

# Eleckart Market Mix Modeling

## Group Name:

1. Mavallapalli Saraschandra
2. Varun Hasteer
3. Prajwal Rao
4. Anuj Garg

# Business And Data Understanding

---

- Identifying the profitable channels for marketing & media investments
- Develop a market mix model to observe the actual impact of different marketing variables over the last year of three different product categories - Camera Accessory, Game Accessory & Home Audio
- Recommend the optimal budget allocation for different marketing levers for the next year.
- Data Source :
  - Sales data from July-2015 to June-2016 in Order level
  - Products details
  - Investment in various media heads in Month level
  - NPS, Stock index data in Month Level
  - Special Sale Calendar
  - Holidays in Ontario State

# Data Preparation

---

- Removing the leading white spaces in orders data GMV column
- Convert all negatives to positives in product procurement SLA
- Filter data between July-2015 to June-2016
- Remove records with units and product MRP 0.
- Outlier Treatment for units , SLA , product MRP, Product procurement SLA
- Holidays from Canada Ontario state are considered

# Feature Engineering

---

## Pricing KPIs:

- List price : Gmv (Gross Merchandise Value) / Units
- Discount : Product MRP - List Price
- % of discount on list price : (Discount / List price) \*100
- Moving Averages of List price , Discount and Product Mrp

## Seasonality KPIS

- No. of holidays in week
- No.of Special Sale Days
- Pay date difference : Days remaining for the next pay day from week start date.

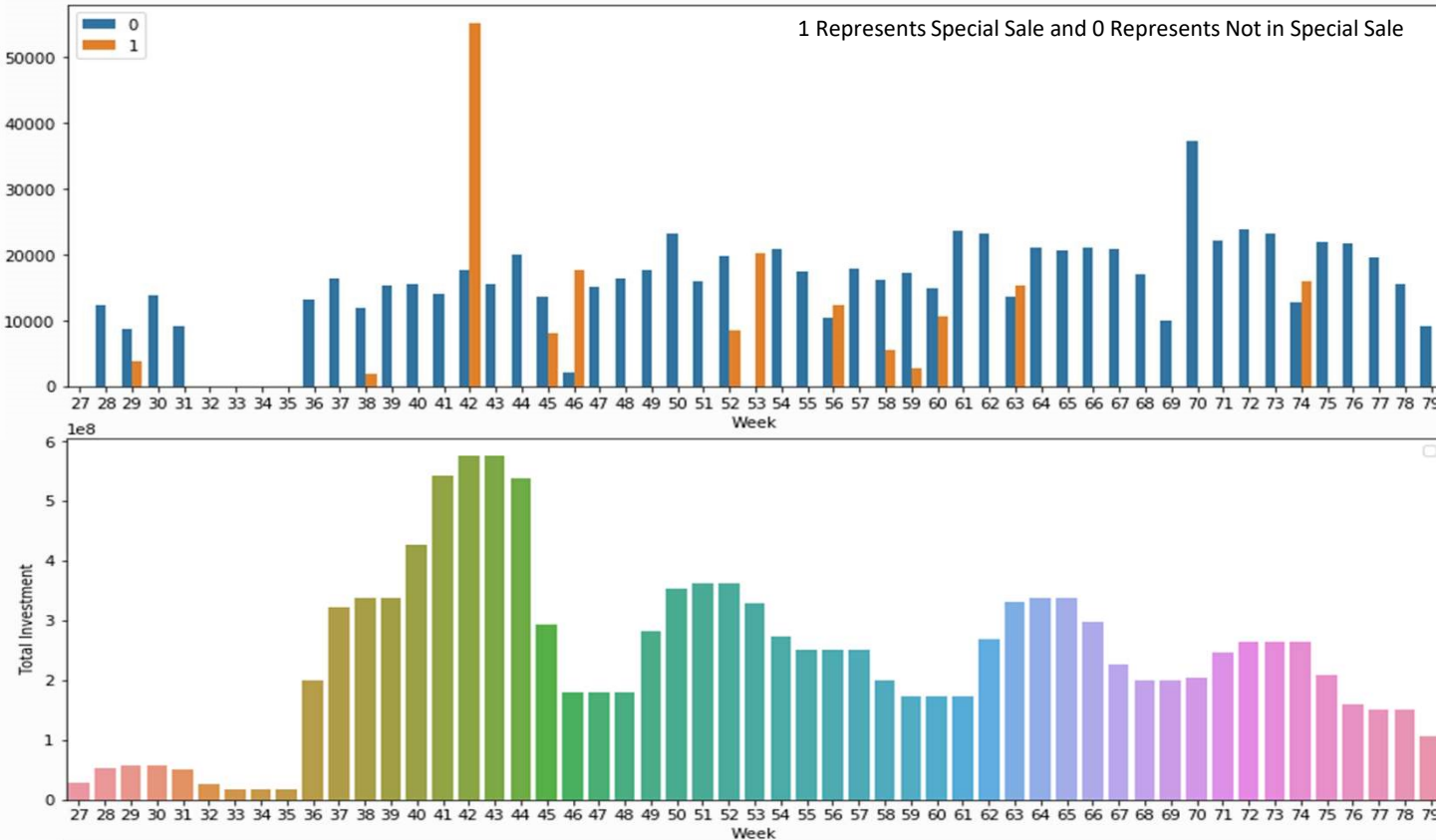
## Ad-stock:

- Media Ad-Stock =Media-Investment Present week +(0.5)\* Media Investment Prior Week (created for All Channels)

## In Modelling:

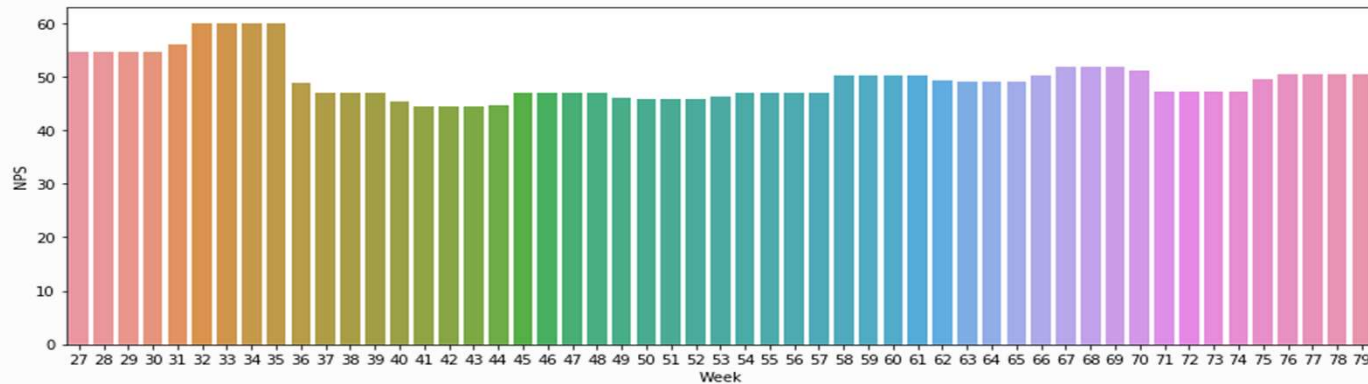
- Moving average of list price & discounts for 3 and 5 weeks to understand impact of change in these two on sales

# Exploratory Data Analysis

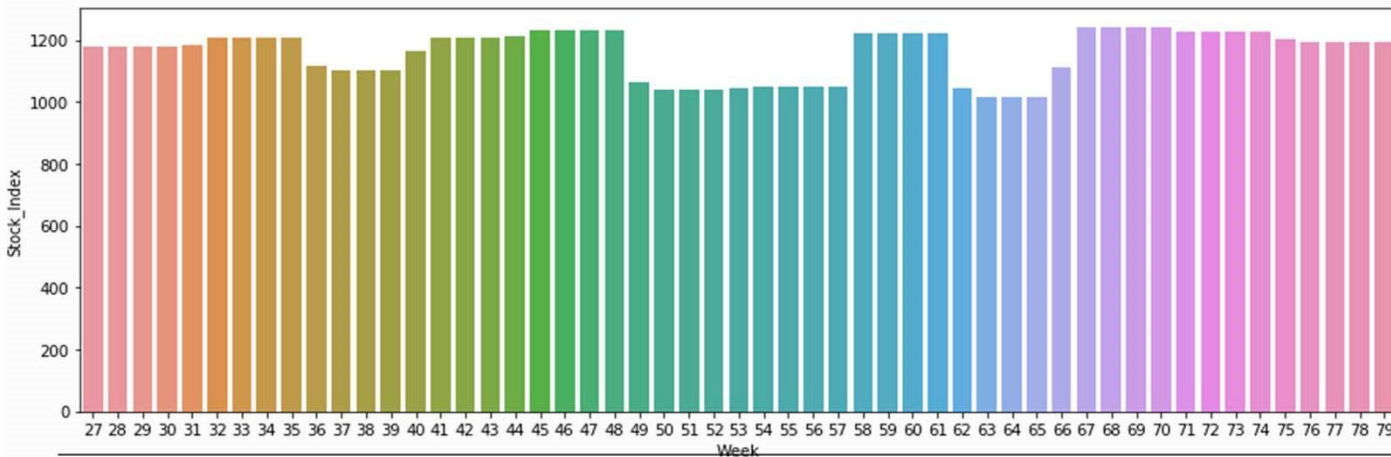


- In week 42 where More orders has been observed, big-ticket promotions sale was going
- In Week 42, Week 46, Week 56, Week 63, Week 74 Sales are more on the dates Special Sale conducted
- From week 35 to 44 more spends on Ads for big-ticket promotions sale
- It has been observed that from Week 49 to Week 53, From Week 62 to Week 65 also Ad spends are more during the special Sale

# Exploratory Data Analysis (Contd..)



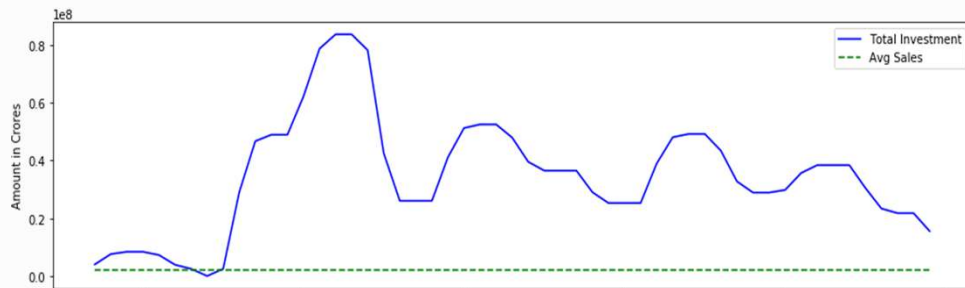
- Maximum NPS (60%) observed during the Weeks of 32 to 35 and Over all Average is 49.6%.
- Maximum Increase of 3.85% in Week 32,
- Drastic drop has been observed from Week 35 to Week 36 of 11.2%



