



Multi-Touch Attribution & Marketing-Mix Model Solutions

Attribution Accelerator, 30 Nov. 2016

Michael Wolfe: CEO, Bottom-Line Analytics LLC and Global Analytics Partners

Michael is CEO of Bottom-Line Analytics. He is also a managing partner of a global analytics venture called Global Analytics Partners. Michael brings almost 30 years of direct experience in marketing analytics both on the client and consulting side. On the former, Michael has worked for Coca-Cola, Kraft Foods, Kellogg's and the agency, BBDO. He has also consulted with such blue-chip firms as AT&T, McDonald's, Coca-Cola, Hyatt Corp., L'Oreal, FedEx, Unilever & Starbucks. Michael's mantra is "pushing the envelope" of analytics innovation. Some of the recent developments from his firm include 1) Monetizing advertising creative with ad copy testing, 2) Measuring the Voice-of-the-Customer using social media and textual reviews. 3) Developing a better approach for measuring the long-term effects of advertising & 4) Multi-Touch Attribution modeling. Michael has masters in economics from University of Iowa and substantial doctoral work from Indiana U.





Rainway Attribution Models**:

Process: It starts with the data

- The failure of traditional mix-models to achieve adequate results on multi-touch attribution is due to lack of due diligence regarding data relationships & its strict variable independence rule
- It starts with Data Discovery: Case Study for Consumer Publication
 - Variable Classification:
 - Dependent: Sales & Website traffic
 - Predictor (Endogenous): TV, Print, Digital Display, Digital Search, Long-Term Ad Effects
 - Environmental (Exogenous): Seasonality, Competitive Media, Trend
 - Stationarity v. Non-Stationarity of all variables (Dickey-Fuller test)
 - Sales & Competitive media non-stationary, all others stationary
 - Reciprocity
 - Sales \longleftrightarrow Website Traffic
 - Short & Long-Term Ad Effects
 - Kalman Filters
 - Multi-Collinearity (VIF Functions)
 - Direct & Indirect Effects
 - Wear-In and Wear-Out
 - Models are part of the data discovery

** I want to recognize my partner from my Global Analytics Partner company, RainMan Consulting of India. Due credit & thanks to Krishna (KK) Kumar, Chief Analytics Officer



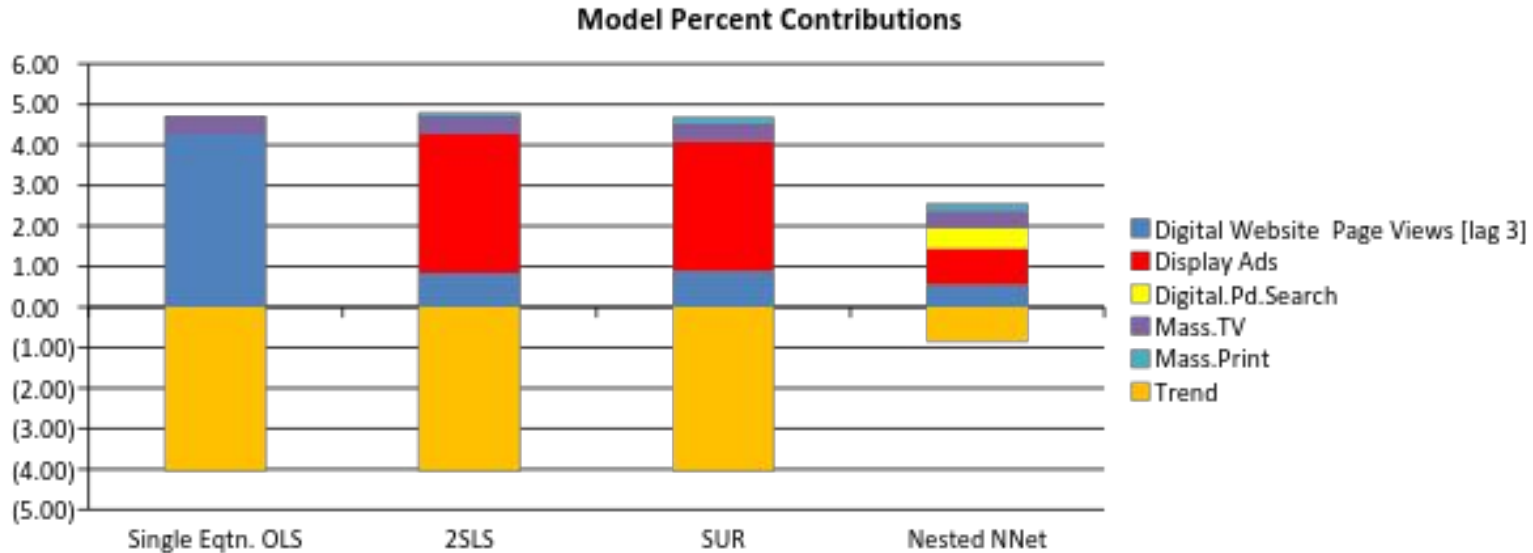
Rainway Attribution Models: Process: Methods & Techniques

