

Marketing Mix Modelling

Capstone Project
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Business & Data Understanding

Objective : ElecKart Market Mix Modelling

- To identify the most impactful channels for marketing spends
- To identify other factors having impact on sales of 3 product categories
 1. Camera Accessory
 2. Game Accessory
 3. Home Audio

Data Understanding :

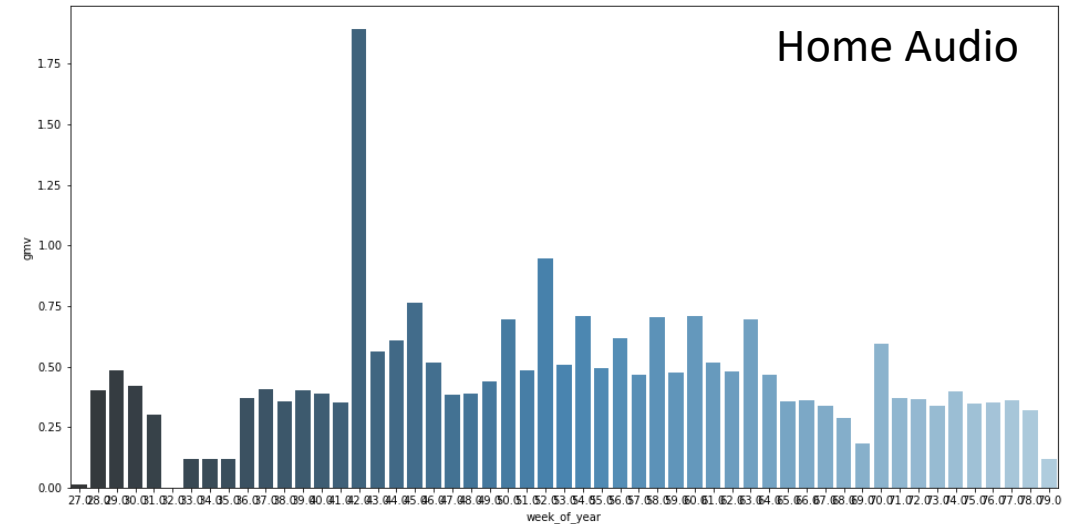
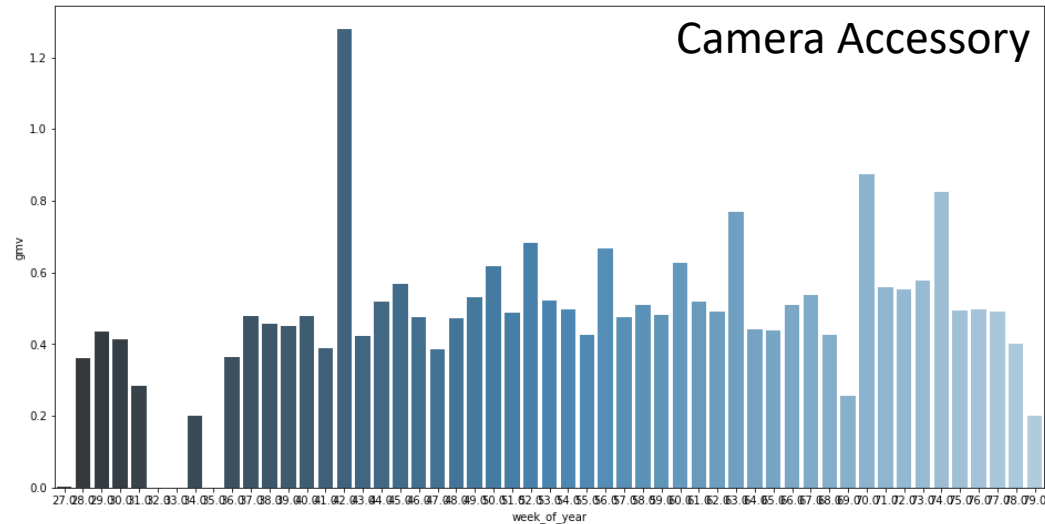
- Data is available for 1 year, i.e. from July 2015 to June 2016
- Data contains all orders & purchases made in this time period
- Monthly advertising spends on different marketing channels is also available
- NPS (brand perception) data is available with the list of all holidays in the time period

Canada's Market Overview (External Study)