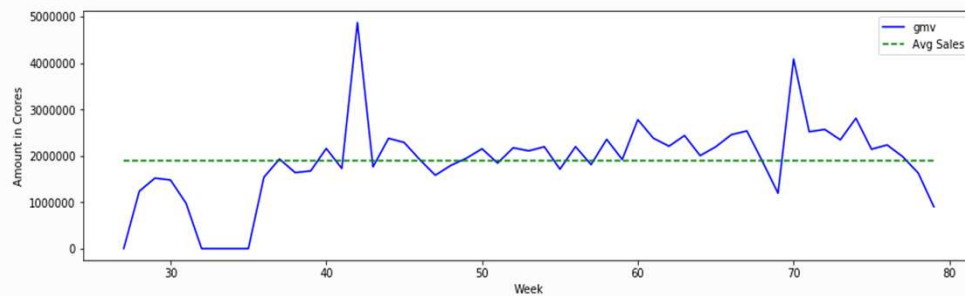
- Stock Index of Electrokart is Maximum during Week 67 to Week 70 showing 1242 per share.
- Strong decline observed in Week 62 of 177.42 Units and in Week 49 of 167 Units.
- Increase observed in Week 58 of 170 units and 129.71 Units in Week 67

# EDA - Media Investment Cam accessories

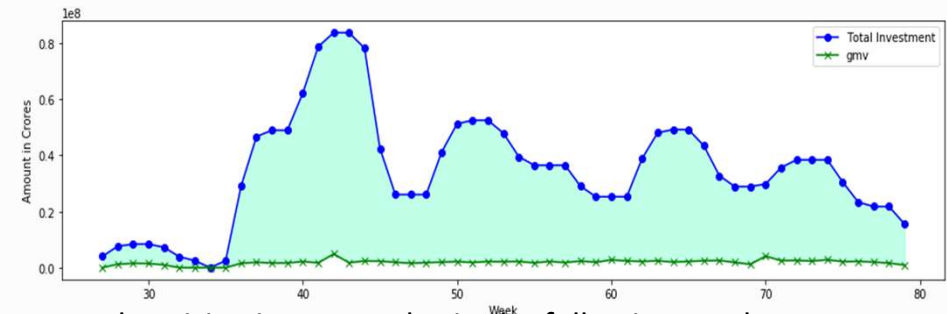
- On Total Media Spends 14.53% of Investments spending on Camera Accessories



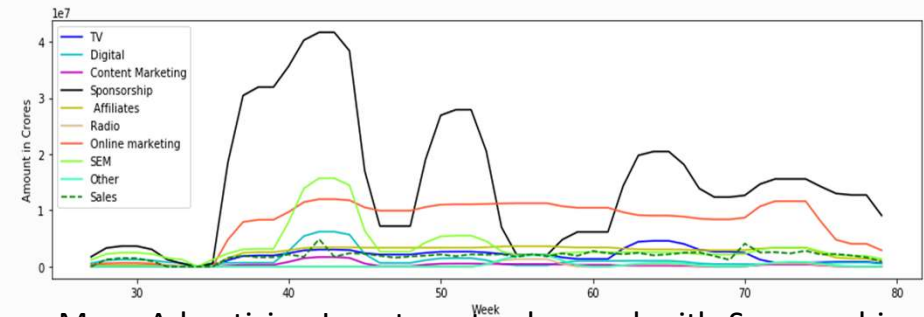
More Advertising Investments Observed during the Special Sales and during Holidays



It has been observed that Sales value in Special Sale days is More than the Average Sales



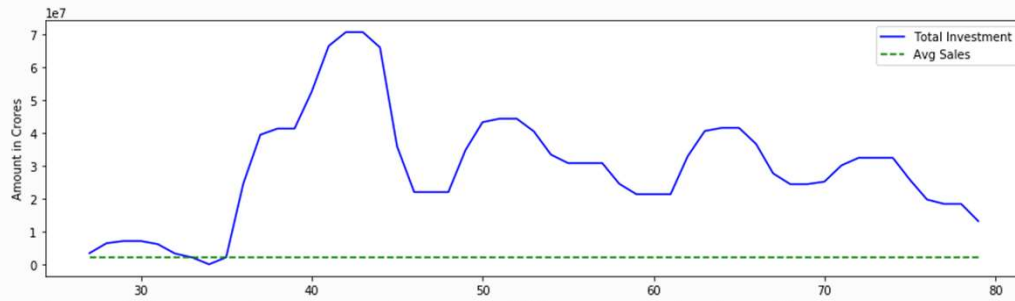
Advertising impacts sales in the following weeks



