CAPSTONE PROJECT – E-COMMERCE

ElecKart Market Mix Modeling

Group Members:

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Problem Statement :

ElecKart is an e-commerce firm specialising in electronic products. Over the last one year, they had spent a significant amount of money in marketing. Occasionally, they had also offered big-ticket promotions (similar to the Big Billion Day). They are about to create a marketing budget for the next year which includes spending on commercials, online campaigns, and pricing & promotion strategies. The CFO feels that the money spent over last 12 months on marketing was not sufficiently impactful, and, that they can either cut on the budget or reallocate it optimally across marketing levers to improve the revenue response.

Objectives :

You are a part of the marketing team working on budget optimisation. You need to develop a market mix model to observe the actual impact of different marketing variables over the last year. Using your understanding of the model, you have to recommend the optimal budget allocation for different marketing levers for the next year.

Approach (Phases in Problem Solving):

The problem is approached in the following phases:

1. Business and Data Understanding: Understanding the business problem and also the provided data
2. Data Preparation, Cleaning and Exploratory Data Analysis: Detecting data quality issues, resolving them and taking a exploratory look at the data
3. Model Building: Modelling data using different types of available models: Additive model, multiplicative model, distributed lag model etc.
4. Recommendations: Recommending the best model of all the built models

Phase-I : Business and Data Understanding

A total of 5 datasets have been provided.

1. ConsumerElectronics.csv : Orders data from July 2015 to June 2016
2. Media data and other information.xlsx:

   This file contains four sheets :

   - Product list : List of products and their sales figures
   - Investment figures: Month-wise marketing spends on different types of media
   - Special sales calendar: List of holidays and other promotional sales periods
   - Monthly NPS score: A proxy for customer satisfaction

Phase-II : Data Preparation, Cleaning and Exploratory Data Analysis

Following issues with data quality were detected:

- Missing values in the following three attributes:
  - gmv (GMV – Gross Market Value)
  - cust_id (Customer ID)
  - pincode (Pincode)

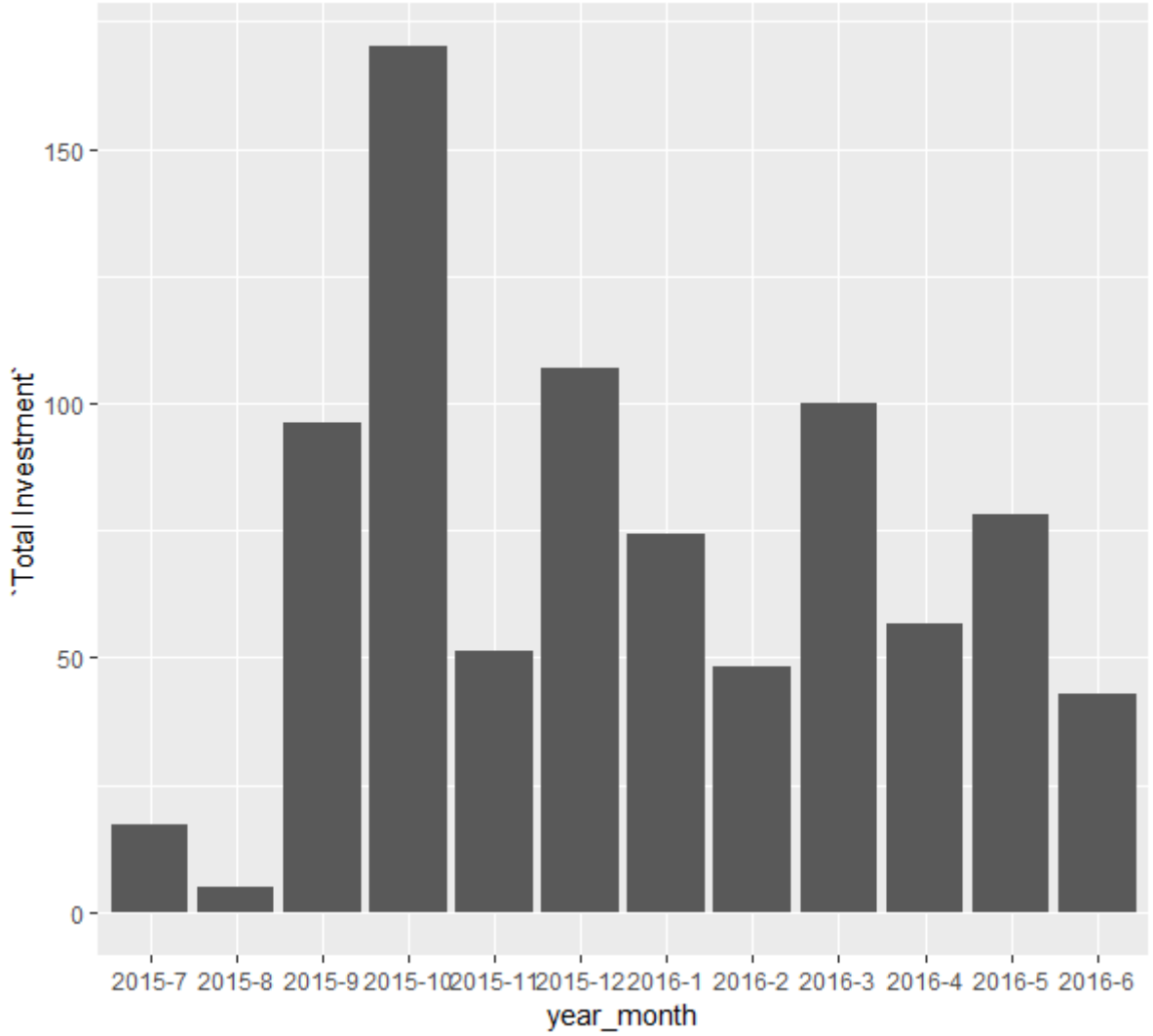
  Each of these attributes have 4904 missing values.
- gmv value 0 for 1349 records and greater than product_mrp for 52494 records
- The following attributes contain negative values:
  - deliverybdays – 1313010 records
  - deliverycdays – 1313010 records
  - product_procurement_sla – 75986 records
- Outliers are detected for relevant attributes.
- Some orders have order dates before July 2015.