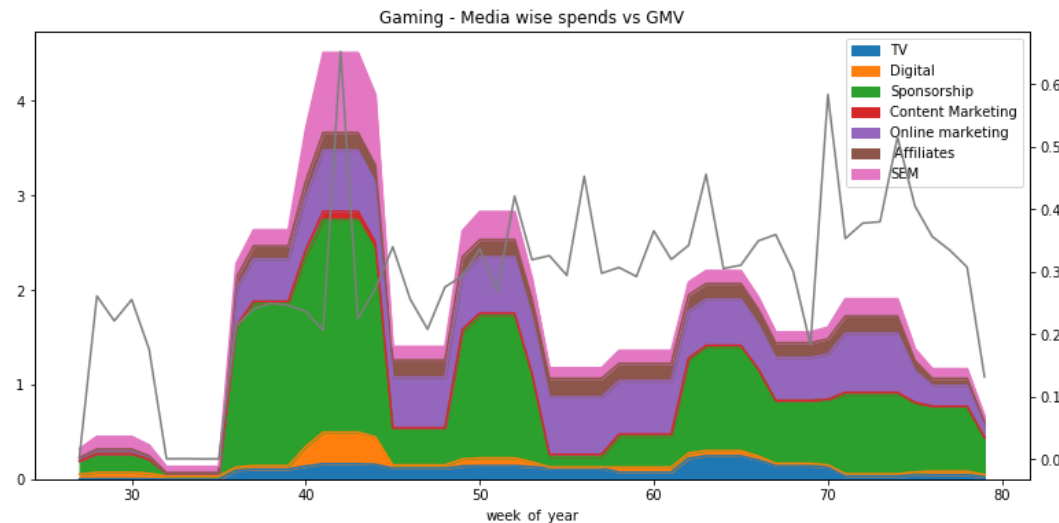
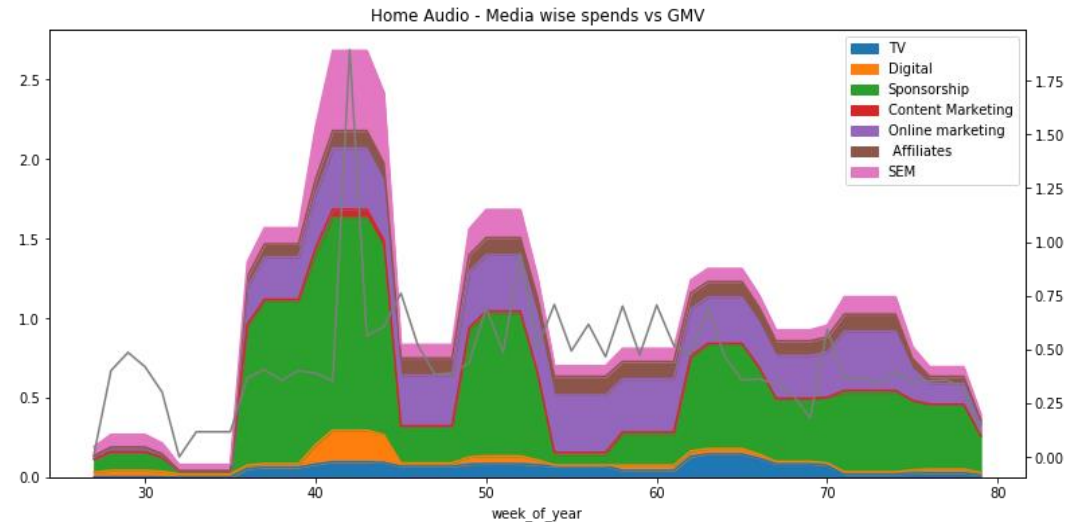
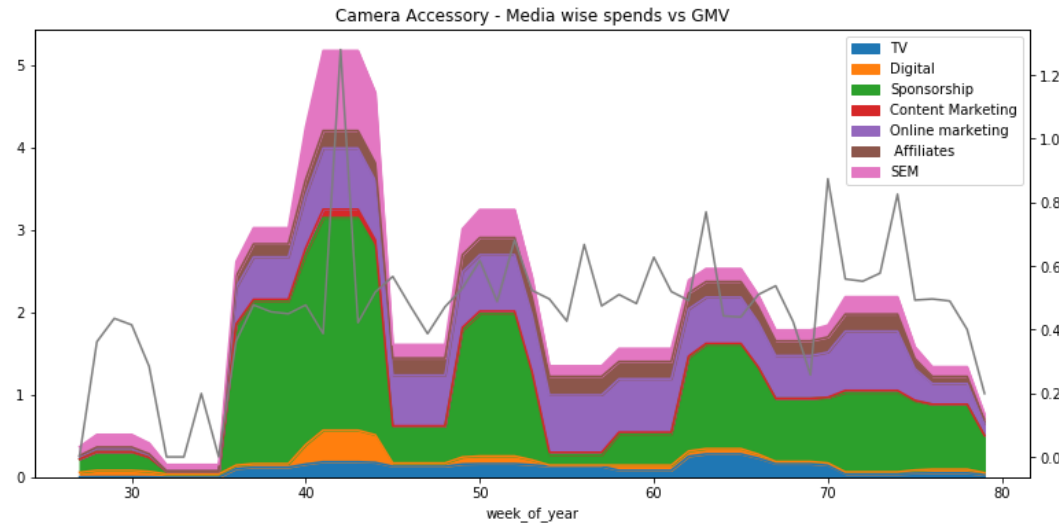
Capital	:	Ottawa, Ontario
Population	:	36.95 million (2018)
Currency	:	Canadian dollar (CAD)
Language(s)	:	English, French
Internet penetration	:	89.9 percent or 33.2 million people (2018)