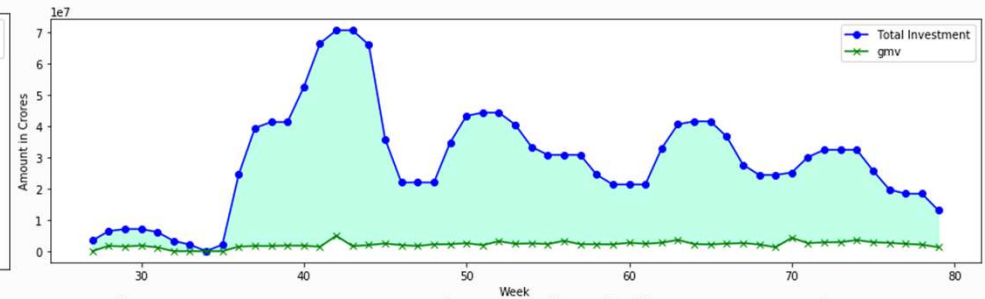
More Advertising Investments observed with Sponsorships and Online Marketing During Special Sales and Holidays and Very less spends observed in Radio and Others

# EDA -Media Investment Gaming Accessories

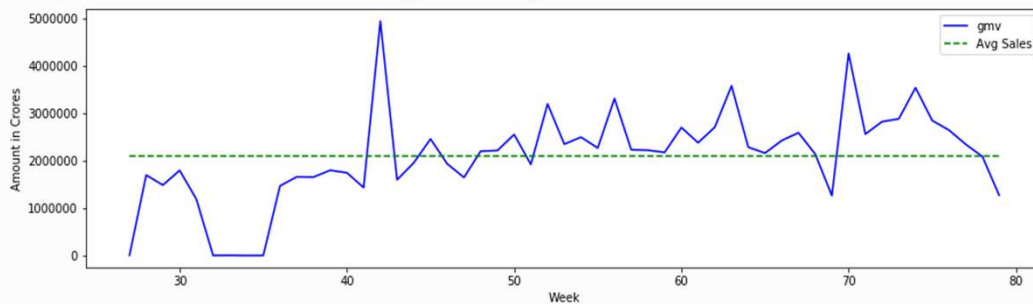
- On Total Media Spends 12.24% of Investments spending on Gaming Accessories



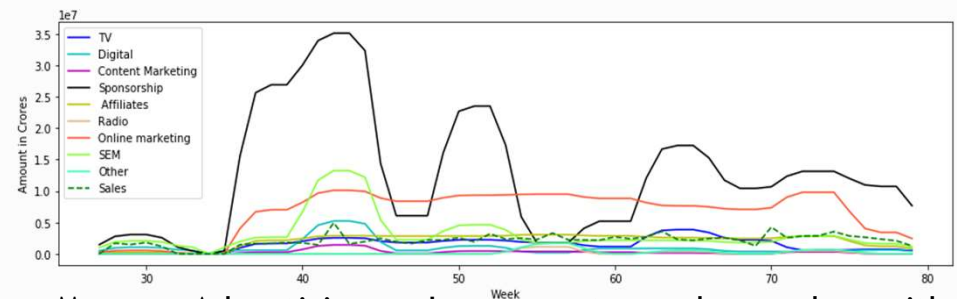
More Advertising Investments Observed during the Special Sales and during Holidays



Advertising impacts sales in the following weeks



It has been observed that Sales value in Special Sale days is More than the Average Sales

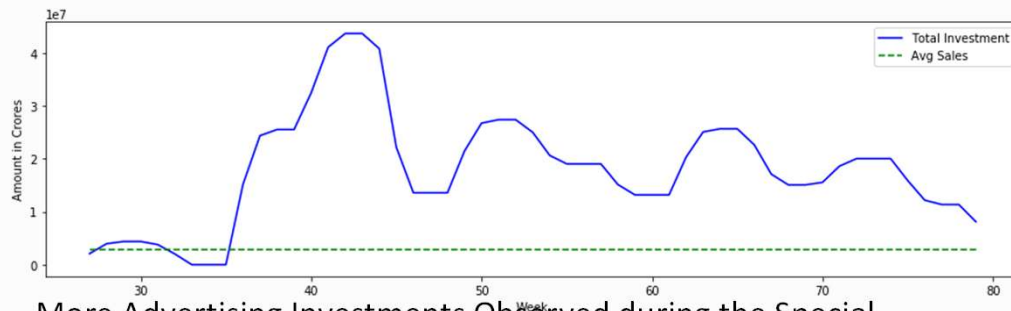


More Advertising Investments observed with Sponsorship, SEM and Online Marketing During Special Sales and Holidays and Very less spends observed in Radio