Following techniques were implemented to clean data:

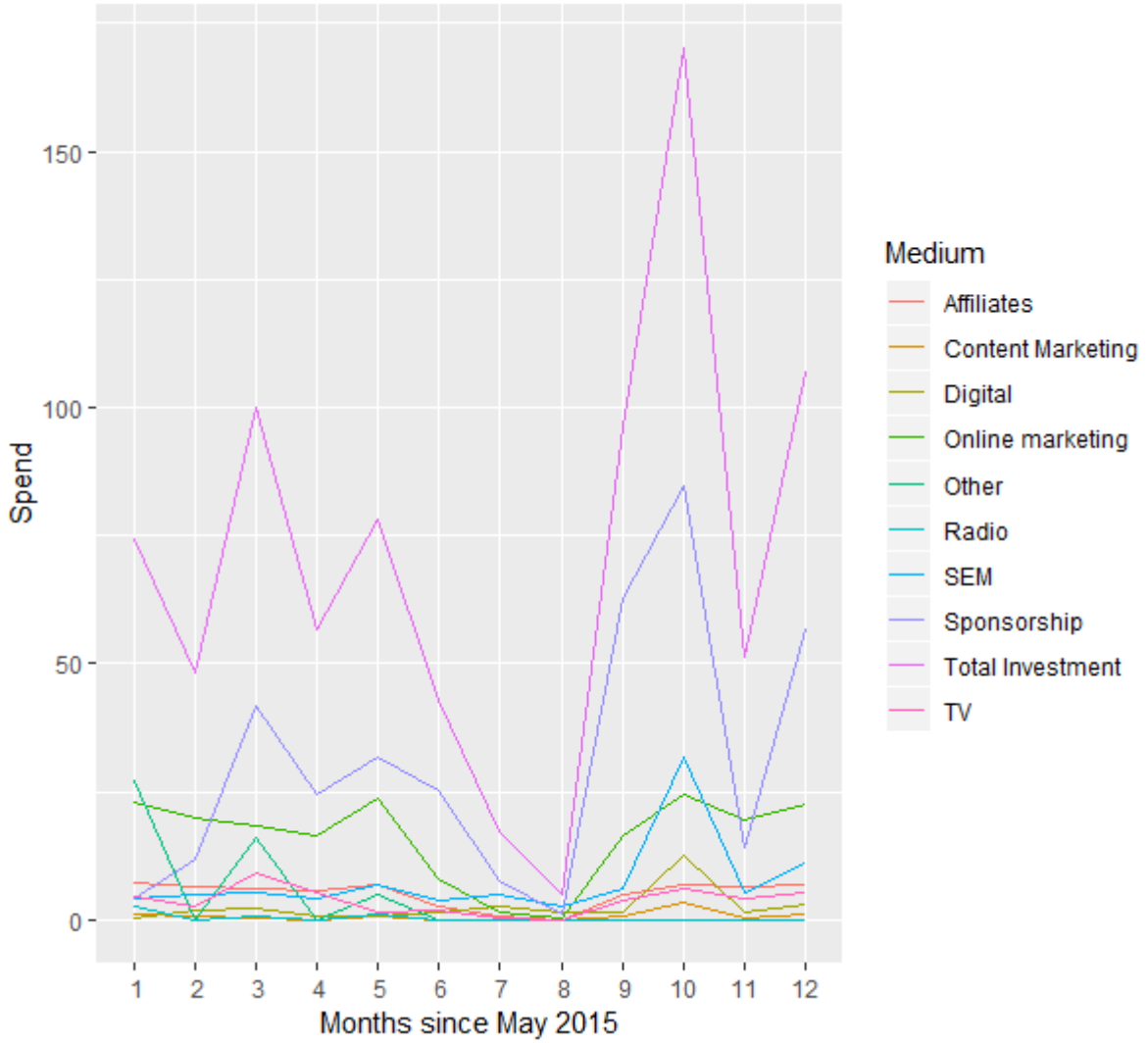
- Rows with missing values were dropped.
- For rows with GMV > MRP, MRP was replaced by the GMV.
- Rows with zero MRP values were dropped.
- Negative values of deliverybdays, deliverycdays, and product_procurement values were replaced by 0.
- Outlier values were capped at an appropriate cut-off value.
- Orders data was aggregated into a week-level dataset and combined with other data to create a master dataset which was then split into 3 parts : one each for CameraAccessory, HomeAudio, and GamingAccessory.
- Order dates were explicitly set to be within July 2015 and June 2016.

The graph shows the total investment in INR Cr. for every month for the complete dataset. Total investment is considerably high in October, December and March owing to the various festive sales in these months.