- In 2017 there was 18.5 million **eCommerce users** in Canada and it is estimated that retail e-commerce sales will total C\$55.78 billion by 2020.
- The major consumer “**buying holidays**” are Christmas (Dec 25), Boxing Day (Dec 26), Back-to-School (Aug), Mother’s Day (May), Valentine’s Day (Feb 14), Easter (Mar/Apr), Father’s Day (Jun) & Halloween (Oct 31).
- Canada also sees a **rise in sales** around the fourth quarter holidays, most notably Cyber Week, the buying period that begins on the thanksgiving, including Black Friday & Cyber Monday.

GMV Trend over the year

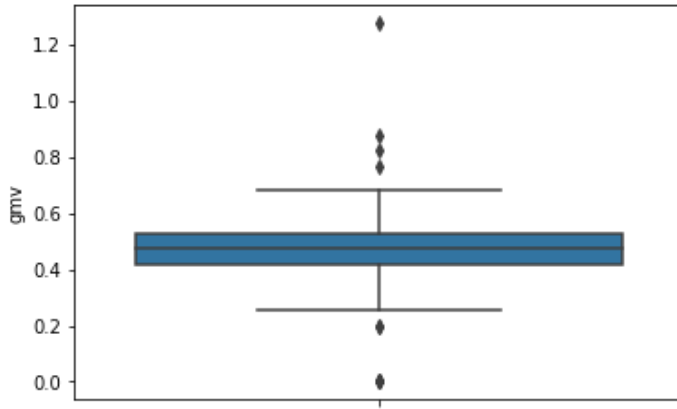


Category wise GMV & Marketing Spend

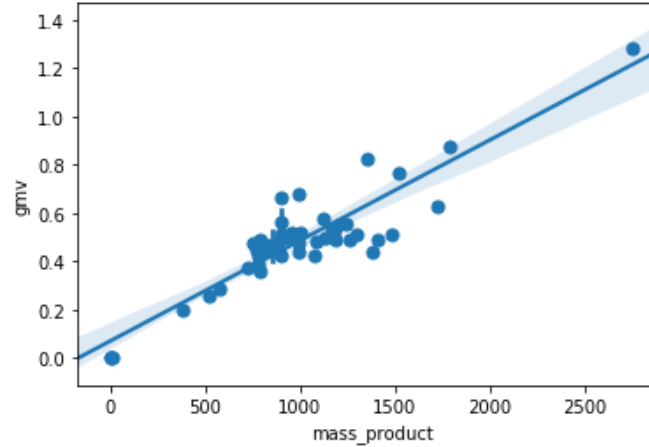


- Marketing spends were allocated to 3 sub product categories in ratio of their GMV to overall GMV share
 - Camera Accessory : 13.4%
 - Home Audio : 7%
 - Gaming Accessory : 11.7%
- Marketing spends & GMV peaked for all categories in Oct'15