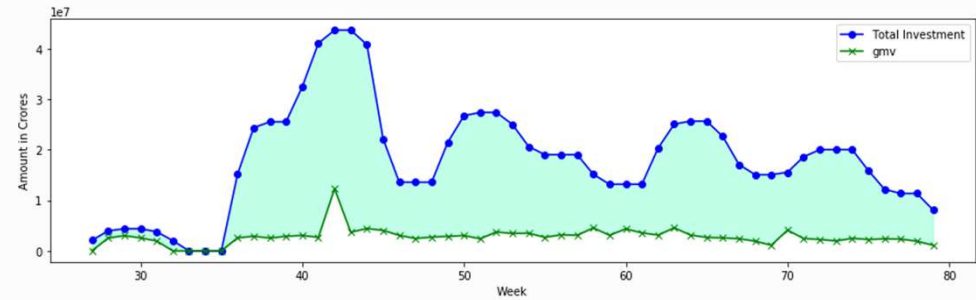


# EDA - Media Investment Home Audio

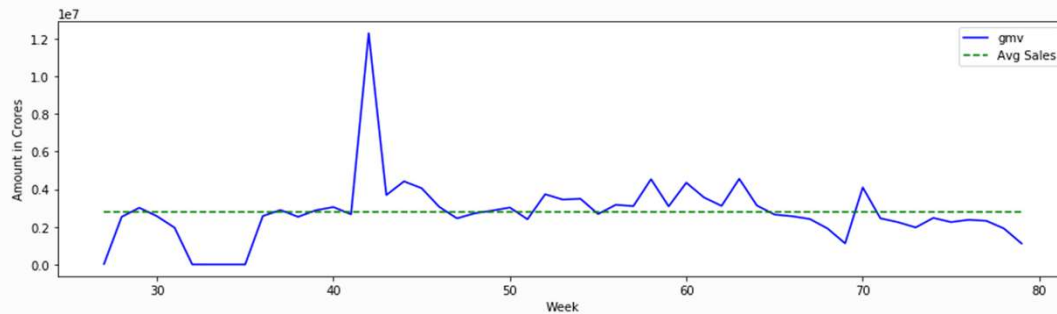
- On Total Media Spends 7.57% of Investments spending on Home Audio



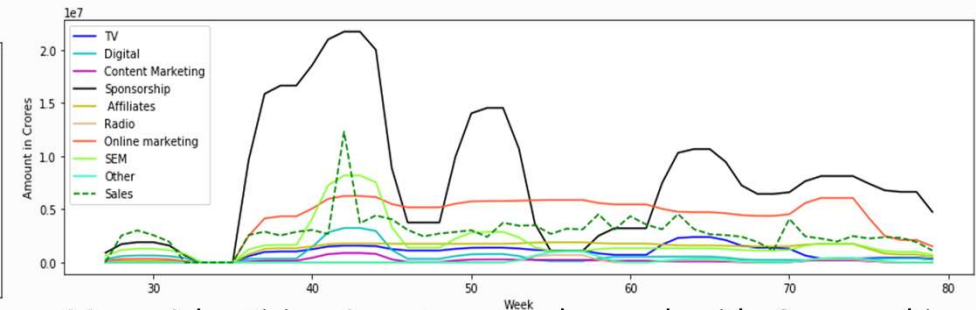
More Advertising Investments Observed during the Special Sales and during Holidays



Advertising impacts sales in the following weeks



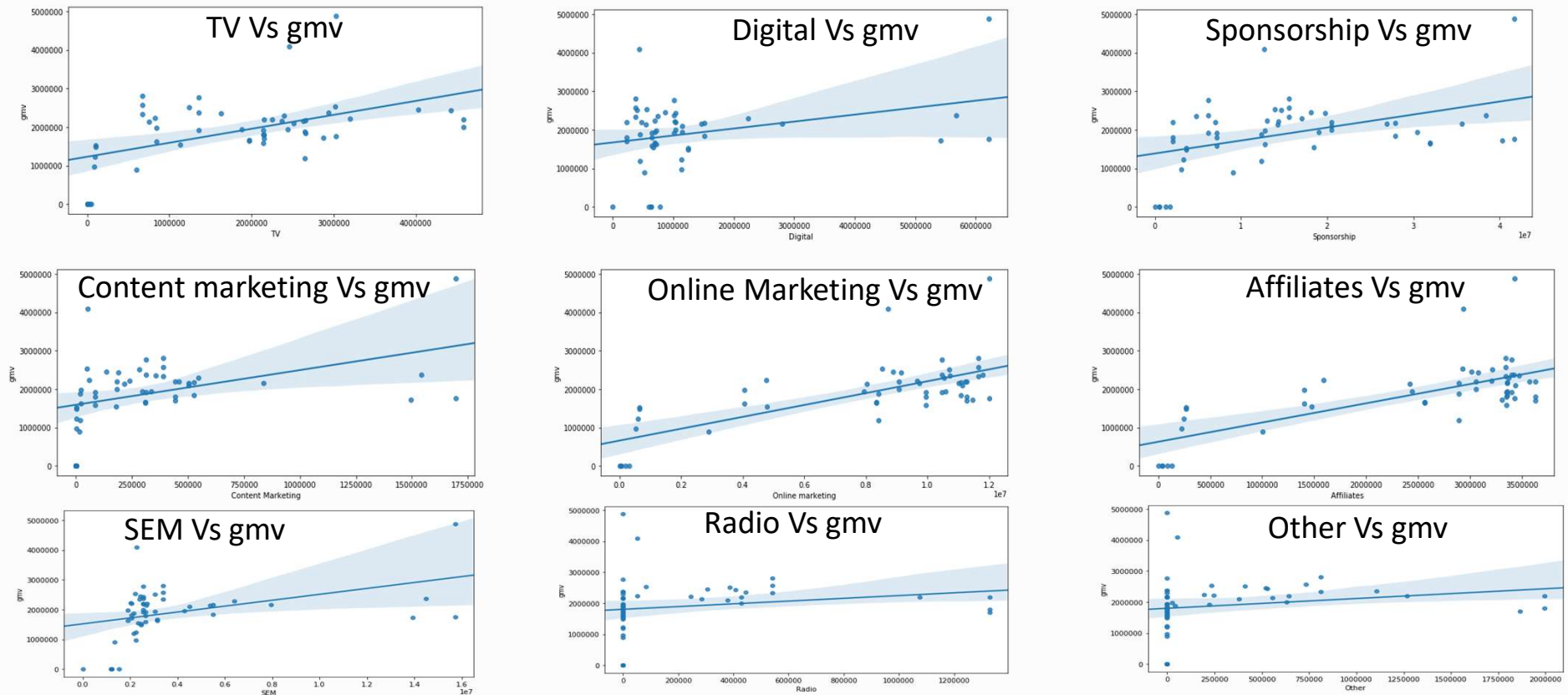
It has been observed that Sales value in Special Sale days is More than the Average Sales