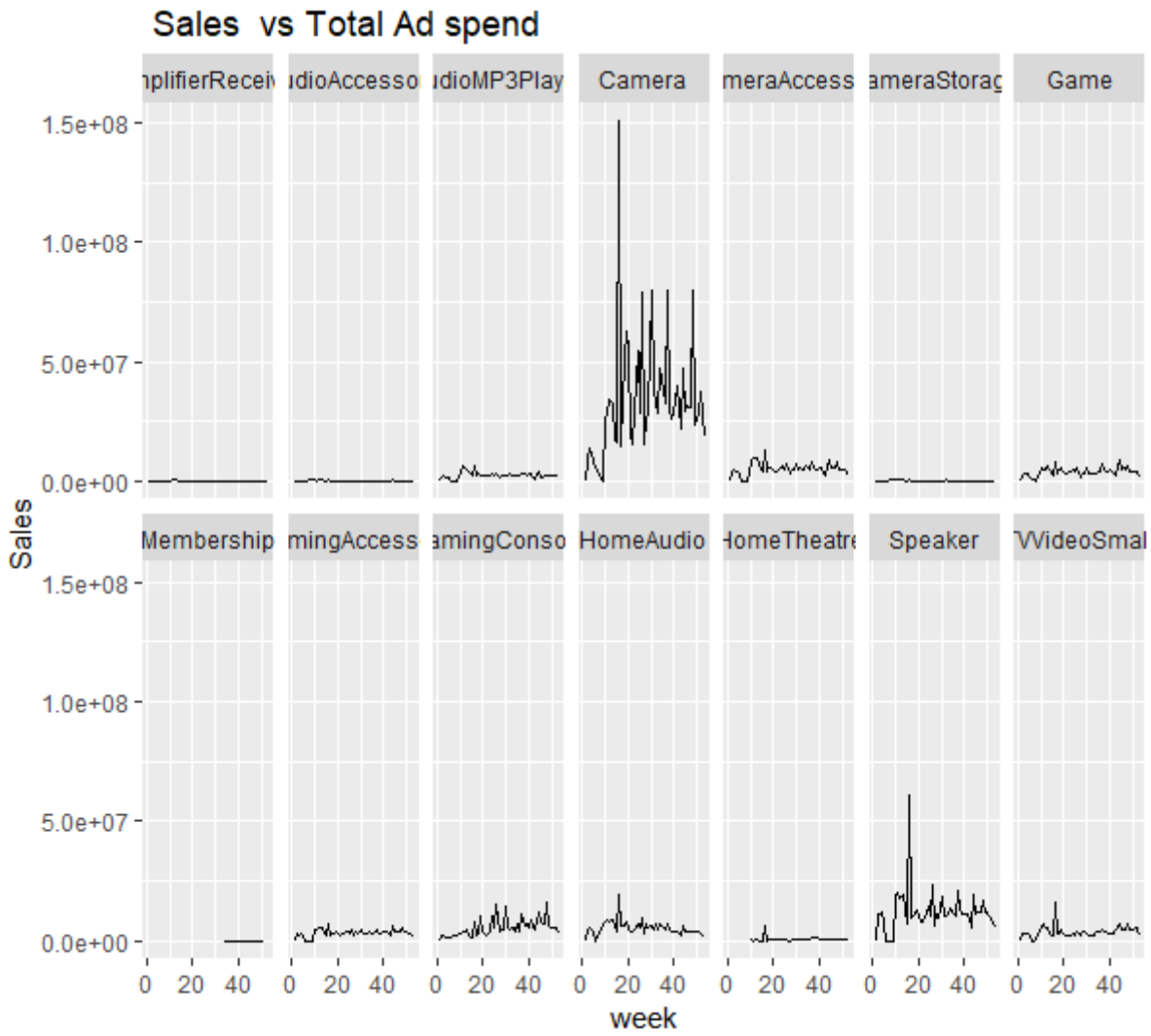
October – Daussera Sale
December – Christmas and New Year Sale
March – BSD 5 Sale