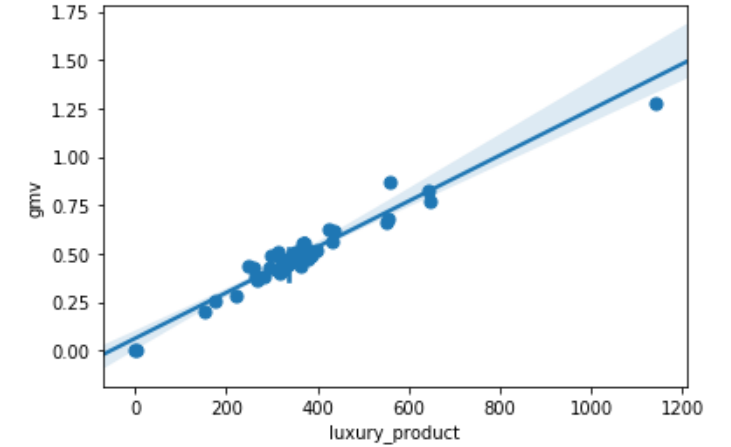
EDA : Camera Accessories



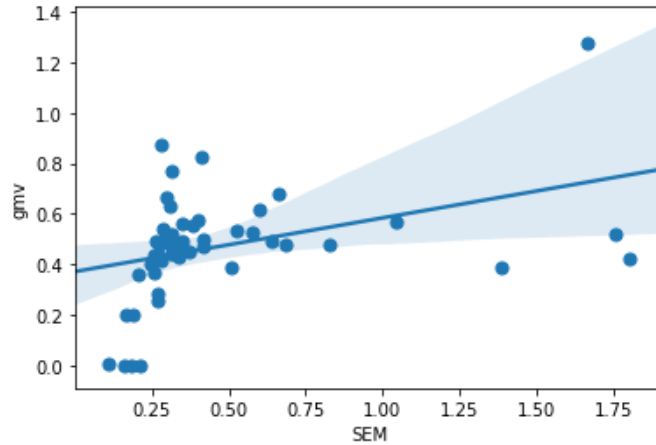
Avg GMV is around 0.47 Crores per week



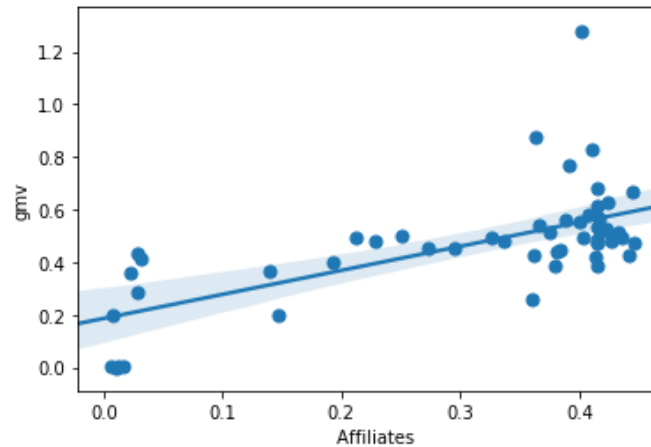
Mass Product Camera accessories are leading to higher GMV



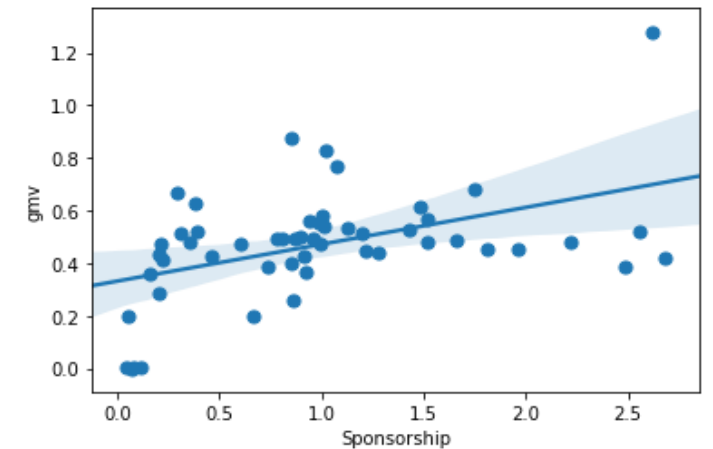
Luxury Product Camera accessories are leading to higher GMV