- Synergies (Neural Net)
- The behavior of your data generates hypotheses which enable selection across multiple modeling techniques
- Methods & Techniques
 - Single Equation OLS
 - Two Stage LS
 - SUR (Seemingly Unrelated Regressions)
 - Nested Neural Network
 - VAR (Vector Autoregression)
 - Bayesian
- Results



Rainway Attribution Models

Process: Results

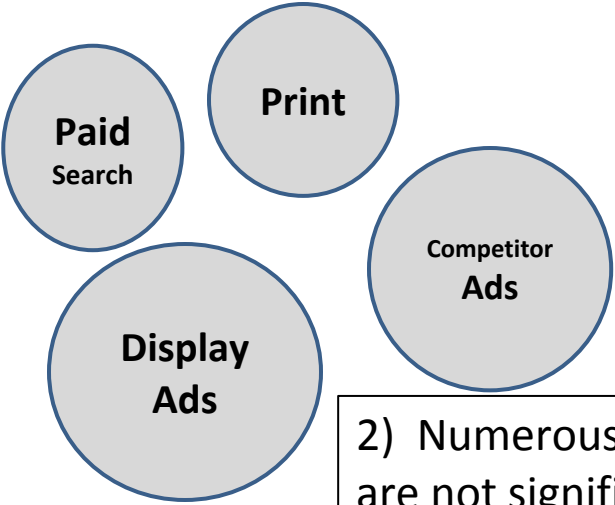
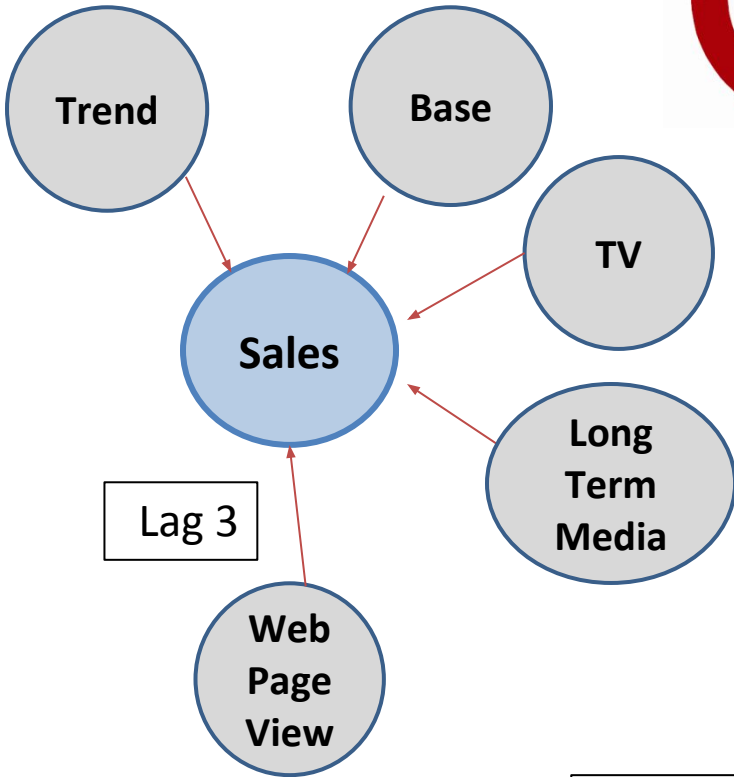