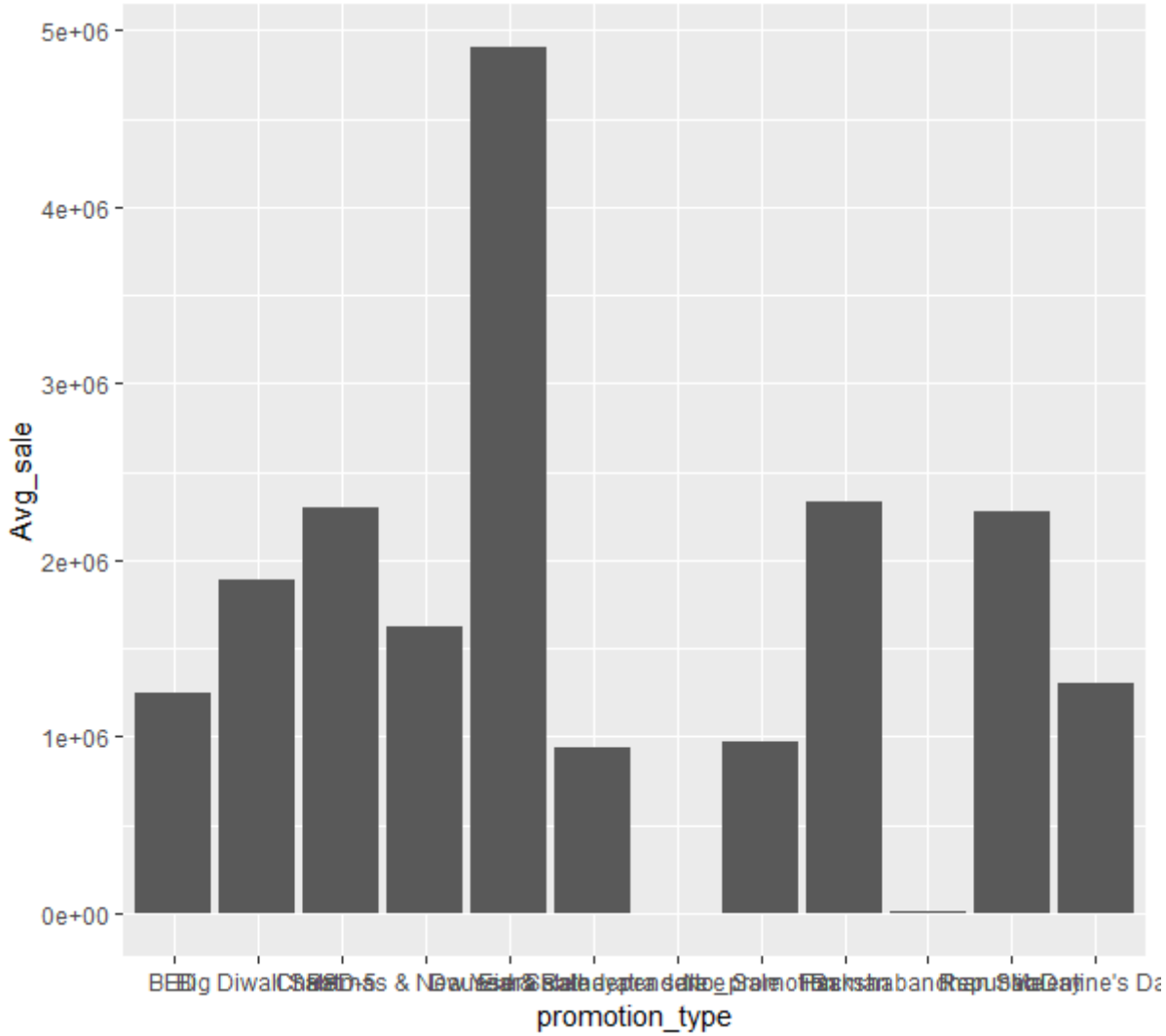
The graph shows the split in the total investment in INR Cr. for every month for the complete dataset. Sponsorship and Online Marketing make up the majority.



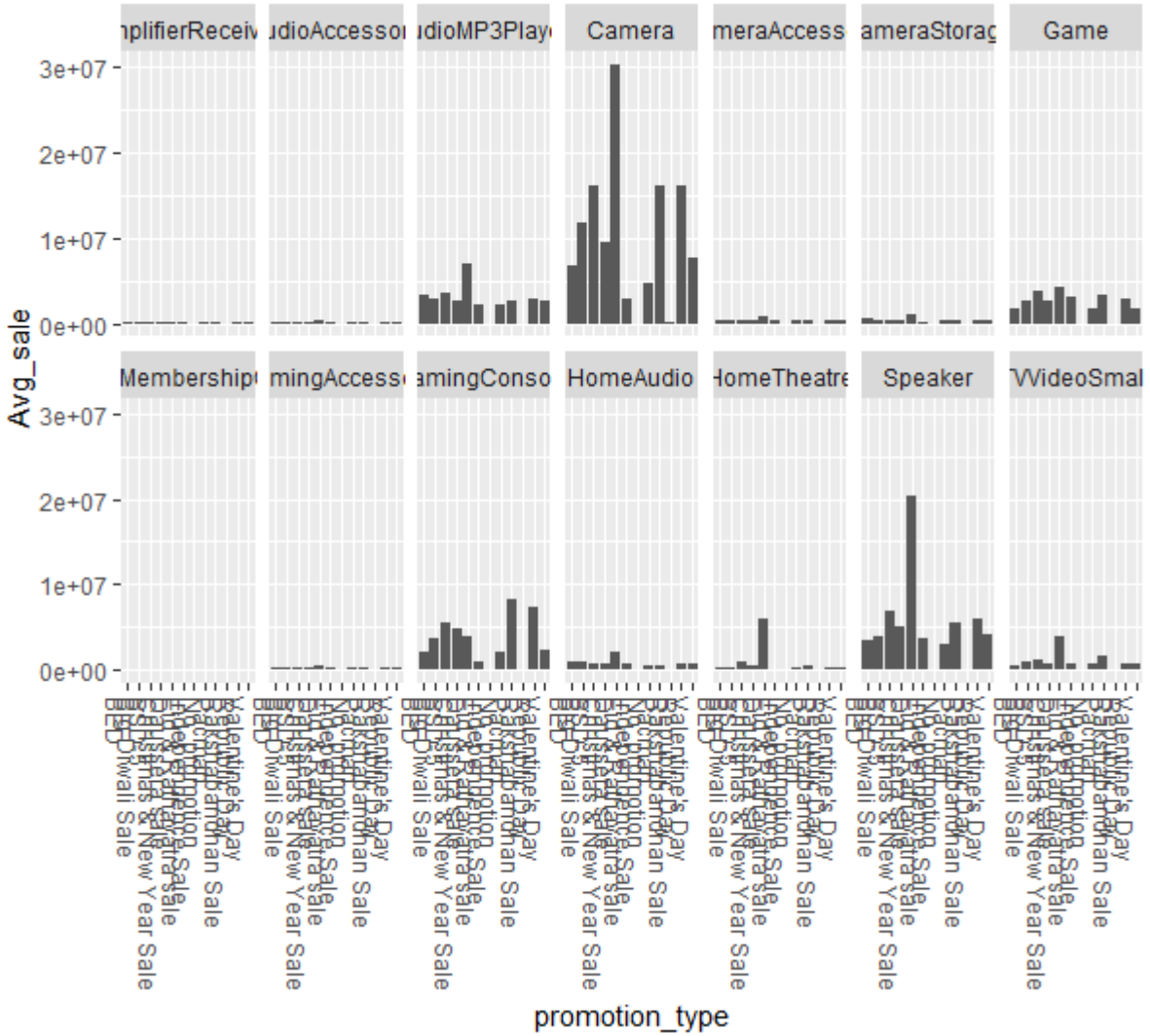
Sales vs. Total Ad spend grouped according to various item categories over the weeks starting May 2015



