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Attribution – the $X million question

“I know half the money I spend on advertising is wasted, but I can never find out which half.

By Unknown - Unknown, Public Domain, https://commons.wikimedia.org/w/index.php?curid=681[illegible]885
From Wikipedia, the free encyclopedia

Attribution - the $X million question

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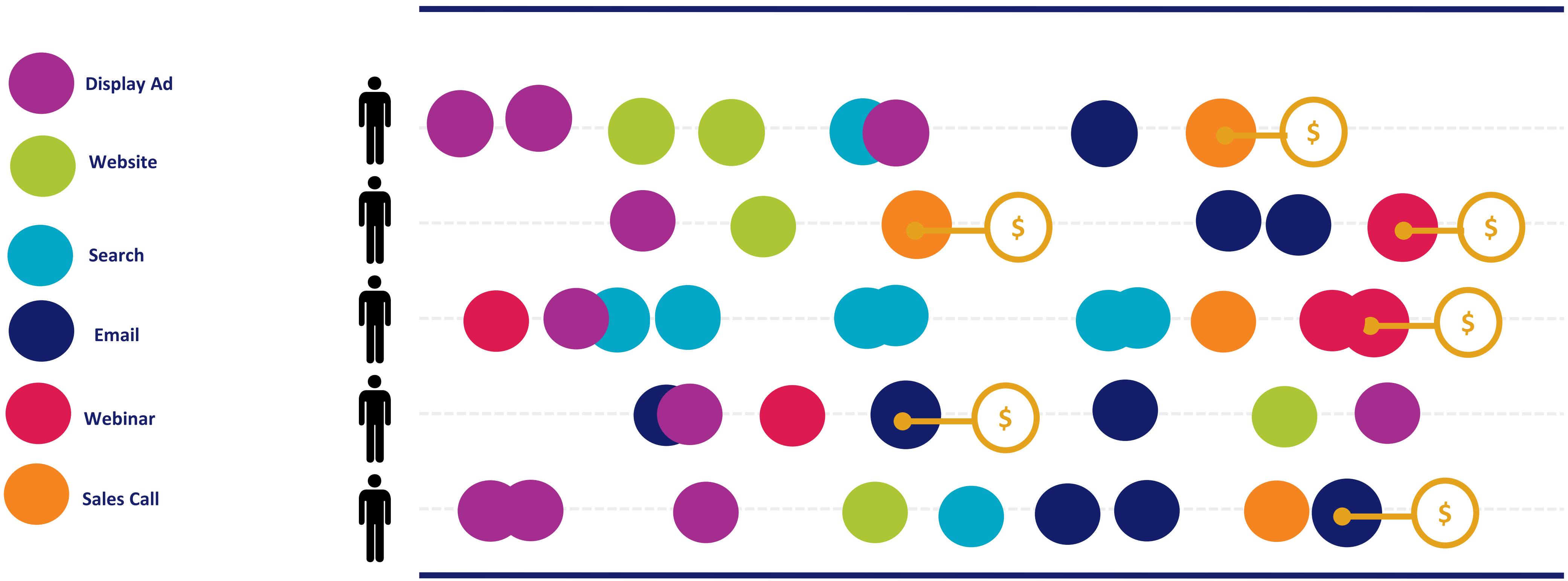
The “Last Touch” Standard

- Last Ad Clicked
- Last interaction

The Reality

Campaigns reach customers multiple times, across multiple channels, over extended periods of time



Two broad classes of models

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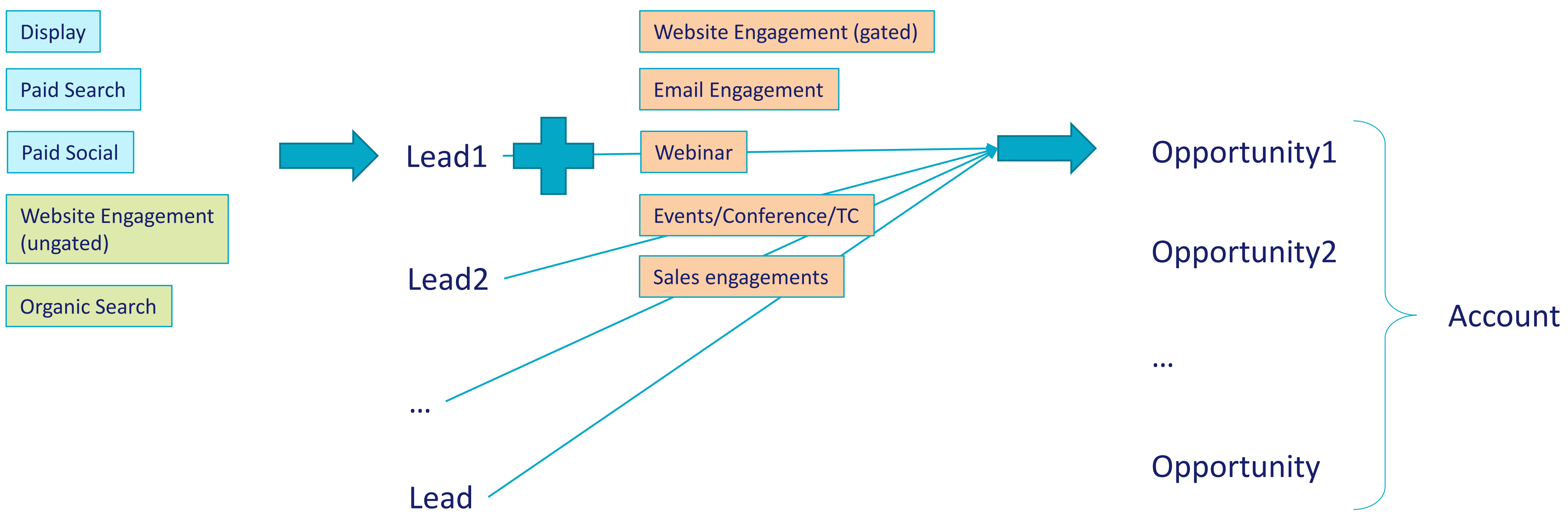
	Multi-Touch Attribution (MTA)	Media Mix Modeling (MMM)
Data:	Atomic, user-level data	Aggregated, granular data
Modeling approach:	Logistic regression/hazard models, Markov model, game theoretic	Regression-based approach
Data grain:	Requires consistent, x-device identity (different vendors may use different IDs)	Can include non-addressable media like TV, Radio, Print, etc. and in-store sales
Result grain:	Enables effectiveness estimates at a more granular level	Holistic estimate across all channels
Purpose:	Determines credit allocation and therefore CPA	Calculates allocation and the marginal effect, the value of an incremental $1 to a given channel or subchannel
Forecast:	User-level predictive model can be used for RTB and site personalization	Predictive model can be used to estimate future sales totals