Percent Contributions	Single Eqtn. OLS	2SLS	SUR	Nested NNet
Digital Website Page Views [lag 3]	4.27	0.83	0.89	0.56
Display Ads		3.44	3.19	0.88
Digital.Pd.Search				0.51
Mass.TV	0.44	0.44	0.44	0.43
Mass.Print		0.09	0.16	0.17
Trend	(4.05)	(4.05)	(4.06)	(0.85)
Final LongLTVVariable .KalmanFilter	28.40	28.40	28.34	4.49
Base	70.94	70.85	71.04	76.91
Total	100.00	100.00	100.00	100.00
Synergy				16.90
	6.0	5.9	6.1	1.8

Single Equation Regression Model



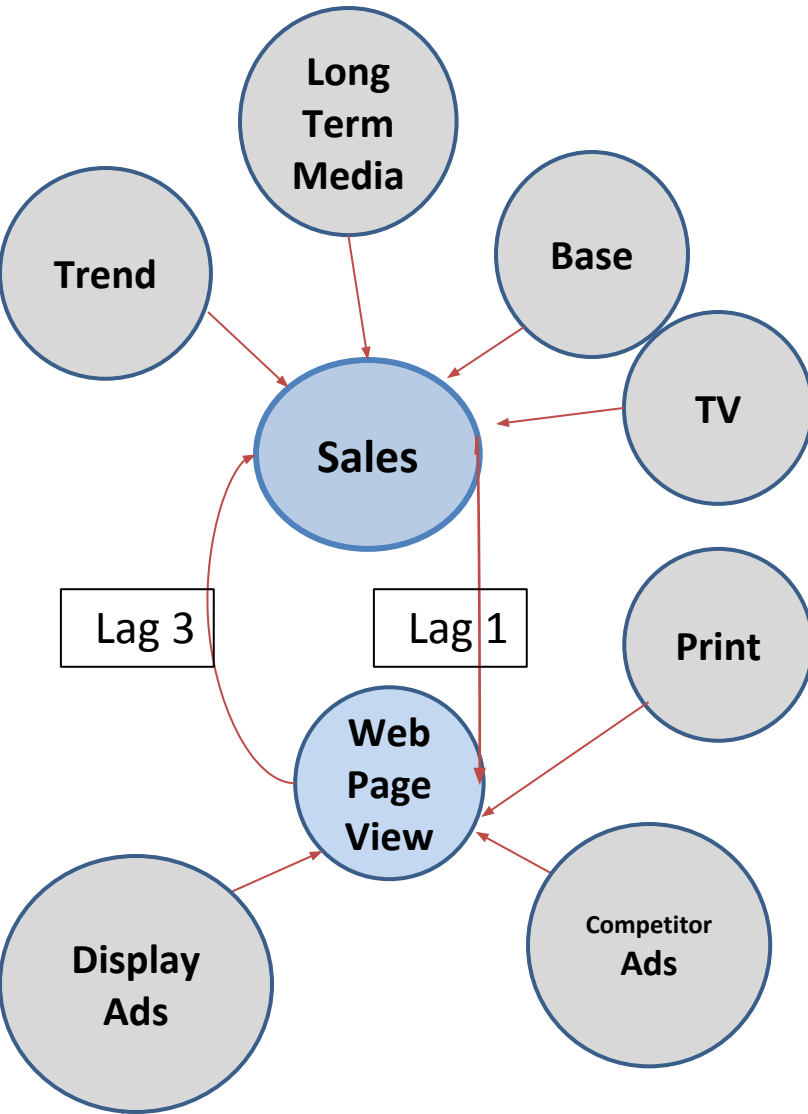
1) Sales is attributed to Web Page Views, TV, Base and Trend



2) Numerous variables are not significant + multicollinear

3) Very high attribution on 1 variable (last touch?)

