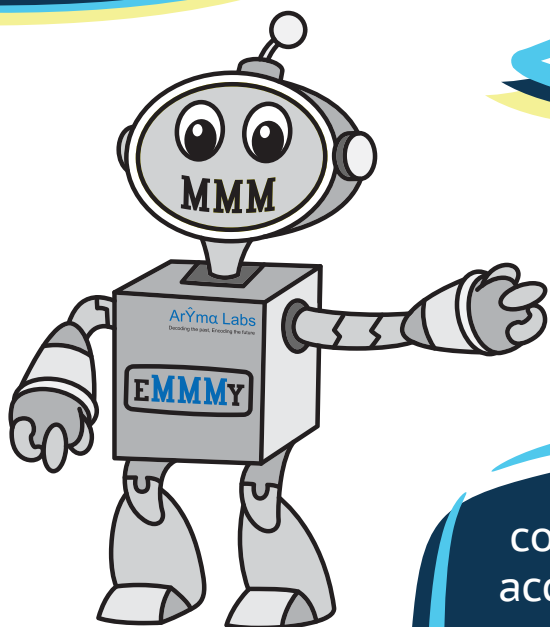# Marketing Mix Modeling

with

EMMMY

Non Linear Impact & Adstock Explained

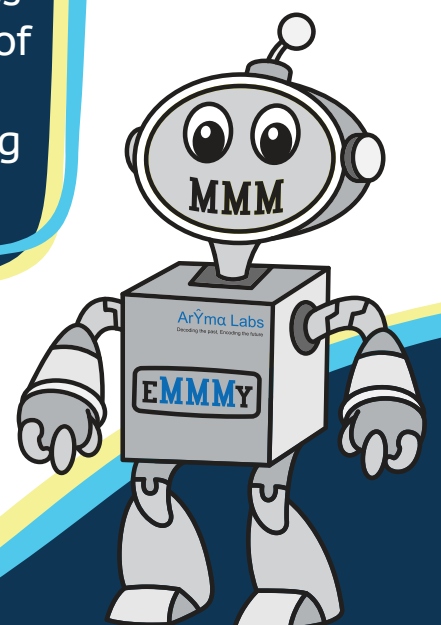**What is the difference between Linear and Non Linear Impact of Predictors ?**

Certain variables show a linear relationship with Sales. This means as we increase these inputs, sales will keep on increasing. But variables like TV GRP do not have a linear impact on sales. Increase in TV GRPs will increase sales only to a certain extent. Once that saturation point is reached, every incremental unit of GRP would have a less impact on sales. So, some transformations are done on such non-linear variables to include them in linear models.

So TV GRPs is an example of non linear impacting variable ?
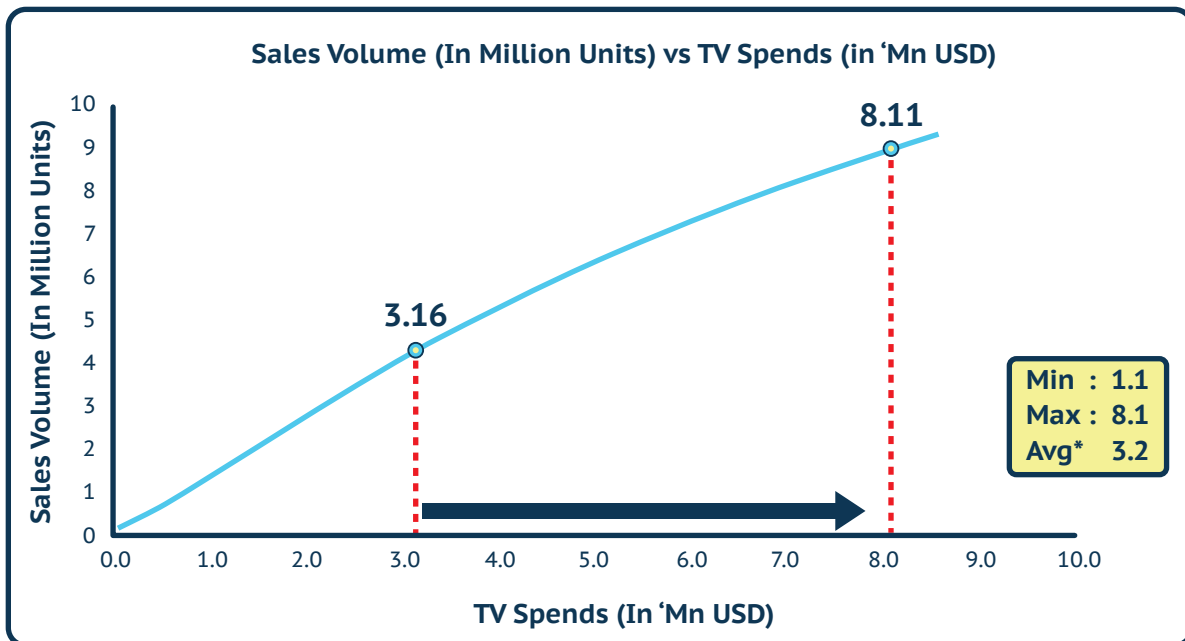
Yes, that's right. TV GRP is considered as a non-linear variable because, according to marketers an advertisement will create awareness among customers to only a certain extent. Beyond a certain point, increased exposure to advertisement would not create any further incremental awareness among customers as they are already aware of the brand.
So to consider TV GRP as one of the modeling inputs, it is transformed into adstock.