Channels that influence lead and revenue conversions

- Attribution of leads vs. attribution of revenue



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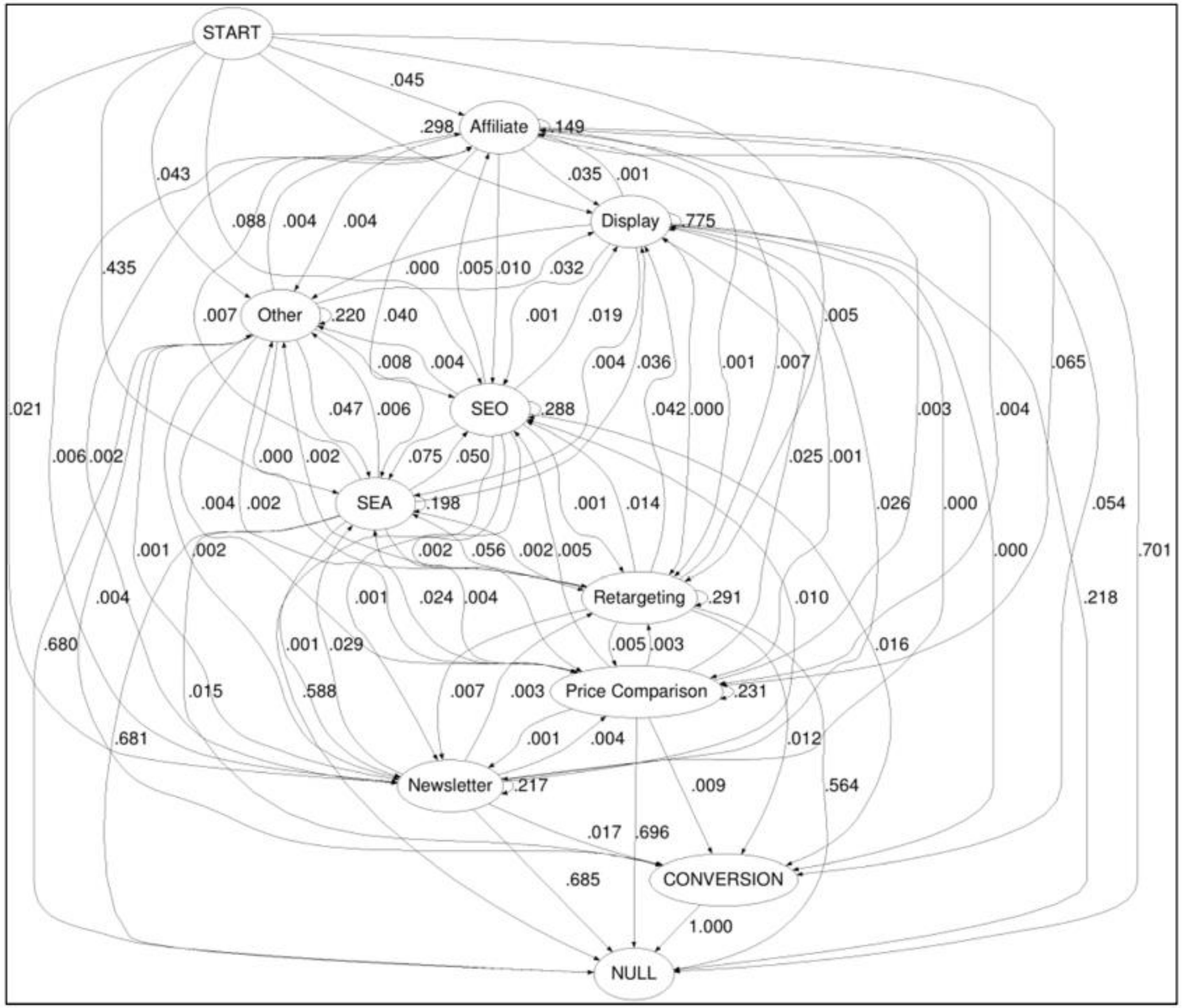
Markov Chain Methodology

- **Markov Chain Models estimate of transition between states.**
- **In Attribution, states are advertising from channels and two end states:**
  - A conversion
  - A non-conversion (NULL) state
- **Does well on principal goals**
  - Objectivity
  - Predictive Accuracy
  - Interpretability
  - Versatility
  - Efficiency
- **Best practice is to include at least one lag.**