Two Stage Least-Squares Model

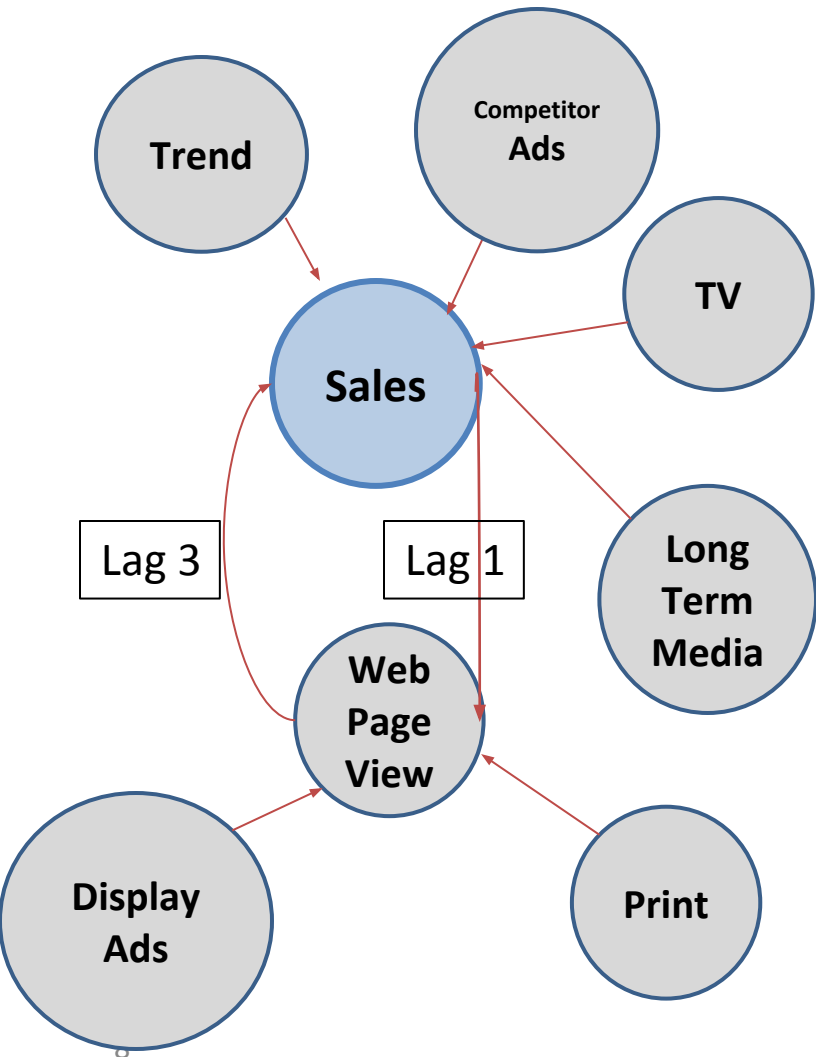


- 1) Uses two equations, also referred to as instrumental variable approach
- 2) Sales and Web Page Views have a reciprocal relationship which is lagged
- 3) Display ads are indirectly contributing to sales via Web Page Views
- 4) It appears that competitor ads are also driving some traffic to own Home Page.
- 5) Direct & Indirect Effects



Paid Search not influencing sales or web page views.

Seemingly Unrelated Regressions (SUR)



1) Like SEM for time series modeling. Multi-equation system

2) When errors are correlated, solution is a path rather than discrete data variables. This path can be assumed to be the attribution path.