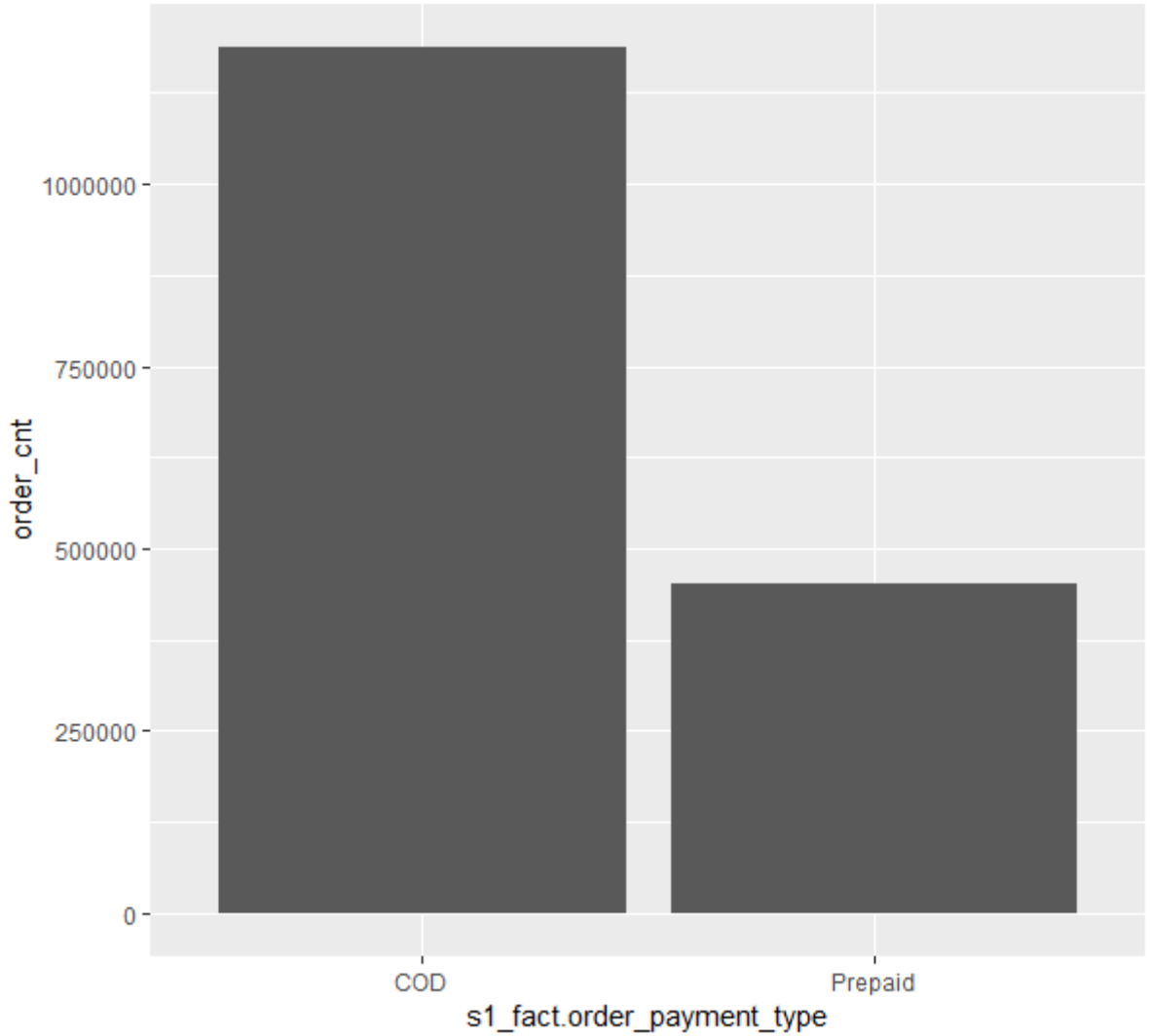
Average Sales vs. Promotion Type for all promotional sales