Higher SEM is leading to higher GMV

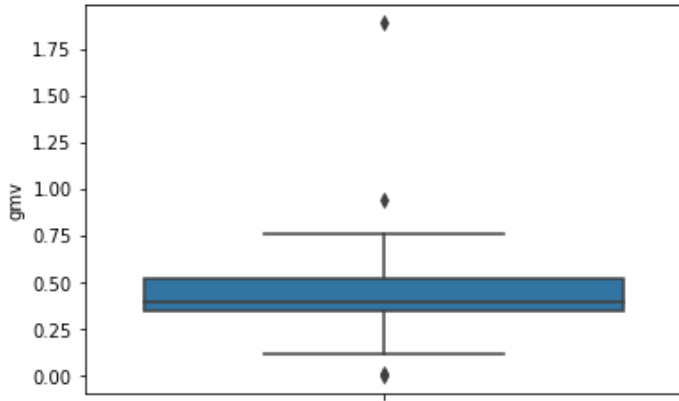


Higher Affiliates is leading to higher GMV

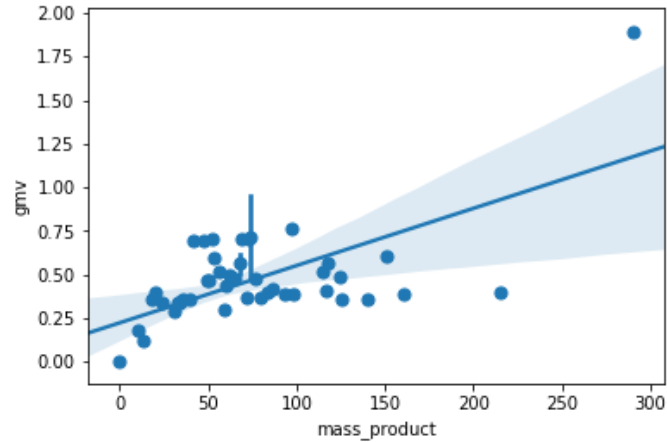


Higher Sponsorship is leading to higher GMV

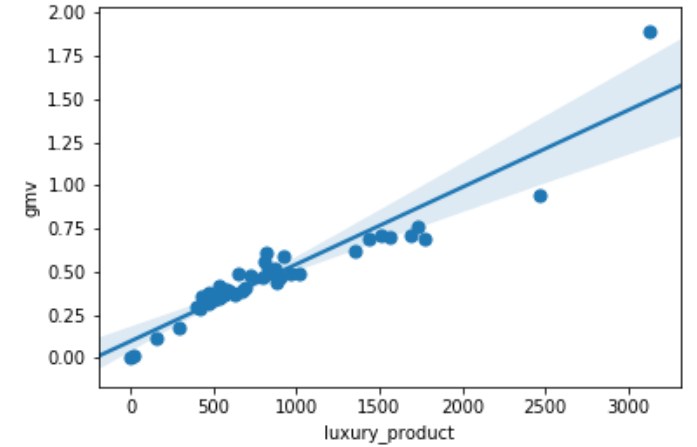
EDA : Home Audio



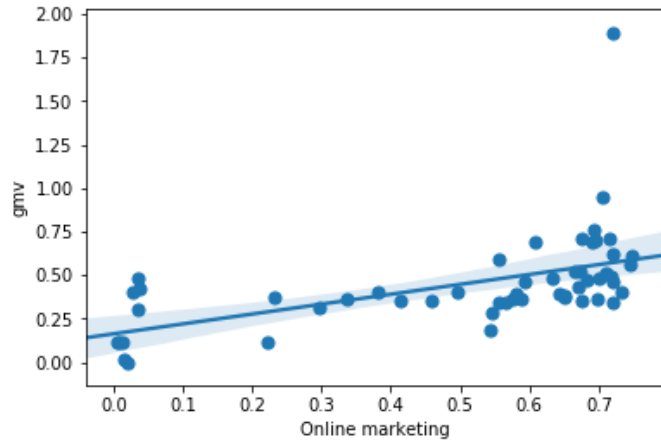
Avg GMV is around 0.45 Crores per week



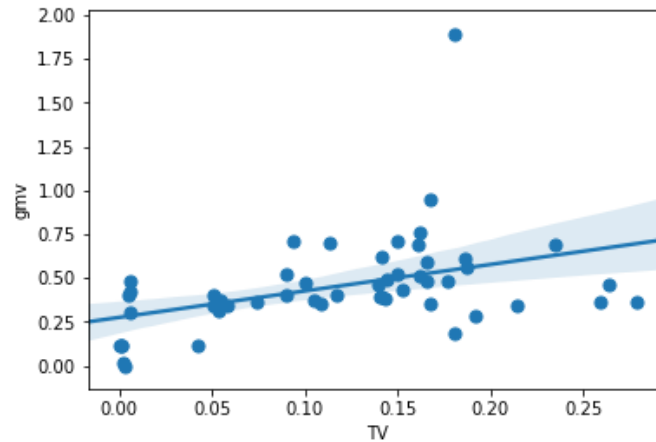
Mass Product Camera accessories are leading to higher GMV



