

A Reference Class Forecasting Approach for Pharmaceutical Launches

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KMK Consulting, Inc.

- Business Analytics firm Founded 2000
 - Staff of 80+ employees
 - Offices in Florham Park, NJ
- Business Analytics / Commercial Operations support for large, medium, small Pharma and BioTech

Marketing Sciences

- Marketing Analytic Support and reporting
- Promotion Response tracking and measurement
- Resource Optimization (Multi-Channel promotional mix modeling)
- In depth understanding of industry trends, data and analytical needs.
- Strategic consulting / Forecasting.
- Marketing KPI Dashboards
- Test/Control design for ROI analysis.

Sales Force Effectiveness

- Targeting / Call planning
- Sales force sizing, alignments
- People Mapping
- Vacant territory Analysis
- Incentive compensation design and implementation
- Sales contest tracking
- Sales dashboard analysis and reporting tools
- Sales Analytic Support

Payer/Provider Analytics

- Plan and payer level analytics incorporating formulary status
- Key Account Reporting, Dashboards
- Rebate/Discount Sensitivity Analysis (Contracting)
- Analysis of Claims Data (HEOR)
- Co-Pay Card Analytics
- Affiliation Mapping
- Group Practice analysis and reporting
- Key Account (Test/Control) Analytics



Information Management and Data Warehousing

- Private Cloud hosted in SAS70 certified type 2 secure data center.
- Data Warehouse Optimized for Analytics
- Information / Data Vendor Management

Different types of “Casts”

- Forecast : A Statement or estimate of future events based on
 - Some “Analysis” of past and present data.
 - “Personal” Observation/Experience.
- *Goalcast* (or Goal) : Stating that a particular observable and measureable outcome must be achieved within a certain time period, based on want.
- *Hopecast* : Stating that a particular outcome will occur based on hope.

Based on (human) internal expectations, pressures, or biases in a particular situation, it is not uncommon for one type of “cast” to look like another.

Reference Class Forecasting

- Introduced in 1979 by Daniel Kahneman and Amos Tversky
 - Based on Decisions made under uncertainty (Nobel Prize in Economics 2002).
 - Typical Forecasting takes an “Inside View” which tends to be over-optimistic and biased.
 - Reference Class takes the “Outside View”. “...frame the forecast problem so as to facilitate utilizing all the distributional information that is available.”
- Concept was further discussed in the Business Setting in 2003 by Dan Lovallo and Daniel Kahneman, and in 2008 by Bent Flyvbjerg.

Kahneman, D. and Tversky, A., 1979a, "Prospect theory: An analysis of decisions under risk." *Econometrica*, 47, pp 313-327

Kahneman, D. and Tversky, A., 1979b, "Intuitive Prediction: Biases and Corrective Procedures." In S. Makridakis and S. C. Wheelwright, Eds., *Studies in the Management Sciences: Forecasting*, 12 (Amsterdam: North Holland).

Lovallo, Dan and Daniel Kahneman, 2003, "Delusions of Success: How Optimism Undermines Executives' Decisions," *Harvard Business Review*, July, pp 56-63

Flyvbjerg, B., 2008, "Curbing Optimism Bias and Strategic Misrepresentation in Planning: Reference Class Forecasting in Practice." *European Planning Studies*, vol. 16, no. 1, pp. 3-21.

Pre-Launch and Early Launch Forecasting Challenges

- Pre-Launch (Product will be launching soon.)
- Early-Launch (Product has a few months of Actual data.)
- Questions
 - What will the first year's sales look like?
 - What will the next 5-10 year's sales look like?
 - What is the Peak share?
 - Are we properly resourced?

Focus for Today (Reference Class Forecasting for Pre-Launch and Early Launch)