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Adstock Explained

Sales Volume (In Million Units) vs TV Spends (in 'Mn USD)

8.11

3.16

Min : 1.1
Max : 8.1
Avg* 3.2

*Sales Volume (In Million Units)* vs *TV Spends (In 'Mn USD)*

Advertising adstock or advertising carryover is the lagged effect of advertising on consumer purchase behavior.

Adtsock has two components
1. Diminishing Returns
2. Carry over effect
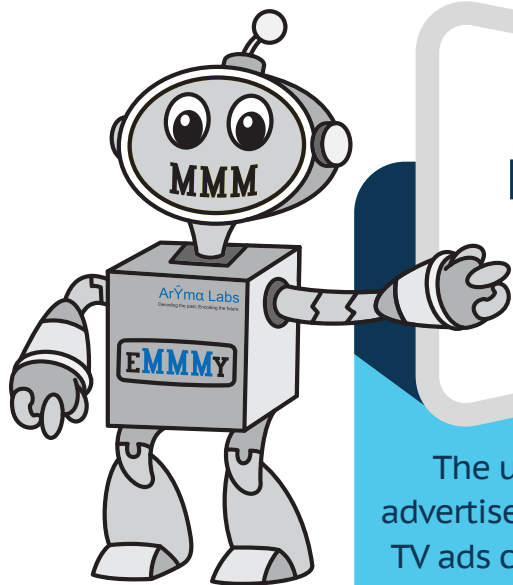
Diminishing Returns

The underlying principle for TV advertisement is that the exposure to TV ads create awareness to a certain extent in the customers' minds. Beyond that, the impact of exposure to ads starts diminishing over time. Each incremental amount of GRP would have a lower effect on Sales or awareness. So, the sales generated from incremental GRP start to diminish and become constant. This effect can be seen in the above graph, where the relationship between TV GRP and sales in non-linear. This type of relationship is captured by taking exponential or log of GRP.
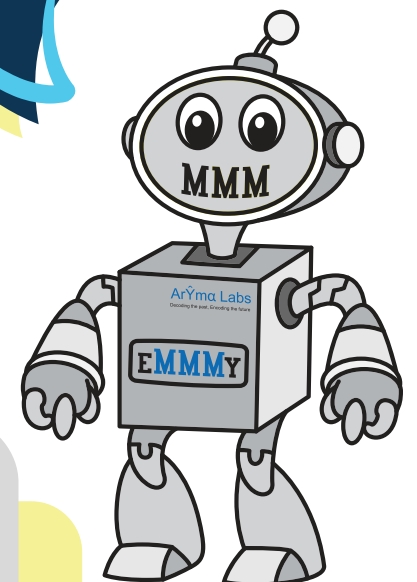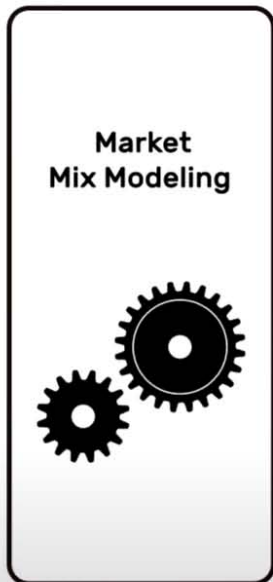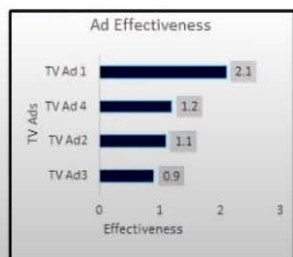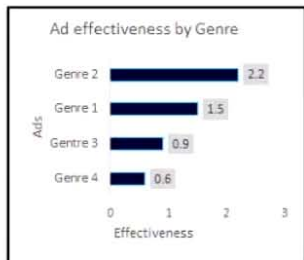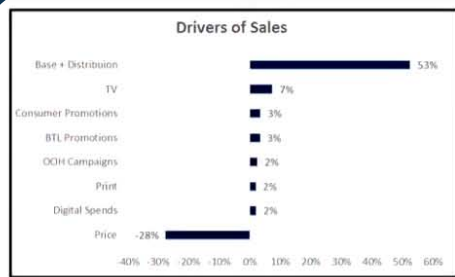
Carry over Effect