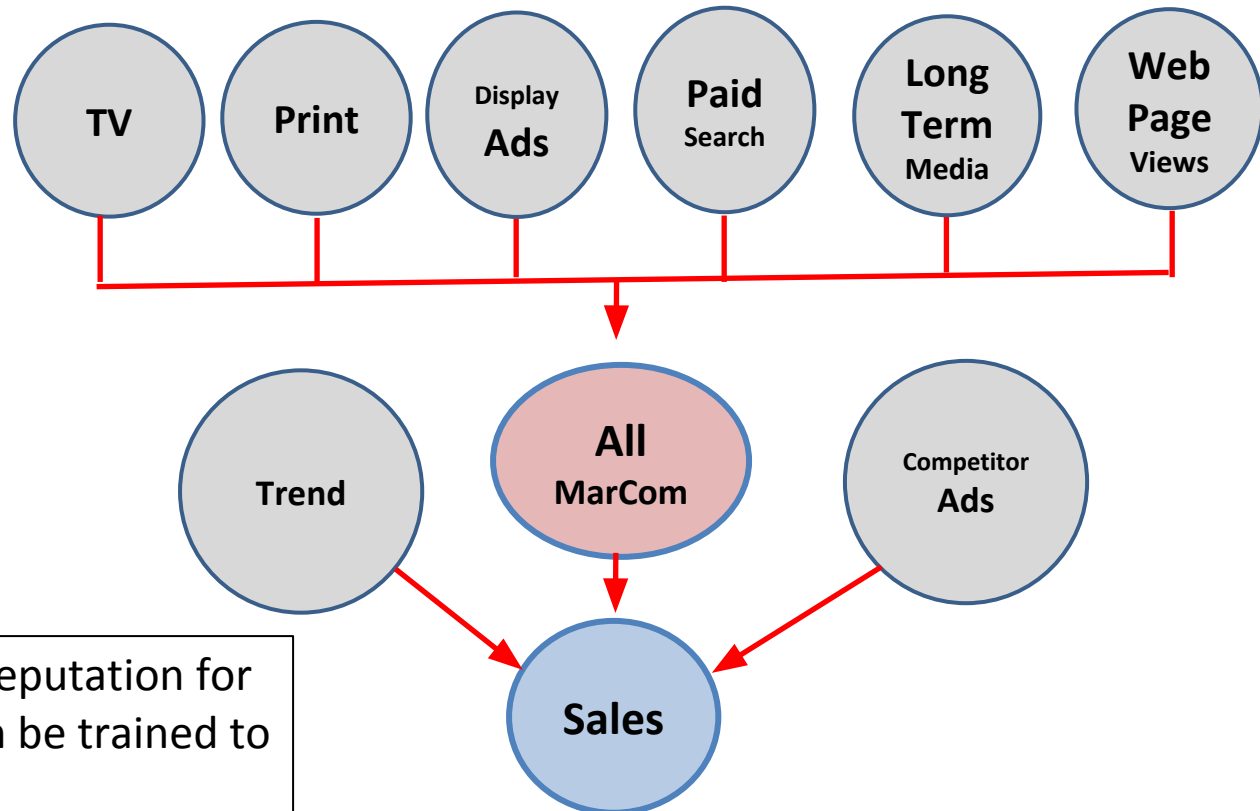
This variables is not significant

3) But when the regression errors really are unrelated, then we are just generating single eqtn. OLS results

Nested Neural-Network Model

1) All MarCom Variables pooled into meta-variable and dynamically weighted

2) Good for discovery of non-linearity, interaction and synergistic effects with our a priori knowledge



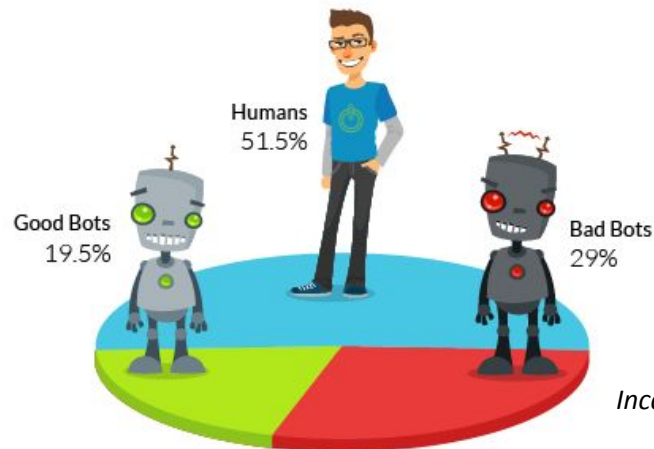
3) Have undeserved reputation for being black-box & can be trained to be stupid.