- Pre-Launch (Product will be launching soon.)
- **Early-Launch (Product has a few months of Actual data.)**
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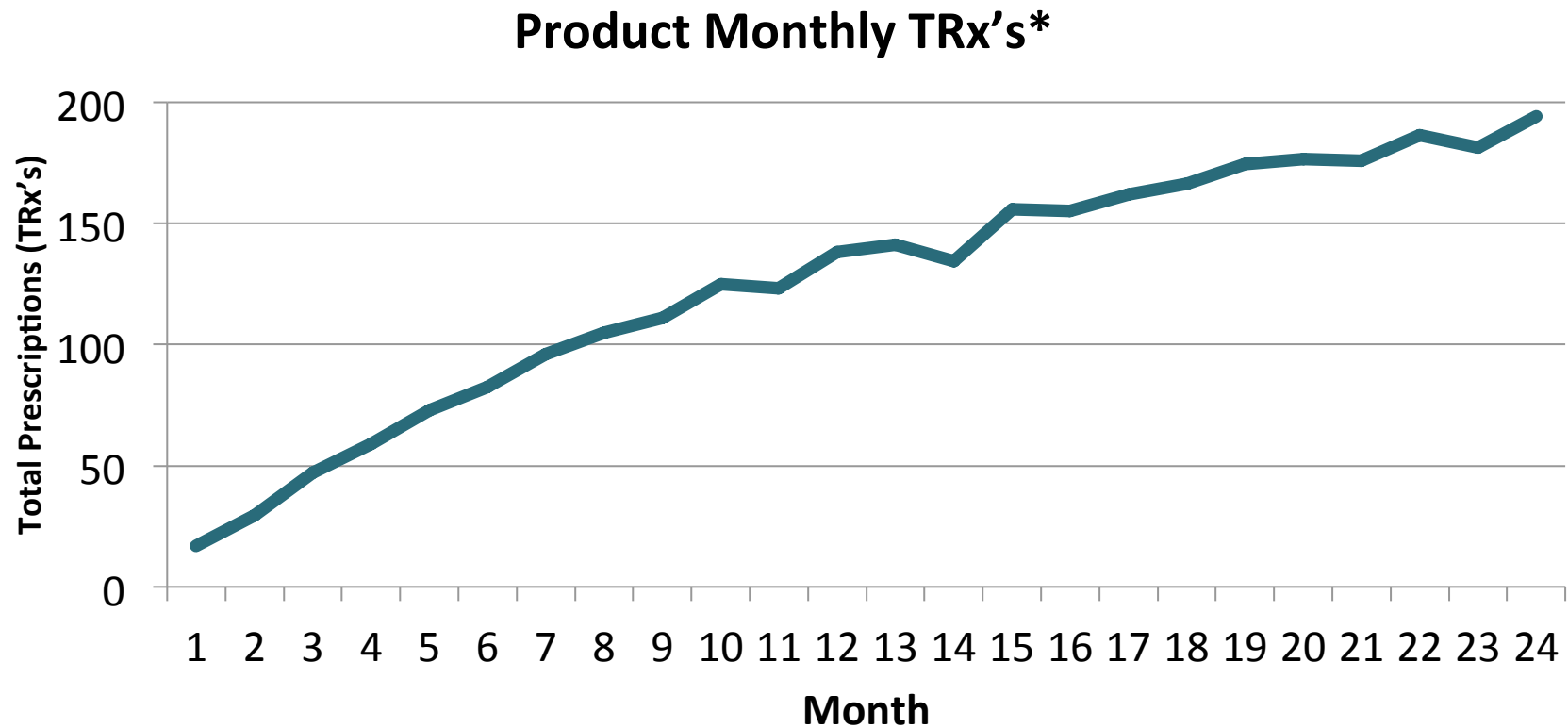


If the first year is way off, the next 5-10 and Peak share predictions Are pretty useless.

IMS Health : Top Provider of Prescription Data

- Total Prescriptions (TRx's)
- New Prescriptions (NRx's)
- Extended Units (Pills, Vials, etc...)
- Dollars
- Brands, Generics, Markets, Product Classes
- Specialties
- National, Physician, Payer/Provider Group Levels, etc..