Anderl, et al, "Mapping the Customer Journey"

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Markov Chain Model Input and Output

Input | Output

ga_client_id	ga_timestamp	touch_num	touchpoint	custom_channel	custom_source	campaign	first_touch_fractional_value	last_touch_fractional_value	linear_touch_fractional_value	markov_model_fractional_value
1000003111	2018-04-13 06:07:04 UTC	6	last touch	Paid Search - Brand	Google	Campaign name A	0	1	0.17	0.13
1000003111	2018-03-25 06:02:11 UTC	5		Paid Search - Brand	Google	Campaign name A	0	0	0.17	0.13
1000003111	2018-03-25 05:05:57 UTC	4		Paid Search - Brand	Google	Campaign name A	0	0	0.17	0.13
1000003111	2018-03-24 07:02:11 UTC	3		Paid Search - Brand	Google	Campaign name A	0	0	0.17	0.13
1000003111	2018-03-24 06:55:56 UTC	2		Paid Search - Brand	Google	Campaign name A	0	0	0.17	0.13
1000003111	2018-03-24 06:53:25 UTC	1	first touch	Organic Search	Google	(not set)	1	0	0.17	0.35
1000126400	2018-05-14 14:02:12 UTC	7	last touch	Display	Google	Campaign name B	0	1	0.14	0.08
1000126400	2018-03-29 19:16:31 UTC	6		Display	Google	Campaign name B	0	0	0.14	0.08
1000126400	2018-03-16 18:26:25 UTC	5		Display	Google	Campaign name B	0	0	0.14	0.08
1000126400	2018-03-15 02:02:10 UTC	4		Paid Search - Brand	Google	Campaign name C	0	0	0.14	0.13
1000126400	2018-03-15 00:58:37 UTC	3		Paid Search - Brand	Google	Campaign name C	0	0	0.14	0.13
1000126400	2018-03-15 00:57:51 UTC	2		Organic Search	Google	(not set)	0	0	0.14	0.36
1000126400	2018-03-15 00:56:38 UTC	1	first touch	Paid Search - Brand	Google	Campaign name C	1	0	0.14	0.13
1000126954	2018-01-16 08:28:19 UTC	1	first touch	Paid Search - Non Brand	Google	Campaign name D	1	0	1.00	1.00
1000145451	2018-05-01 14:05:26 UTC	4	last touch	Display	Google	Campaign name E	0	1	0.25	0.25
1000145451	2018-03-02 13:00:16 UTC	3		Display	Google	Campaign name E	0	0	0.25	0.25
1000145451	2018-03-01 18:02:10 UTC	2		Display	Google	Campaign name E	0	0	0.25	0.25
1000145451	2018-03-01 17:04:17 UTC	1	first touch	Display	Google	Campaign name E	1	0	0.25	0.25
1000189009	2018-05-11 17:02:12 UTC	6	last touch	Organic Search	Google	(not set)	0	1	0.17	0.18
1000189009	2018-05-11 15:02:11 UTC	5		Organic Search	Google	(not set)	0	0	0.17	0.18
1000189009	2018-05-10 19:45:42 UTC	4		Organic Search	Google	(not set)	0	0	0.17	0.18
1000189009	2018-05-10 17:41:23 UTC	3		Organic Search	Google	(not set)	0	0	0.17	0.18
1000189009	2018-03-03 14:32:19 UTC	2		Direct	Direct	(not set)	0	0	0.17	0.13
1000189009	2018-03-03 01:44:44 UTC	1	first touch	Direct	Direct	(not set)	1	0	0.17	0.13
1000201235	2018-03-28 23:07:35 UTC	1	first touch	Paid Search - Brand	Google	Campaign name F	1	0	1.00	1.00
1000375842	2018-01-25 09:06:39 UTC	2	last touch	Organic Search	Bing	(not set)	0	1	0.50	0.50
1000375842	2018-01-09 05:50:54 UTC	1	first touch	Organic Search	Bing	(not set)	1	0	0.50	0.50
1000384716	2018-02-28 13:04:29 UTC	5	last touch	Organic Search	Google	(not set)	0	1	0.20	0.21
1000384716	2018-02-18 13:00:17 UTC	4		Organic Search	Google	(not set)	0	0	0.20	0.21
1000384716	2018-02-16 14:02:11 UTC	3		Organic Search	Google	(not set)	0	0	0.20	0.21
1000384716	2018-02-16 13:18:25 UTC	2		Organic Search	Google	(not set)	0	0	0.20	0.21
1000384716	2018-01-17 13:47:08 UTC	1	first touch	Direct	Direct	(not set)	1	0	0.20	0.15
1000402403	2018-04-04 19:02:18 UTC	3	last touch	Paid Search - Brand	Google	Campaign name G	0	1	0.33	0.33
1000402403	2018-04-04 16:02:11 UTC	2		Paid Search - Brand	Google	Campaign name G	0	0	0.33	0.33
1000402403	2018-03-29 21:19:14 UTC	1	first touch	Paid Search - Brand	Google	Campaign name G	1	0	0.33	0.33

Note: Data is illustrative only. It resembles actual data but has been modified for confidentiality.

How much lead credit re-attributed?