Insights and Recommendations

- MT Attribution is a “really” complex issue
 - Conventional MM modeling is not the only game in town
 - Digital Attribution is the challenger
 - Limited to E-Commerce world
 - Does not adequately address mass media touch points
 - Advantage in fast and furious programmatic media buying
 - Bots!

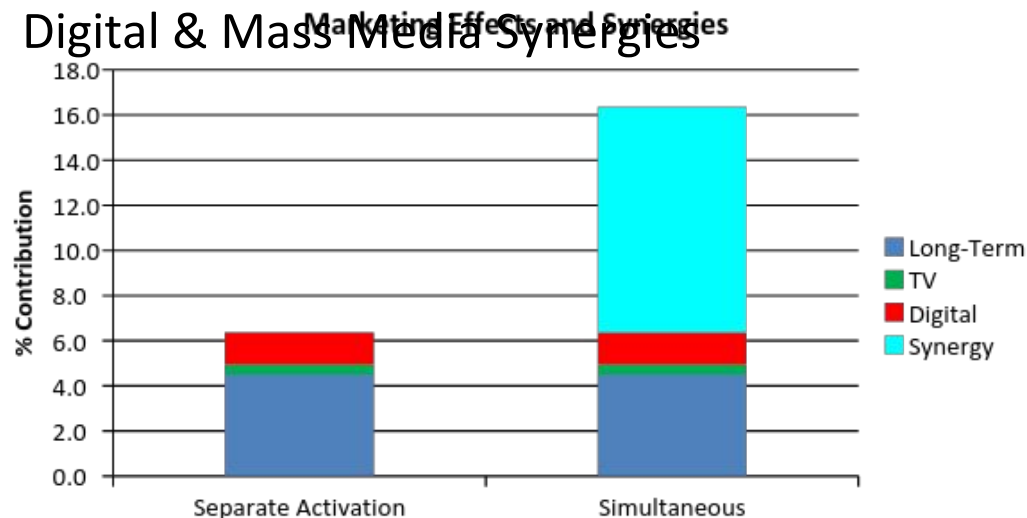
This is a breakdown of online traffic in 2015:





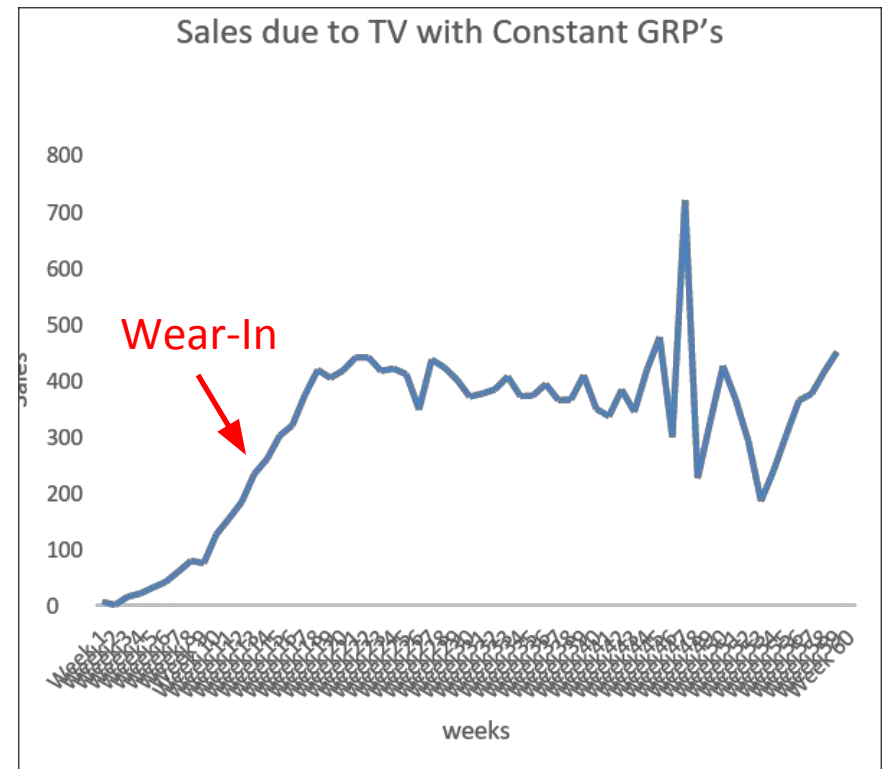
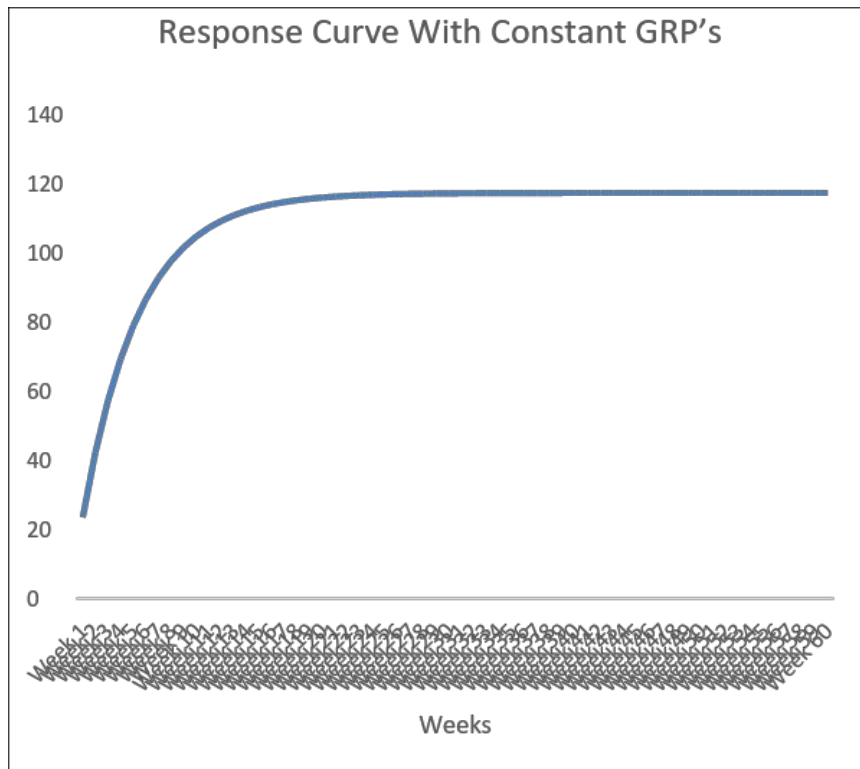
Insights and Recommendations

- MM Modeling is an option & has some distinct advantages
 - Mapping the flow of effects, interactions, synergies, reciprocal effects, wear-in and wear-out
 - Long-term effects
 - Pick a solution that seems right
 - Mass Media Touch-Points
 - Brick and mortar retail
 - Digital & Mass Media Synergies



Response Curve For Ad stock And Sales using Time Varying Beta

With State-Space function in SUR model, we can derive time-based and varying model “betas” and thereby simulate the time-effect “wear-in” of media, using a constant GRP Simulation. Kalman-Filters used to derive underlying response patten in first panel



Wear-In And Wear-Out

We then simulate what happens if we take the time-based constant simulation to zero At 12 weeks. The decay shown represents the wear-out pattern in the media.

