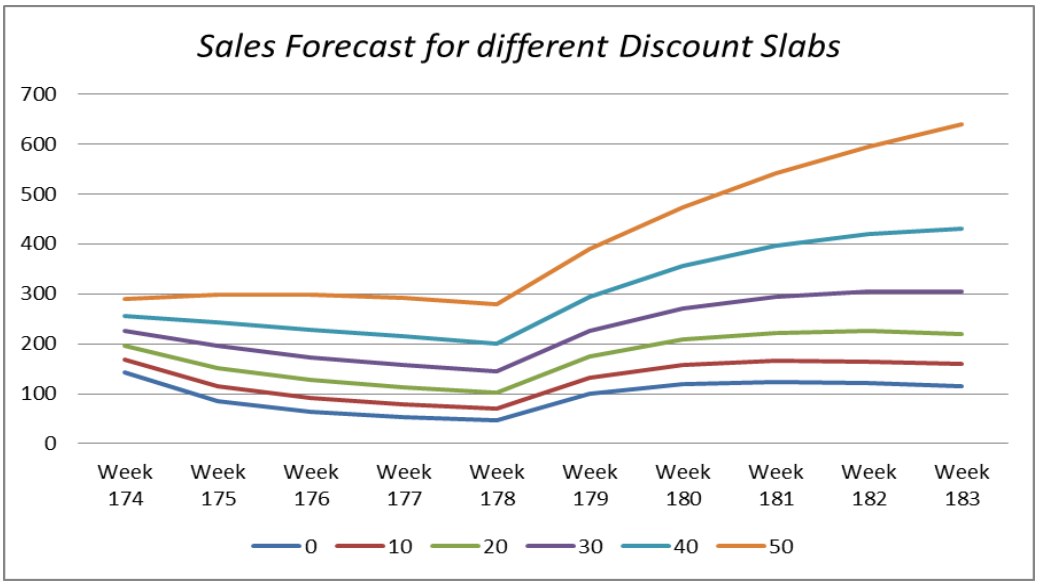
Final Model and Output

Regression Model –

$$sqrt(SALES\_QTY) = 6.36 + 0.035\ t + 0.10\ DIS\_PER - 0.0232\ SHELF\_AGE + 0.02\ SALES\_QTY\_LAG1 + \epsilon$$

Actual vs. Predicted Plot on Test data





CONCLUSION

In this project we found that multiple linear regression as a simple and most useful technique for demand forecasting. For price optimization we suggested two methods, first is using non-linear optimization using excel solver (for advanced users) and the other one is simpler approach using business rules. There is further scope of building a more granular model subjected to availability of dataset. The parameters in the current model for forecasting demand would require to be re-trained every week as new data keeps on adding, making model more accurate. The process adherence for the markdown management may require a fresh perspective by the stake holder to get the maximum benefits in the long run.