Attribution Model - Total Fractional Credit

By Channel and Journey Length

Journey Length

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Custom Channel	First Touch Fractional Val..	Last Touch Fractional Valu..	Linear Touch Fractional Va..	Markov Model Fractional ..
Direct	30%	17%	22%	23%
Display	7%	6%	7%	6%
Eloqua	5%	11%	9%	6%
Organic Search	28%	36%	33%	38%
Organic Social	1%	1%	1%	0%
Paid Search - Brand	10%	8%	9%	8%
Paid Search - Non Brand	8%	7%	7%	7%
Paid Social	5%	4%	5%	4%
Product	0%	1%	1%	0%
Referral	6%	8%	8%	7%

Journey Length

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Attribution Model - Total Fractional Credit

By Channel and Journey Length

Custom Channel	First Touch Fractional Val..	Last Touch Fractional Valu..	Linear Touch Fractional Va..	Markov Model Fractional ..
Direct	30%	15%	20%	22%
Display	6%	6%	6%	6%
Eloqua	4%	12%	9%	6%
Organic Search	29%	37%	34%	41%
Organic Social	1%	1%	1%	0%
Paid Search - Brand	10%	8%	9%	8%
Paid Search - Non Brand	8%	6%	7%	6%
Paid Social	5%	5%	5%	5%
Product	0%	1%	1%	0%
Referral	6%	9%	8%	7%

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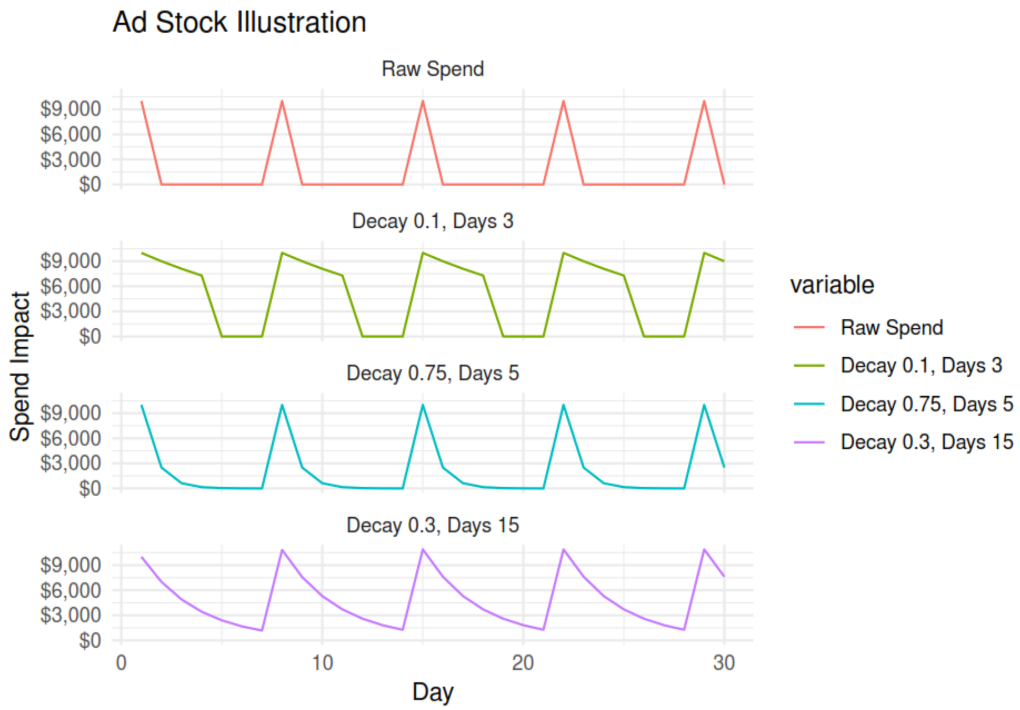
Media Mix Modeling

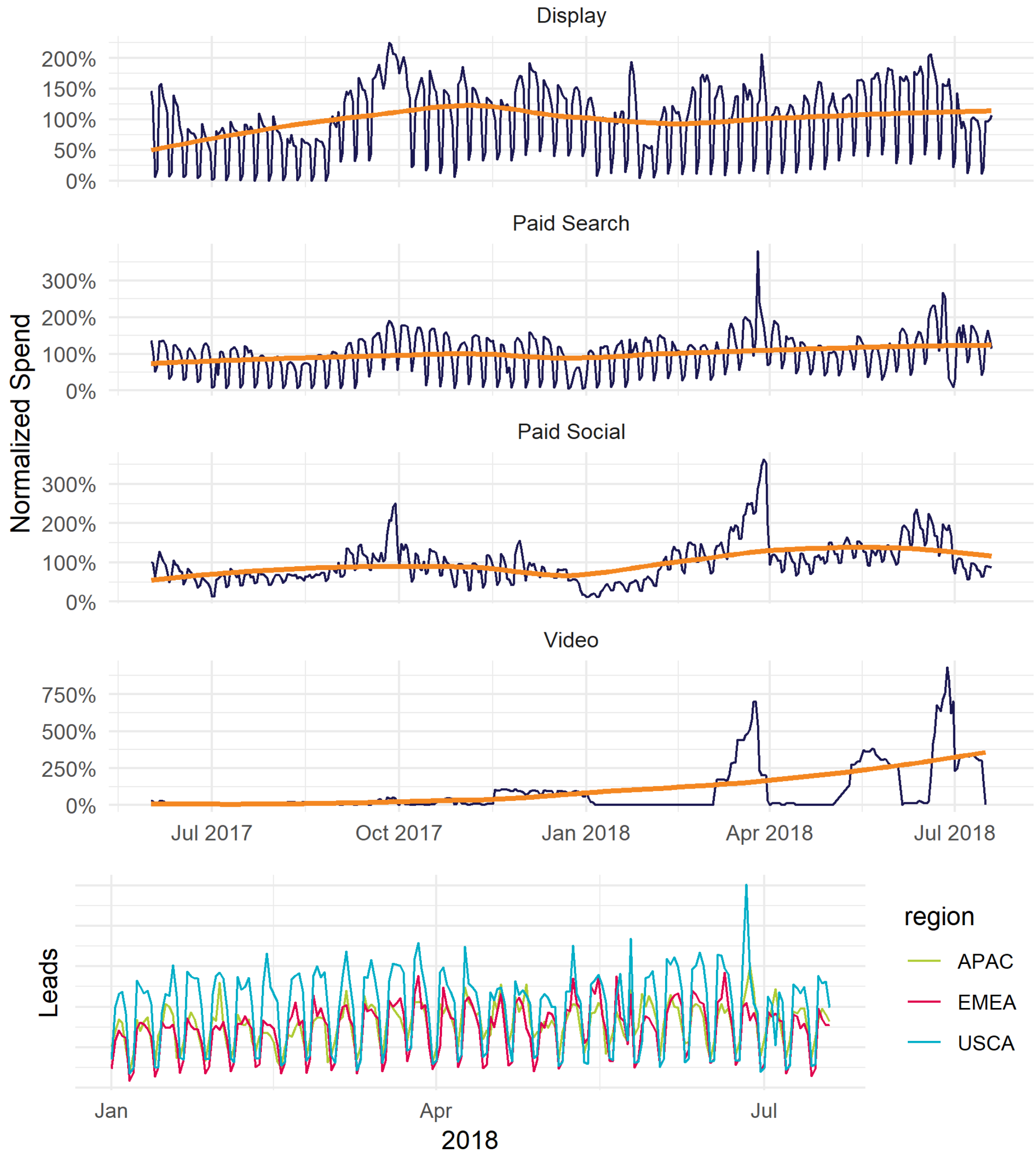
- **MMM grew out of econometric methods.**
- **Classical regression technique:**