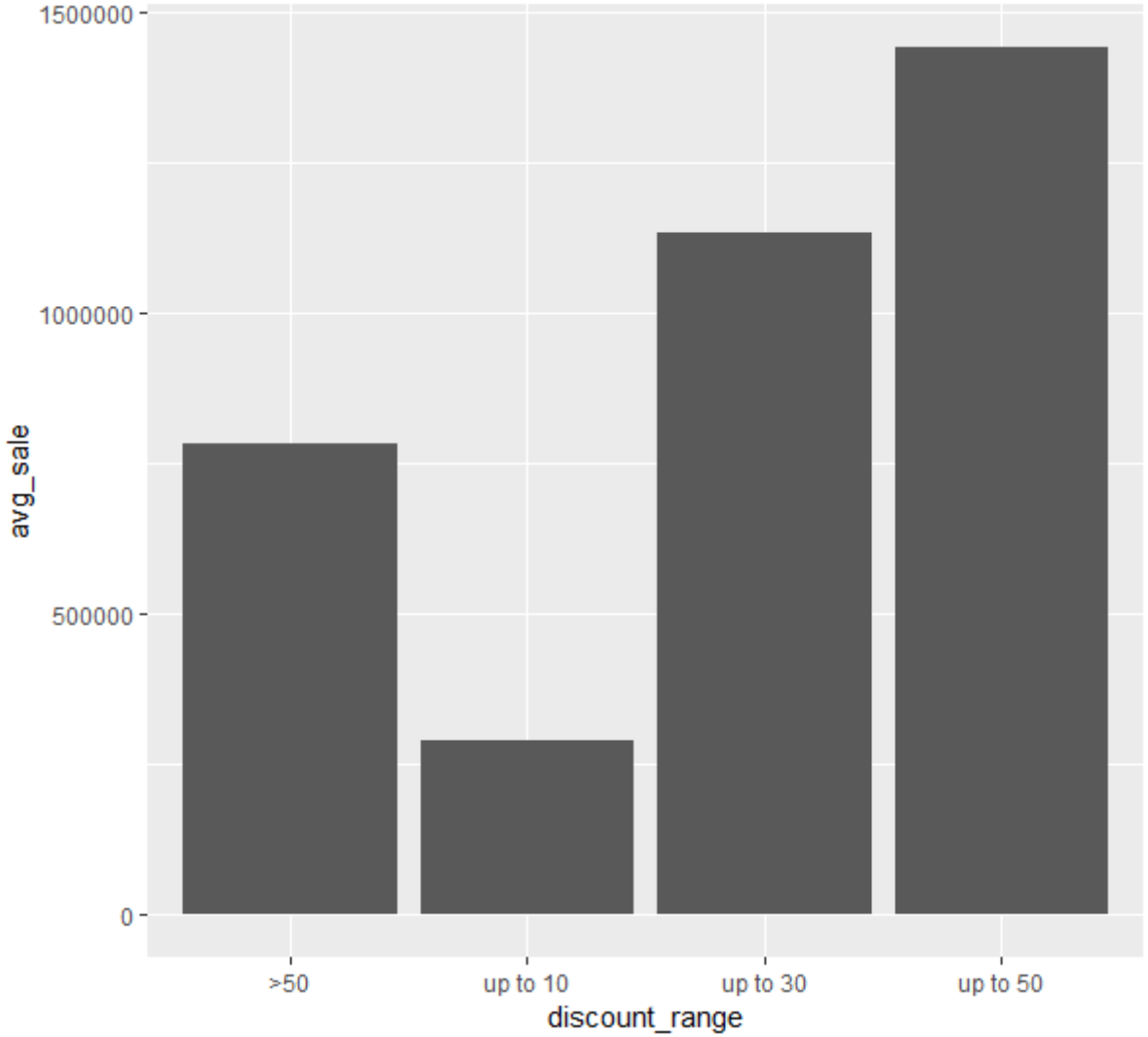
Sales vs. Promotion Type with product sub-categories



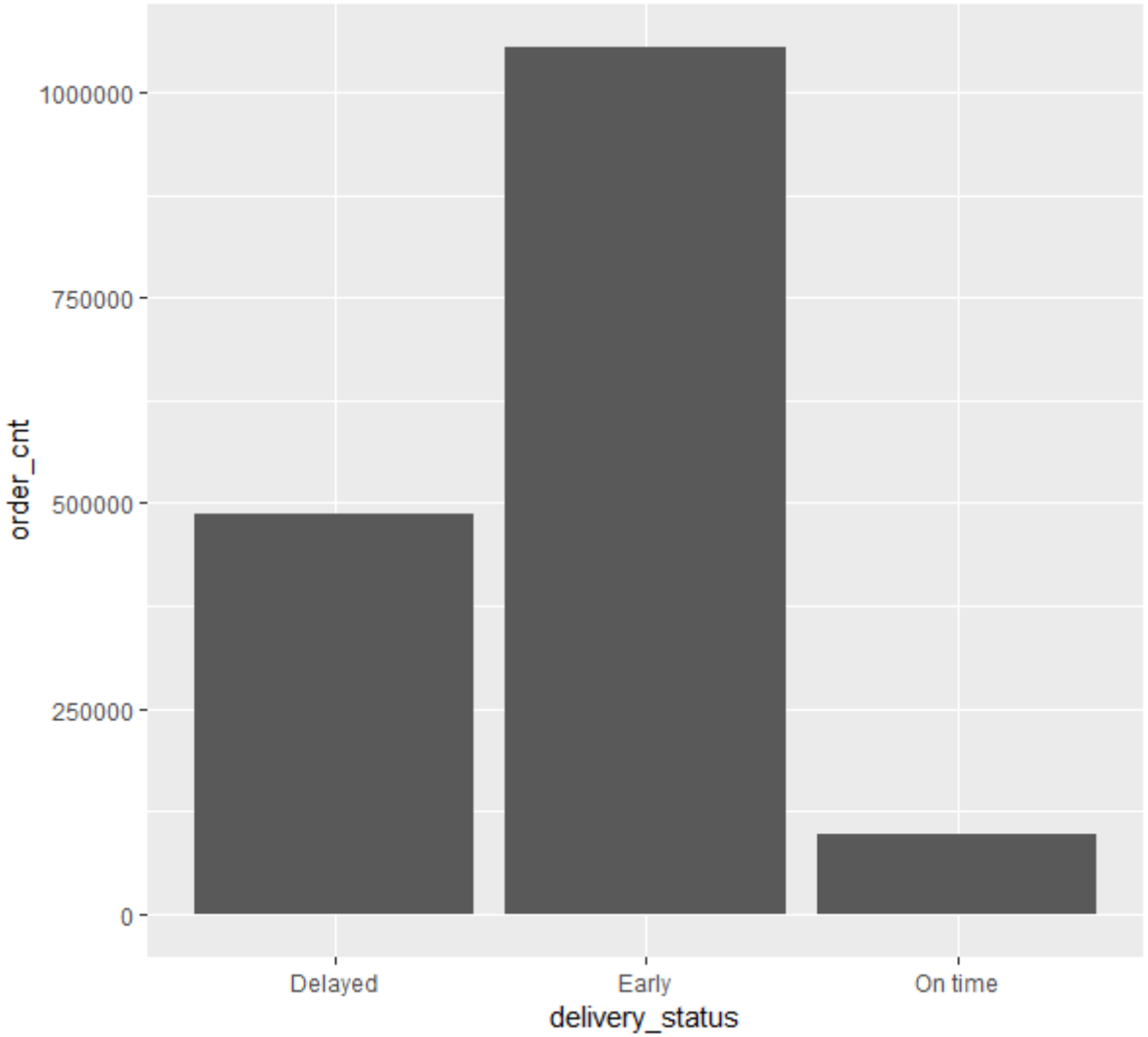
No. of orders for each of COD and Prepaid payment types