Product Monthly Sales Example

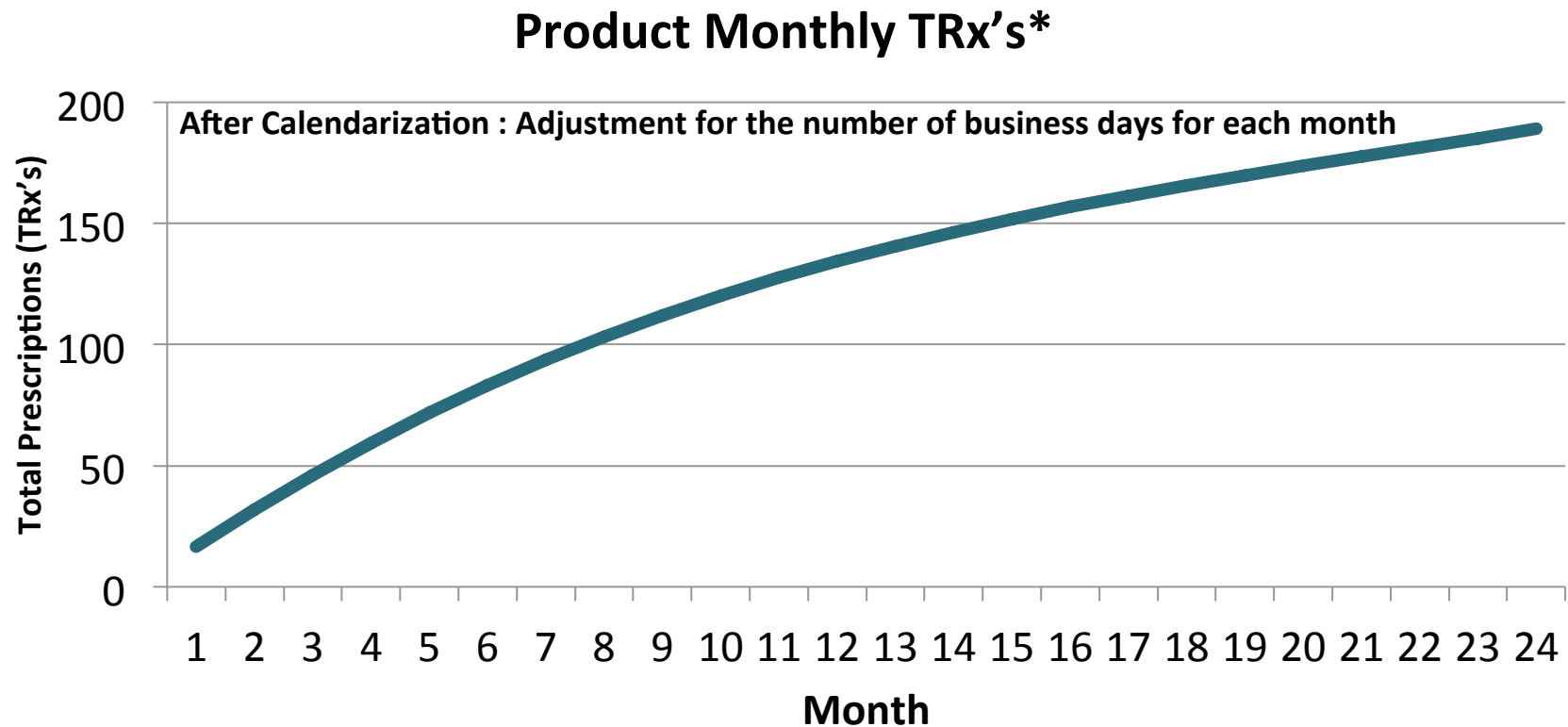


* Data Used for Example Only
Not Actual Rx Data

Calendarization of Monthly Sales

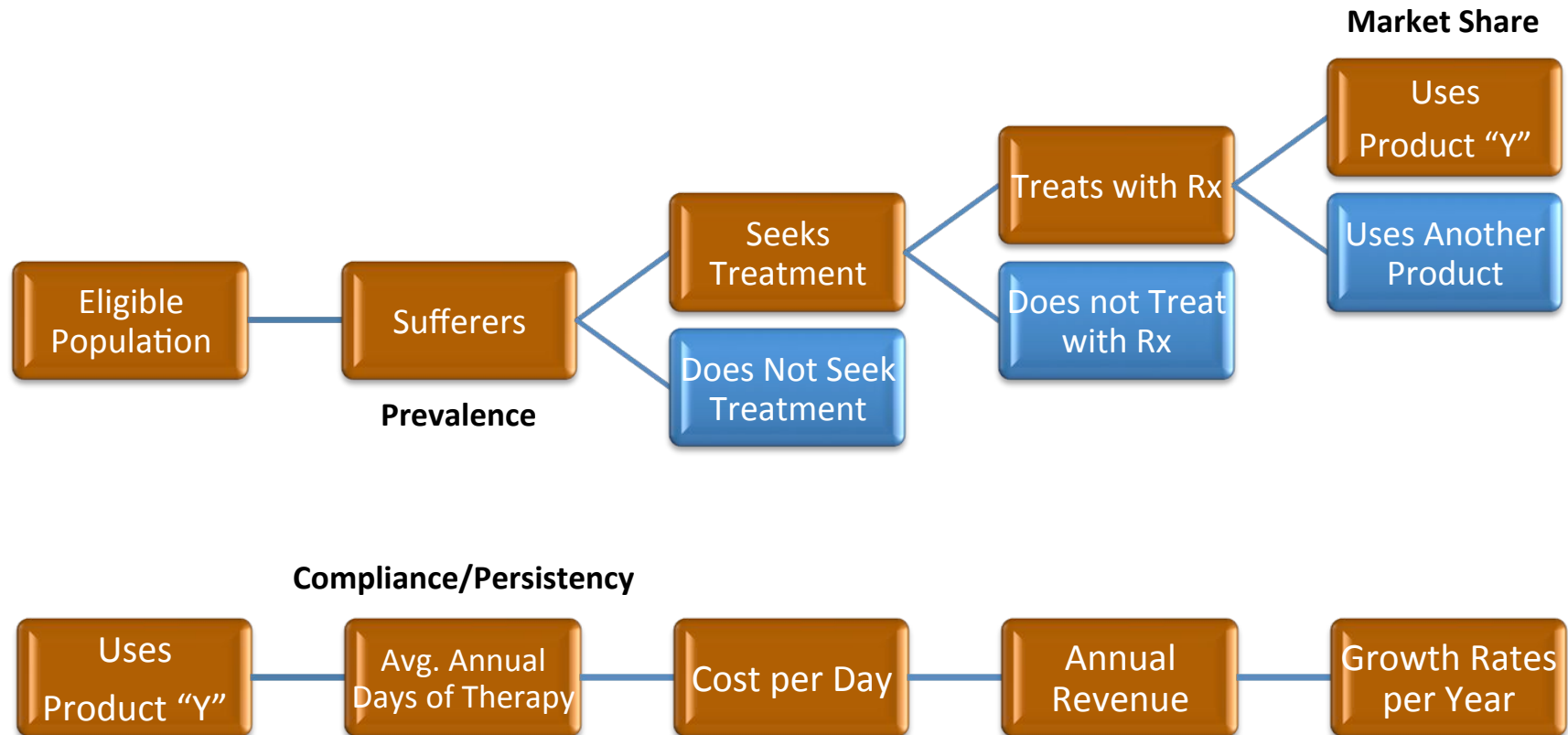
- Each Month's Sales have different number of
 - Days in Total
 - Weekdays
 - Holidays
 - Business Days (Normal, Light).
- Adjustments need to be made to Monthly data to make an “apples-to-apples” comparison.

Product Monthly Sales Example (Calendarized)



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Patient-Based Approach



PROS

- Basic Idea is easy to follow, seems intuitive
- Fits nicely in spreadsheets (Easy to update)

CONS

- Lots of assumptions
- Huge variability
- Less Reliable

A word about Growth Rates (Expecting x% growth each year)

- Linear Trends do not yield equal growth period-to-period unless growth is flat (i.e. 0).
 - Months 1,2,3,4,5 \longrightarrow 100, 200, 300, 400, 500 in Sales
 - Growth each period \longrightarrow 100%, 50%, 33%, 25%, etc...
 - Years 1,2,3,4,5 \longrightarrow 600, 630, 660, 690, 720 in Sales
 - Growth each period \longrightarrow 5.00%, 4.76%, 4.55%, 4.35%
- Expecting similar (positive) growth rates year to year requires
 - Positive exponential growth (upward bend from linear).

Analog Forecasting Approach in Pharma

- Usually refers to a particular brand or brands within the market that the product competes in.
- Product Y is the product of interest to forecast.
- Typically look at Product X_1 's and/or Product X_2 's Launch.