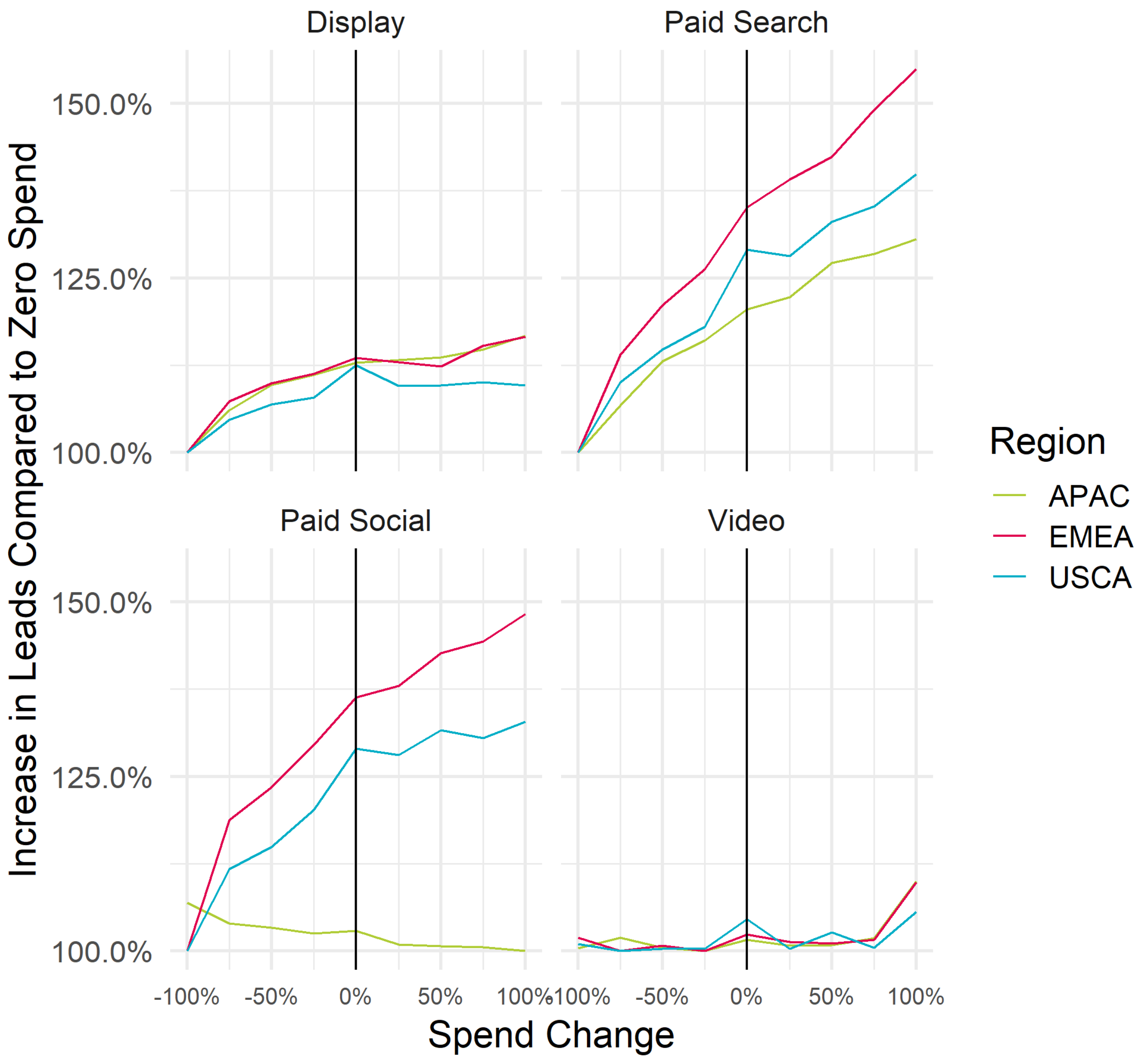
$$\begin{aligned}\text{conv}_\text{t} = \beta_0 + \beta_m \cdot \text{month}_\text{t} + \beta_{dow} \cdot \text{weekday}_\text{t} + \\ \beta_d \cdot \text{display}_\text{t} + \beta_v \cdot \text{video}_\text{t} + \beta_s \cdot \text{search}_\text{t} + \beta_{soc} \cdot \text{social}_\text{t} + \\ \beta_{org} \cdot \text{organic}_\text{t} + \epsilon_t\end{aligned}$$