Average Sales wrt. Discounts offered.



Delivery status updates for order counts



Derived KPIs

Following KPIs have been derived:

1. Average GMV
2. Average MRP
3. List Price
4. Lag GMV and price values
5. Discount
6. Average number of orders
7. Promotion type
8. Ad stocks value
9. Holiday weeks
10. Value per visit
11. Delivery status/timing

Phase III: Model Building

Camera Accessories: Outcomes of different models

Model	Adjusted R-squared on test set	Cross Validation MSE
Simple Linear Model	0.839	0.236
Multiplicative Model	0.789	1.14
Distributed Lag Model	0.798	0.317
Koyck Model	0.731	0.232
Multiplicative Lag Model	0.871	0.67

Simple Linear Model is chosen as the best model.

Game Accessories: Outcomes of different models

Model	Adjusted R-squared on test set	Cross Validation MSE
Simple Linear Model	0.544	0.297
Multiplicative Model	0.69	1.24
Distributed Lag Model	0.68	0.322
Koyck Model	0.669	0.319
Multiplicative Lag Model	0.763	0.91

Distributed Lag Model is chosen as the best model.

Home Audio: Outcomes of different models

Model	Adjusted R-squared on test set	Cross Validation MSE
Simple Linear Model	0.813	0.16
Multiplicative Model	0.679	0.863
Distributed Lag Model	0.74	0.42
Koyck Model	0.896	0.41
Multiplicative Lag Model	0.782	0.89

Simple Linear Model is chosen as the best model.