The impact of past advertisement on present sales is known as Carry over effect. A small component termed as lambda is multiplied with the past month GRP value. This component is also known as Decay effect as the impact of previous months' advertisement decays over time.
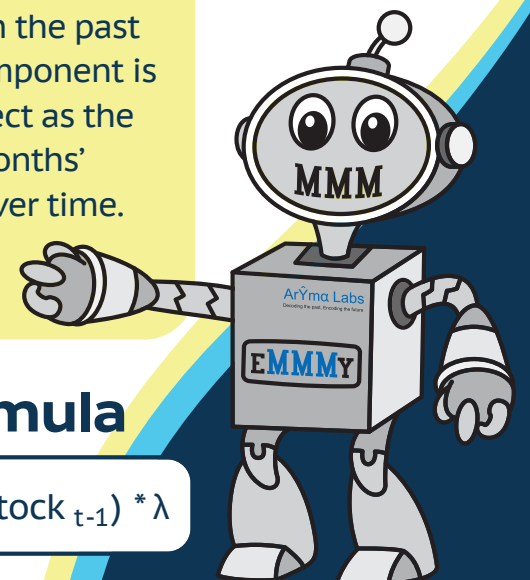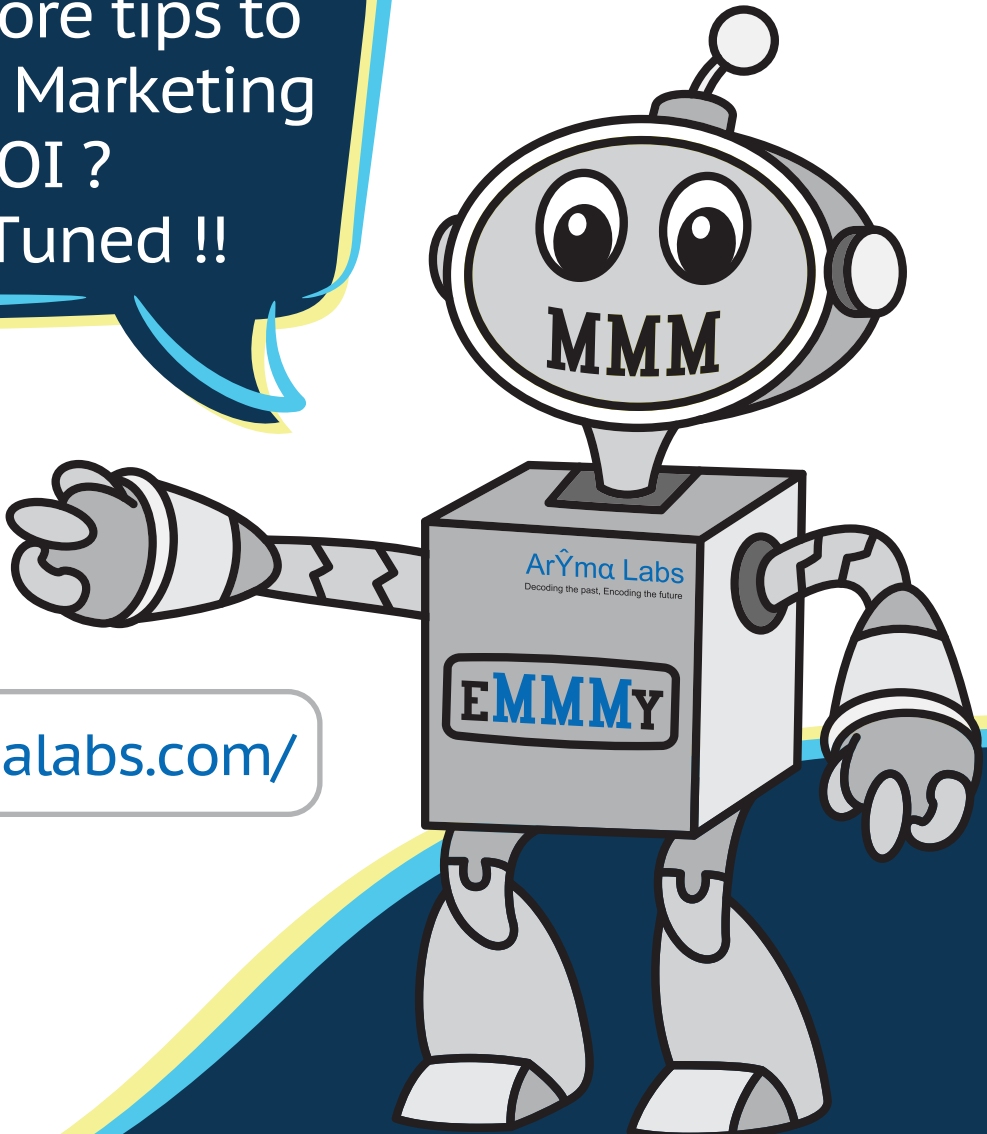
Adstock Formula

$$Adstock_t = (GRP_t)^n + (Adstock_{t-1}) * \lambda$$

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