- **In reality, models include additional complexities:**
  - Transformations for diminishing returns
  - Incorporation of Ad Stock variables
  - Interactions
- **Regression context allows inference while "holding all else equal".**
- **Model complexity demands visual results for practitioners—no one wants a table of coefficients.**



MMM Input and Output





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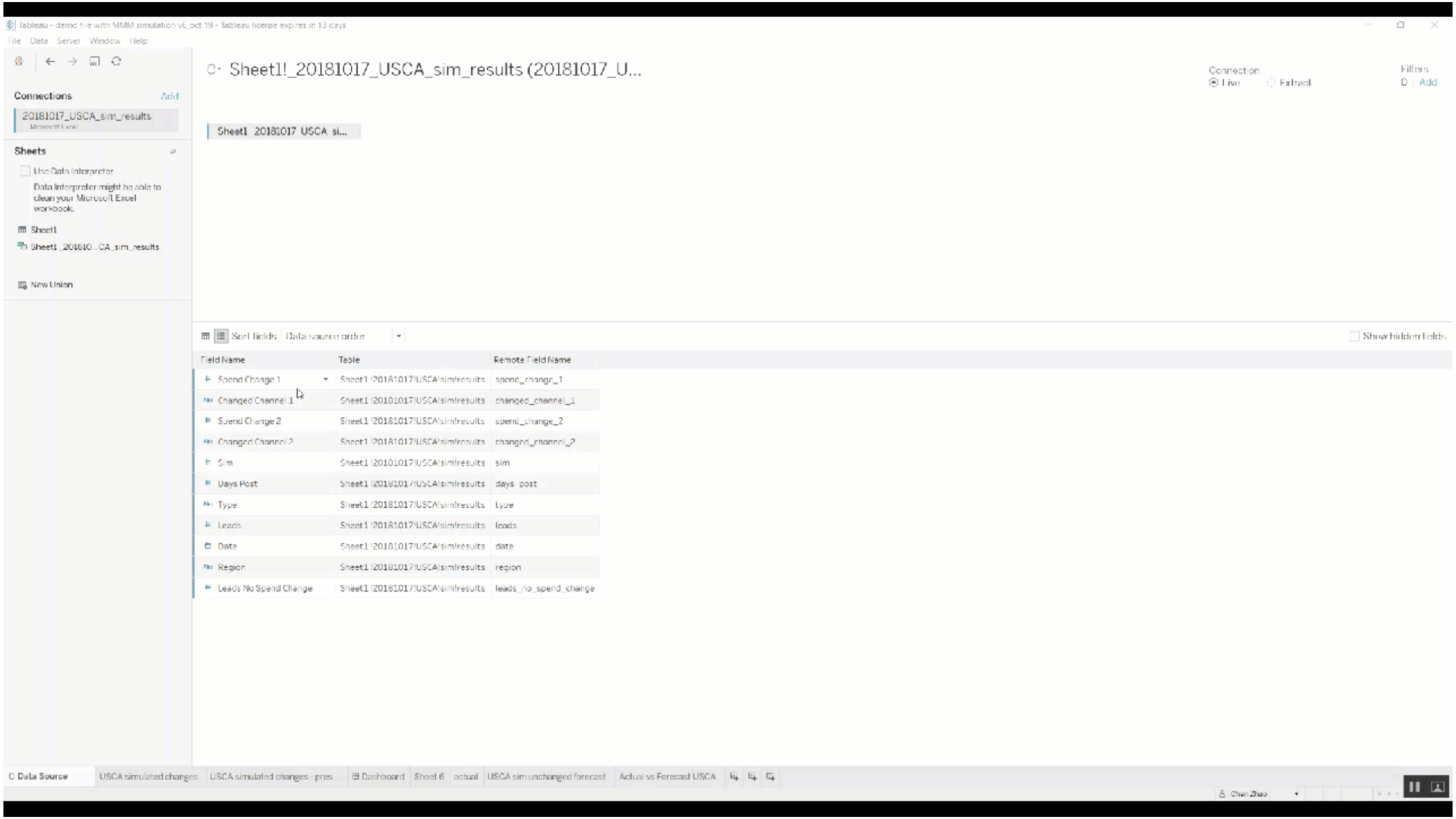