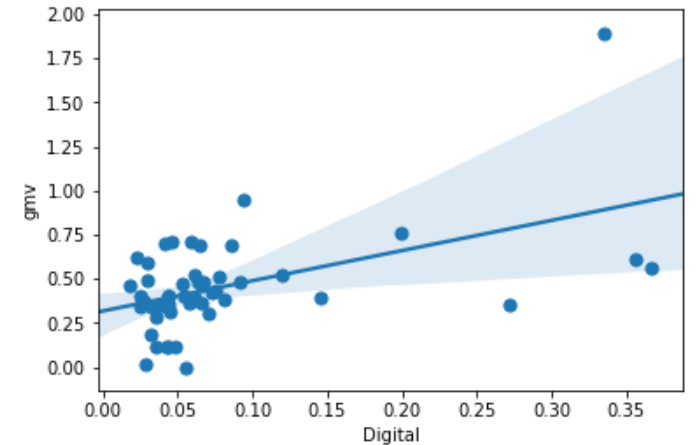
Luxury Product Camera accessories are leading to higher GMV



Higher Online Marketing is leading to higher GMV

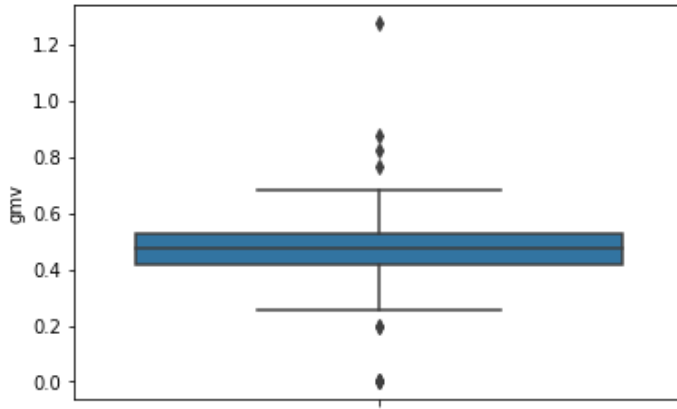


Higher TV Marketing is leading to higher GMV

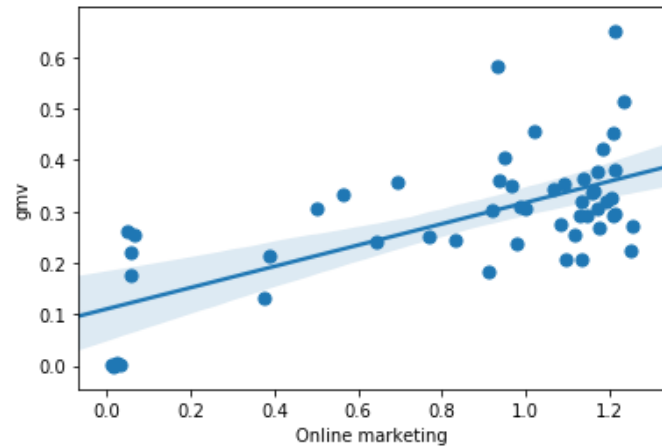


Higher Digital Marketing is leading to higher GMV

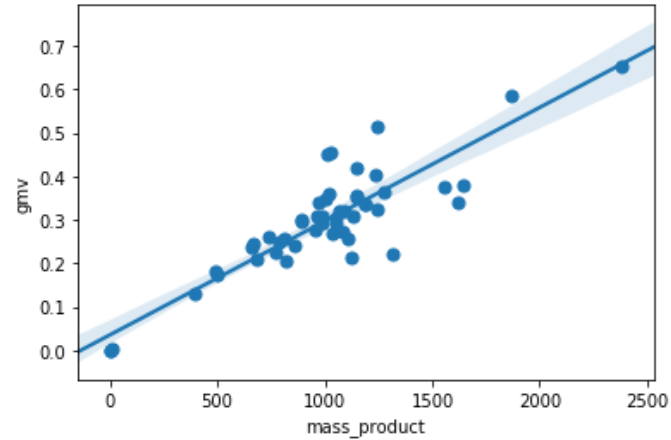
EDA : Gaming Accessories



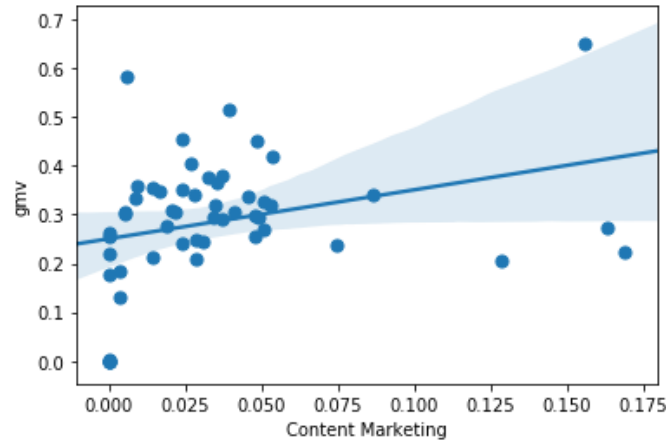
Avg GMV is around 0.29 Crores per week



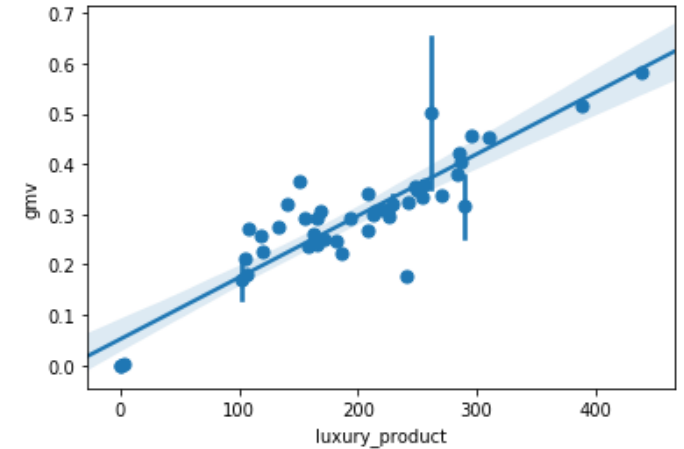
Higher Online Marketing is leading to higher GMV



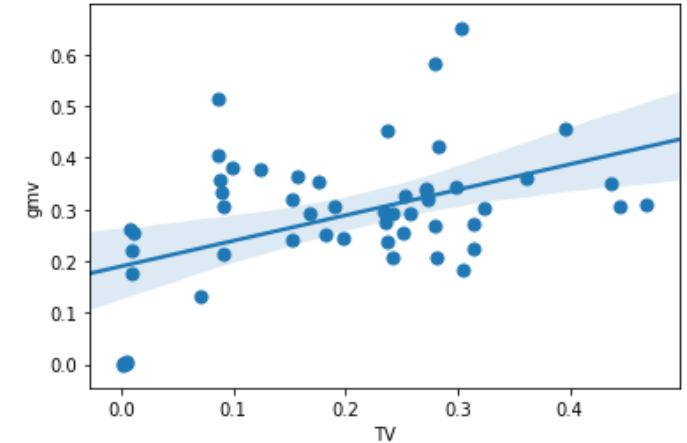
Mass Product Camera accessories are leading to higher GMV



Higher Content Marketing is leading to higher GMV



Luxury Product Camera accessories are leading to higher GMV



Higher TV Marketing is leading to higher GMV

Derived KPIs & Features

ORIGINAL FEATURES

GMV & MRP

Order Date

Units

Delivery &
Procurement
SLA

Payment
Type

DERIVED FEATURES

Luxury Tag
MRP >80 %tile

Mass Market Tag
MRP <20 %tile

Discount %

Pay Day

Sales Day

COMPLEX DERIVED FEATURES

NPS & Stock Index
Considered same across month

Weather Data
Rainy day, Hot Day & Snowy day

Media Investments
Ad stock for all medias

Model Building : Camera Accessories