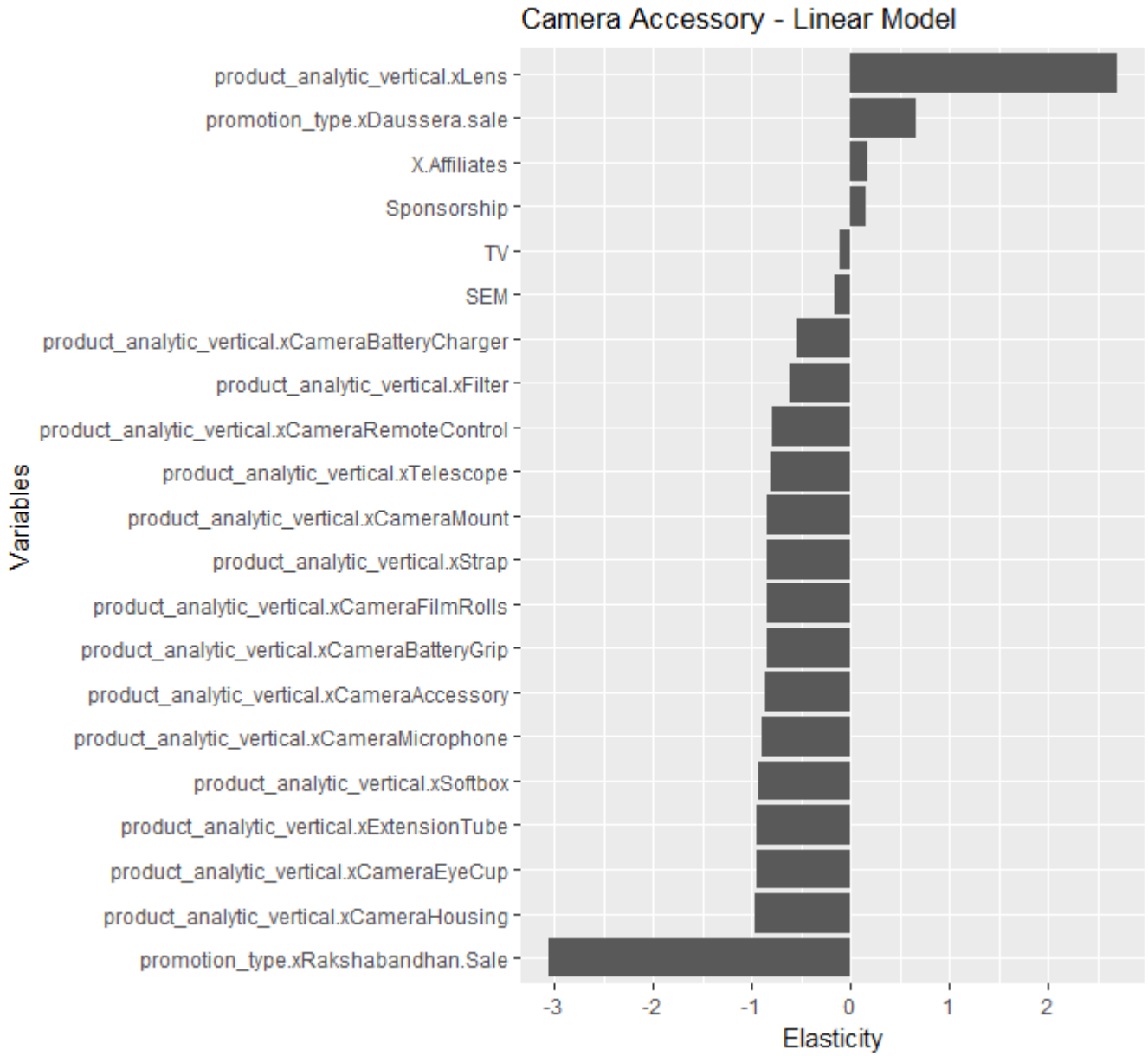
Phase IV: Recommendations

Recommendation for CameraAccessory:

Positive elasticity means increase in the KPI would increase the sales.

KPIs having positive impact on sales of CameraAccessory:

1. Daussera Sale
2. Sponsorship
3. Affiliates

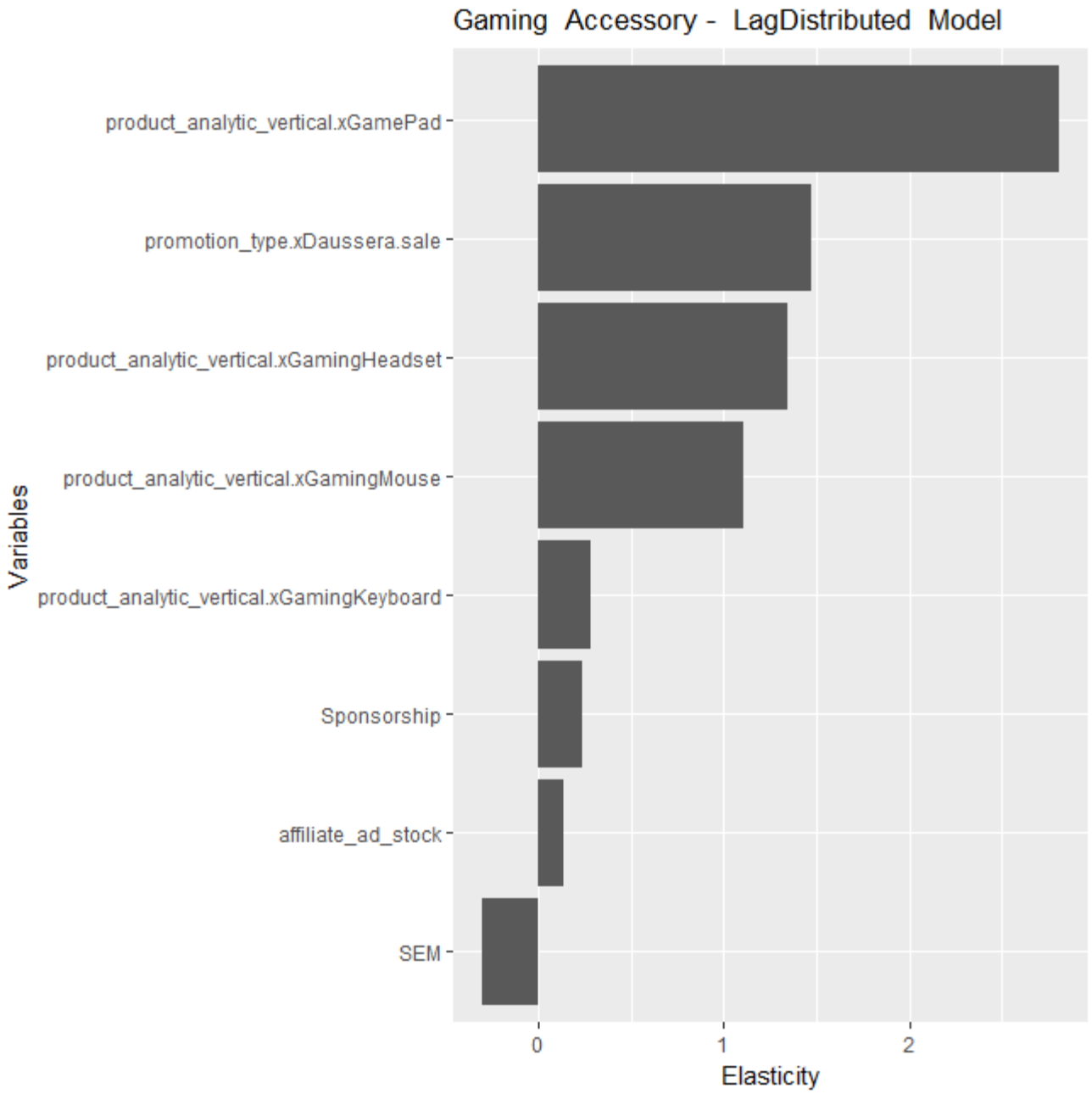


Recommendation for GamingAccessory:

Positive elasticity means increase in the KPI would increase the sales.

KPIs having positive impact on sales of CameraAccessory:

1. Daussera Sale
2. Sponsorship
3. Affiliates ad stock
4. Sales of GamePad, GamingMouse and GamingKeyboard



Recommendation for HomeAudio:

Positive elasticity means increase in the KPI would increase the sales.

KPIs having positive impact on sales of CameraAccessory:

1. BigDiwali Sale
2. Sponsorship
3. ContentMarketing
4. Sales of HomeAudioSpeaker and FMRadio
5. Eid..Rathyatra sale