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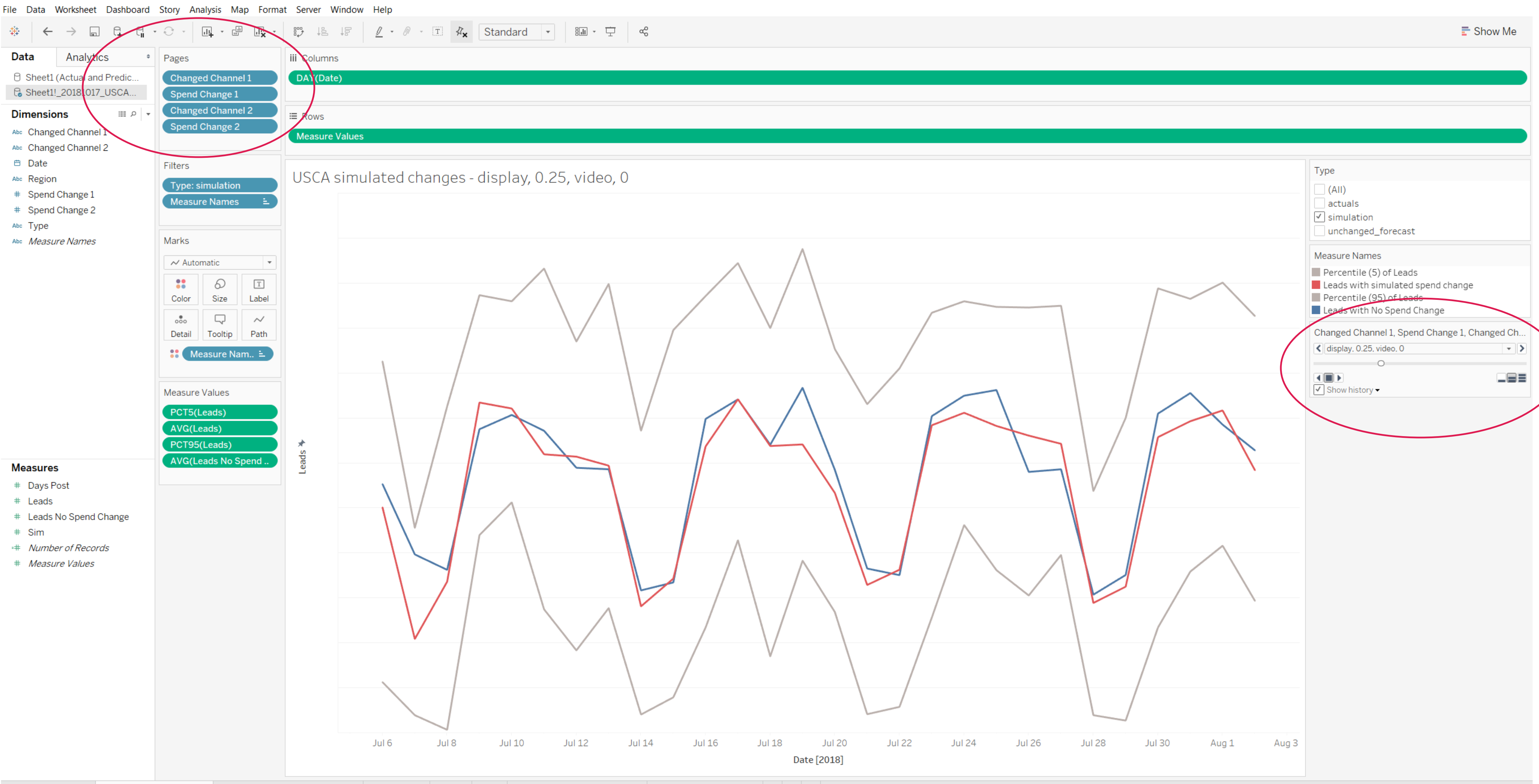

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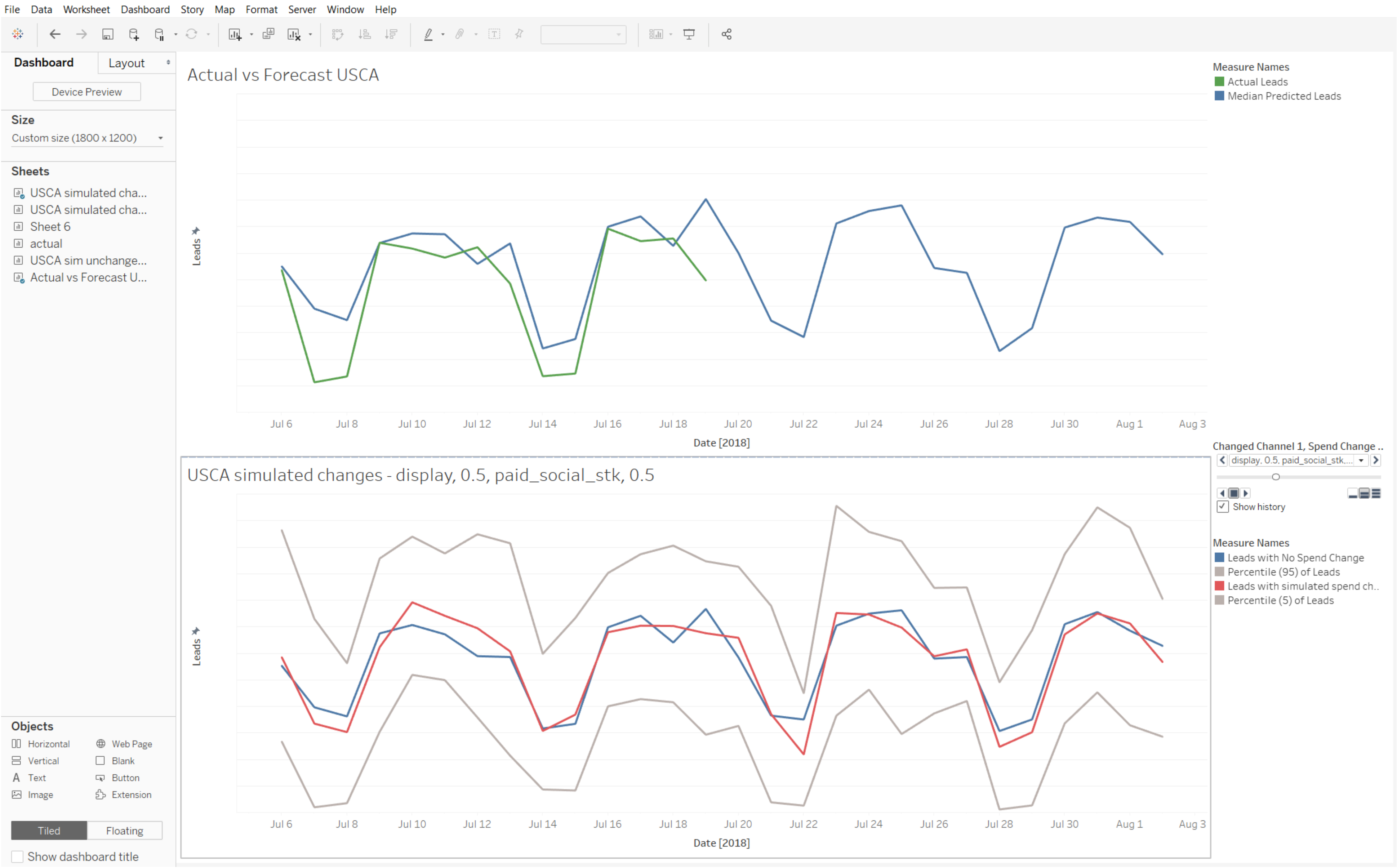