Model	Performance on Training Dataset		Performance on Test Dataset		Significant Features
	R-Square	Adjusted R-square	R-Square	Adjusted R-square	
Simple Linear Model	0.959	0.956	0.810	0.781	luxury_product, mass_product, SEM
Multiplicative Model	0.689	0.661	0.676	0.595	Online marketing, Affiliates, luxury_product
Koyck Model	0.955	0.952	0.805	0.776	luxury_product, Affiliates
Distributed Lag (Additive)	0.955	0.952	0.805	0.775	luxury_product, Affiliates_lag_1
Distributed Lag (Multiplicative)	0.638	0.617	0.686	0.638	luxury_product, Online_marketing_lag_1

- We choose **Simple Linear Additive Model** for Camera Accessory since it does have high R-square and high Adjuster R-square values. It does generalizes well on test dataset.
- We also choose **Koyck Model** and **Distributed Lag (Additive) Model** for Camera Accessory as alternate models since it does have high R-square and high Adjuster R-square values. It does generalizes well on test dataset.
- As per our analysis, **Affiliates (Media Investment)** is most effective for Camera Accessory.
- As per our analysis, **SEM (Media Investment)** is also effective for Camera Accessory.
- In general, both **luxury** as well as **mass products** are contributing in GMV, however, we may prioritize sale of **luxury products** since their contribution to GMV is higher.