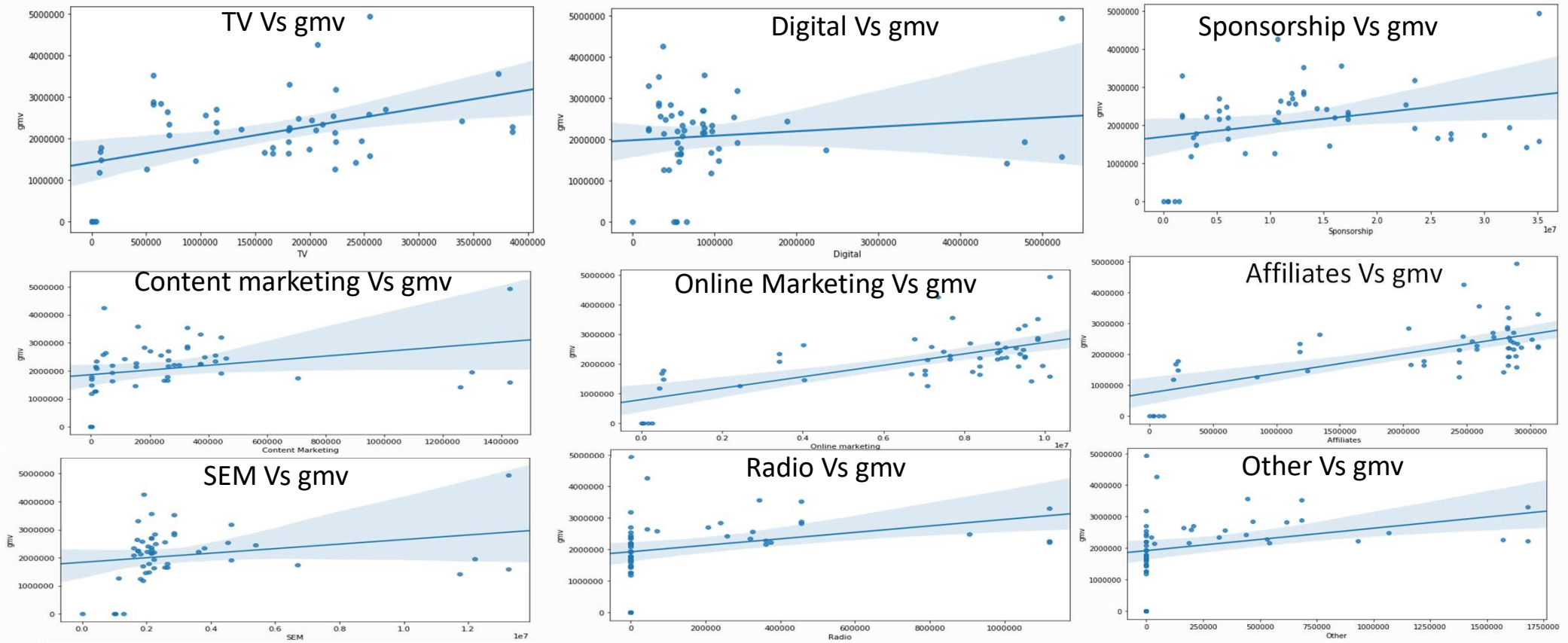
More Advertising Investments observed with Sponsorship, SEM and Online Marketing During Special Sales and Holidays and Very less spends observed in Radio