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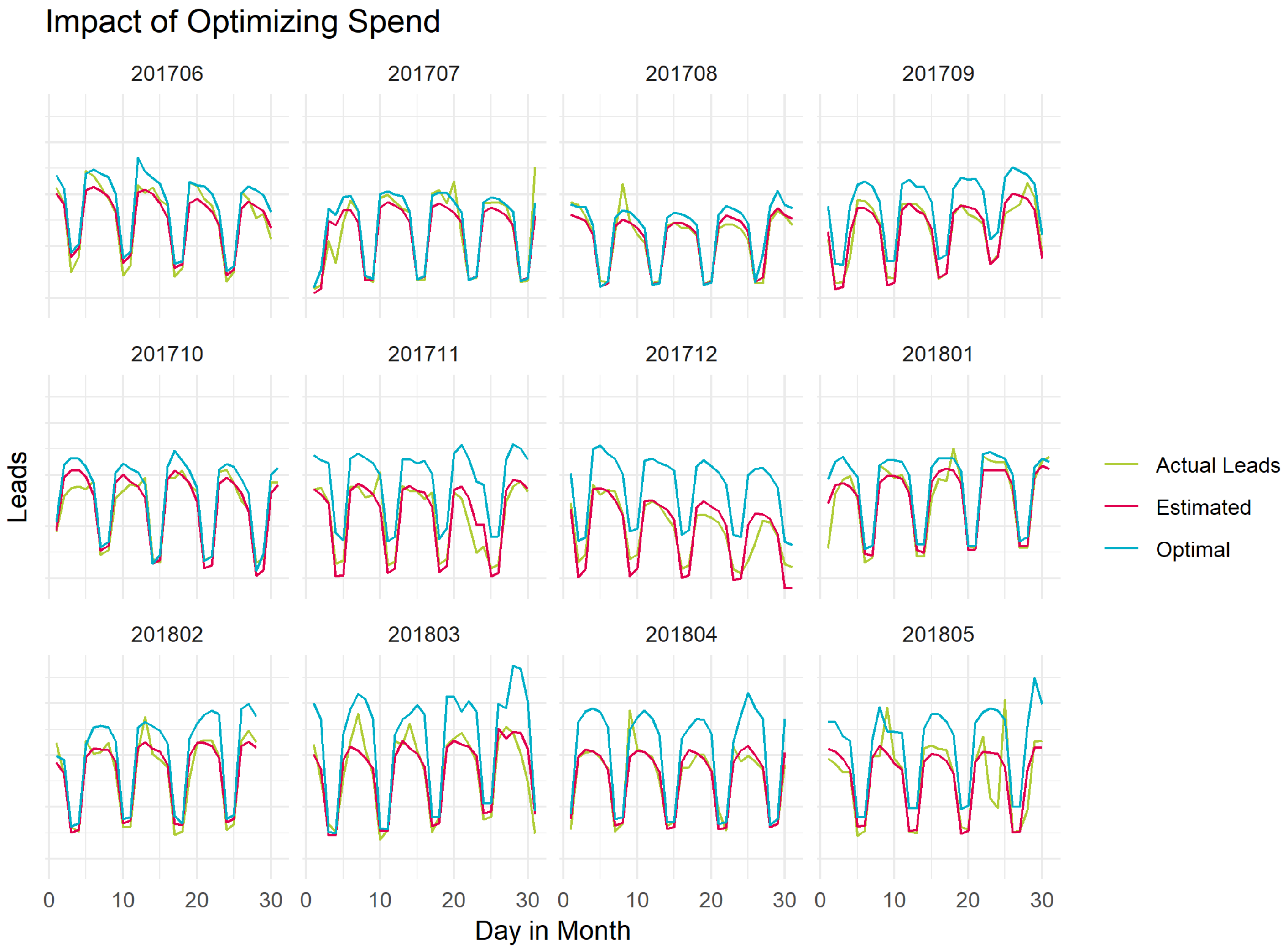
Using the Models



Optimizing Budget

- Model allows exploration of budgeting scenarios.
- Keeping same spend as currently could yield **30%** more leads total.

Measuring Efficiency

- Model shows us Paid Search incremental Cost-per-Lead (CPL) varies by **80%**.
- Most efficient incremental CPL at average spends can be **20x** more efficient than least efficient.

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