Model Building : Home Audio

Model	Performance on Training Dataset		Performance on Test Dataset		Significant Features
	R-Square	Adjusted R-square	R-Square	Adjusted R-square	
Simple Linear Model	0.939	0.934	0.898	0.873	luxury_product, mass_product, Digital
Multiplicative Model	0.878	0.867	0.664	0.580	luxury_product, Affiliates, SEM
Koyck Model	0.919	0.915	0.865	0.844	luxury_product, Digital
Distributed Lag (Additive)	0.920	0.913	0.833	0.792	luxury_product, Digital_lag_1, Online_marketing_lag_1
Distributed Lag (Multiplicative)	0.872	0.861	0.637	0.547	luxury_product, Digital_lag_1, Affiliates_lag_1

- We choose **Simple Linear Additive Model** for Home Audio since it does have high R-square and high Adjuster R-square values. It does generalizes well on test dataset.
- We also choose **Koyck Model** and **Distributed Lag (Additive) Model** for Home Audio as alternate models since it does have high R-square and high Adjuster R-square values. It does generalizes well on test dataset.
- As per our analysis, **Digital (Media Investment)** is most effective for Home Audio.
- As per our analysis, **Online Marketing (Media Investment)** is also effective for Home Audio.
- In general, both **luxury** as well as **mass products** are contributing in GMV, however, we may prioritize sale of **luxury products** since their contribution to GMV is higher.

Model Building : Gaming Accessories

Model	Performance on Training Dataset		Performance on Test Dataset		Significant Features
	R-Square	Adjusted R-square	R-Square	Adjusted R-square	
Simple Linear Model	0.812	0.795	0.843	0.803	luxury_product, Online marketing, Digital
Multiplicative Model	0.645	0.613	0.771	0.714	luxury_product, Online marketing, Affiliates
Koyck Model	0.772	0.759	0.772	0.737	luxury_product, SEM
Distributed Lag (Additive)	0.896	0.886	0.828	0.785	luxury_product, mass_product, Content_Marketing_lag_1
Distributed Lag (Multiplicative)	0.675	0.656	0.670	0.620	luxury_product, units

- We choose **Simple Linear Additive Model** for Gaming Accessory since it does have high R-square and high Adjuster R-square values. It does generalizes well on test dataset.
- We also choose **Koyck Model** for Gaming Accessory as alternate model since it does have high R-square and high Adjuster R-square values. It does generalizes well on test dataset.
- As per our analysis, **Online Marketing (Media Investment)** is most effective for Gaming Accessory.
- As per our analysis, **Digital (Media Investment)** is also effective for Gaming Accessory.
- As per our analysis, **Content Marketing (Media Investment)** is also effective for Gaming Accessory.
- In general, both **luxury** as well as **mass products** are contributing in GMV, however, we may prioritize sale of **luxury products** since their contribution to GMV is higher.

Recommendations : Camera Accessories

1. We should **allocate more money** for **Affiliates (Media Investment)** since it highly affects the GMV positively.
2. We should also **allocate more money** for **SEM (Media Investment)** since it also affects the GMV positively.
3. We should **reduce the money allocated** for other forms of media investments i.e. TV, Digital, Sponsorship, Content Marketing, Online marketing, Radio and Other, specifically for Camera Accessories section.
4. Sales of **luxury product** is also affecting the GMV much more positively than sales of mass market products, and thus we need to give more priority for the sale of **premium (luxury) products**.

Recommendations : Home Audio

1. We should **allocate more money** for **Digital (Media Investment)** since it highly affects the GMV positively.
2. We should also **allocate more money** for **Online Marketing (Media Investment)** since it also affects the GMV positively.
3. We should **reduce the money allocated** for other forms of media investments i.e. TV, Sponsorship, Content Marketing, Affiliates, SEM, Radio and Other, specifically for Home Audio section.
4. Sales of **luxury product** is also affecting the GMV much more positively than sales of mass market products, and thus we need to give more priority for the sale of **premium (luxury) products**.

Recommendations : Game Accessories

1. We should **allocate more money** for **Online Marketing (Media Investment)** since it highly affects the GMV positively.
2. We should also **allocate more money** for **Digital and Content Marketing (Media Investment)** since they also affects the GMV positively.
3. We should **reduce the money allocated** for other forms of media investments i.e. TV, Sponsorship, Affiliate, SEM, Radio and Other, specifically for Camera Accessories section.
4. Sales of **luxury product** is also affecting the GMV much more positively than sales of mass market products, and thus we need to give more priority for the sale of **premium (luxury) products**.