# EDA - Sales Vs Ad-stock of Different Media Channels

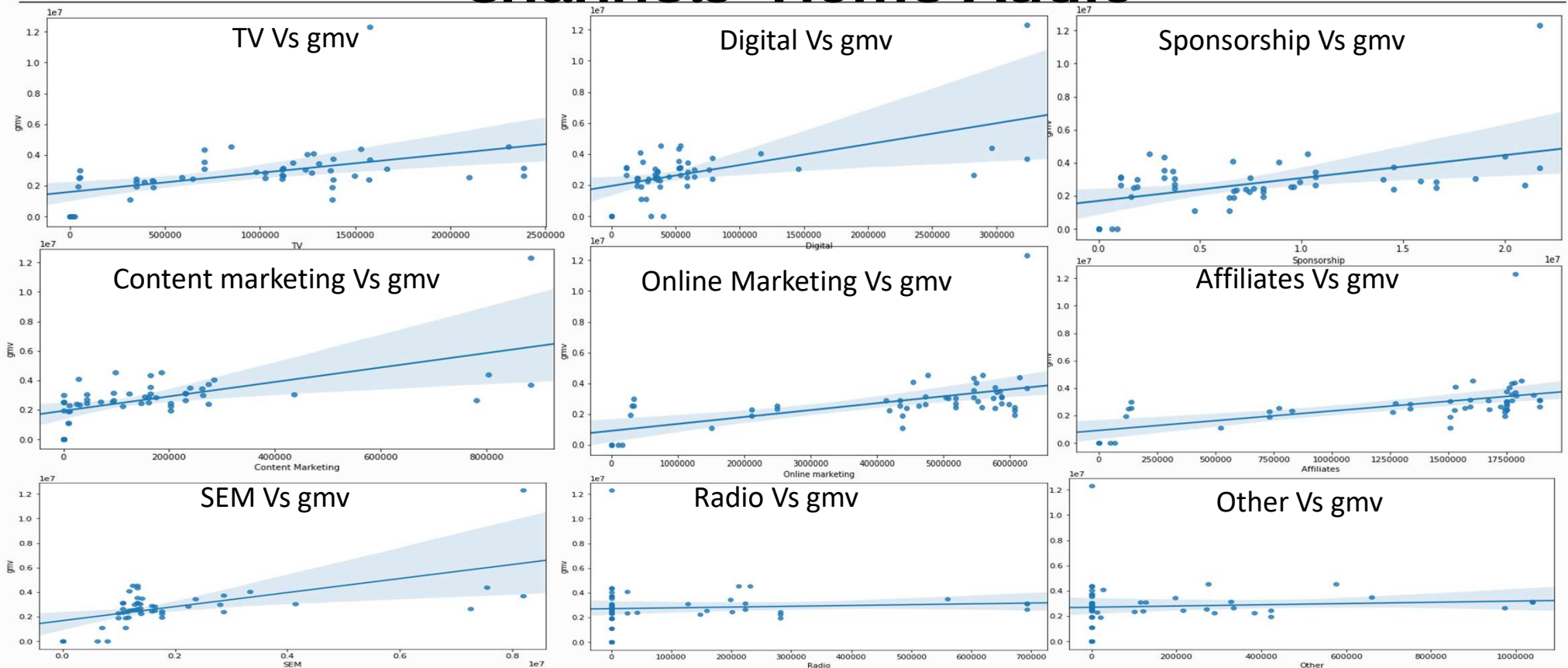
## Camera Accessories



# EDA - Sales Vs Ad-stock of Different Media Channels Game Accessories



# EDA - Sales Vs Ad-stock of Different Media Channels Home Audio



# Camera Accessories - Building the 4 Models

- Adjusted R-Squared figures are based on the performance of the model on the training data.
- MSE is calculated based on 10-Fold Cross Validation
- Even though, the Multiplicative model, Distributed lag model and Koyck Model has a decent Adj.  $R^2$  figure, but it has just 2 important variables. Also, these variables may not be too important from business point of view.
- So, we select the simple linear model on the account of higher Adj. R-Squared values

Model	Variables	Adj. R Square	MSE
Simple Linear Model	Discount + Digital + Online Marketing	91%	0.003
Koyck Model	units + product_procurement_sla + Digital - LP_MA_5	96%	0.001
Multiplicative Model	units+product_procurement_sla + % discount wrt list price +Digital	99%	0.0001
Distributed Lag model	discount +Digital_lag_2	89%	0.003

# Gaming Accessories - Building the 4 Models

- Adjusted R-Squared figures are based on the performance of the model on the training data.
- MSE is calculated based on 10-Fold Cross Validation
- the Multiplicative model has a decent Adj. Rsq figure, but it has just 2 important variables. Also, these variables may not be too important from business point of view.
- Distributed Lag Model and Koyck model also doesn't have Important Variables
- So, we select the simple linear model on the account of higher Adj. R-Squared values

Model	Variables	Adj. R Square	MSE
Simple Linear Model	Discount +TV + No of Holidays in week	94%	0.003
Koyck Model	units + Digital + Sponsorship + LP_MA_5	94%	0.003
Multiplicative Model	units + % discount wrt list price	99%	0.0005
Distributed Lag model	discount + % discount wrt list price_lag_2	90%	0.004

# Home Audio - Building the 4 Models

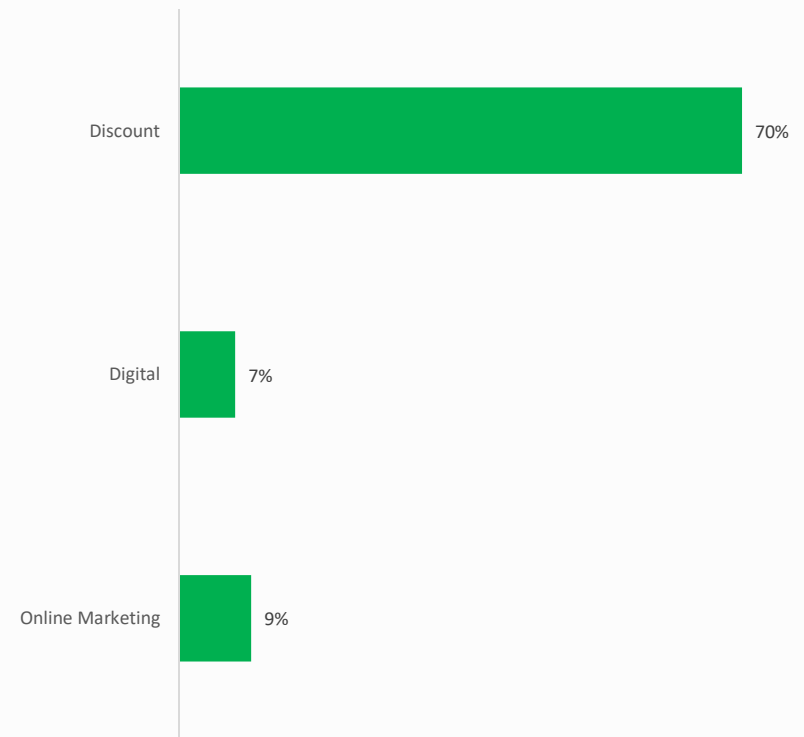
- Adjusted R-Squared figures are based on the performance of the model on the training data.
- MSE is calculated based on 10-Fold Cross Validation
- Koyck and Multiplicative Models have High MSE Values .
- So, we select the simple linear model & Distributed Lag Model

Model	Variables	Adj. R Square	MSE
Simple Linear Model	Discount +TV + Stock Index	97%	0.0006
Koyck Model	units + Sponsorship	99%	9.535
Multiplicative Model	Week + units + product_procurement_sla + Sponsorship+SEM+NPS	99%	3.76
Distributed Lag model	Discount + gmv_lag_1	97%	0.0007

# Camera Accessories - Recommendations Based on Elasticity of KPIs

- Positive elasticity means that increasing the value of the KPI would lead to increase in the sales figure
- Therefore, the objective would be to allocate more spending on the KPIs that have positive elasticity w.r.t the sales.
- Thus, going with the Basic Linear Model, ElecKart should focus more on the Digital channel, Sponsorships and discounts

Camera Accessory – Linear Model

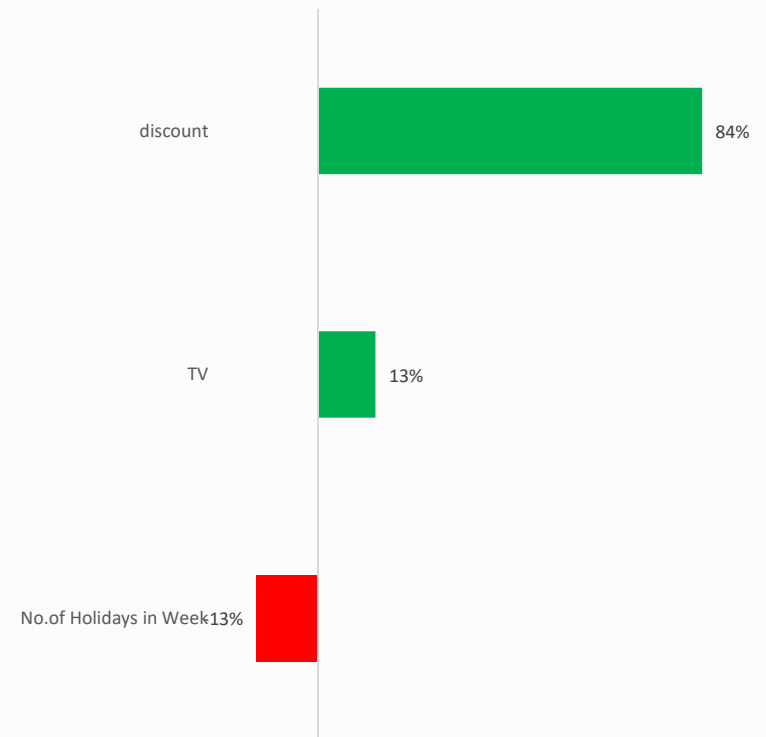




# Game Accessories - Recommendations Based on Elasticity of KPIs

- Positive elasticity means that increasing the value of the KPI would lead to increase in the sales figure
- Therefore, the objective would be to allocate more spending on the KPIs that have positive elasticity w.r.t the sales.
- Thus, going with the Basic Linear Model, ElecKart should focus more on the Media investments through TV and Providing Discounts has Positive Impact and Sales and Holidays in Week showing negative Impact

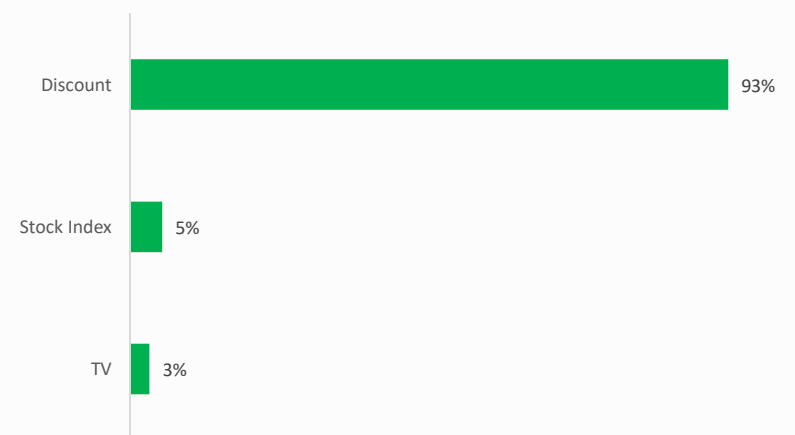
Game Accessories – Linear Model



# Game Accessories - Recommendations Based on Elasticity of KPIs

- Positive elasticity means that increasing the value of the KPI would lead to increase in the sales figure
- Therefore, the objective would be to allocate more spending on the KPIs that have positive elasticity w.r.t the sales.
- Thus, going with the Basic Linear Model, ElecKart should focus more on Discounts and the Media investments through TV to Increase the Sales
- Stock Index also influencing the Sales
- If we go with Distributed Lag model, ElecKart should focus on Discounts and Sales in Prior week also having the Impact

Home Audio – Linear Model



Home Audio – Distributed lag