Reference Class (Pre-Launch/Early Launch)

- Similar conditions
- Product Launches into a market which has had safety concerns.
- Product Launches into a market where a product has been removed from the market.
- Product Launches into a market where the top product in the market has gone generic.
- Seriousness of the disease state (“Lifestyle” drug vs. Life-threatening condition).
- Increasing Market, Declining Market, Flat Market
- Heavy Direct to Consumer (DTC) TV Advertising Market
- Product is a combination product (i.e. mixture of at least two established compounds.)
- Product is a line extension (XR, SR, ER, LA, XL, etc...)

Reference Class (Pre-Launch) Continued

- Things to measure for a Pre-Launch Reference Class
 - What type of share did the (Reference Class) branded product launch attain?
 - Did that product mimic previous branded launches in that class?
 - What was the shape of this product's TRx's (uptake).
 - Linear? For how long?
 - Monotonic increasing concave?
 - Generalized Logistic? Bass Curve?
 - How did the competitors fare.
 - Did competitors do pre-emptive increased spending (samples, detailing, DTC).

Product Correlation Reference Class (Early Launch)

- For any early product launch “Y” (4+ months), first correlate these monthly observations with all the brand launches.
- For the brands with the highest correlations, trend out the expected path of product launch “Y”, using those correlated products.*

EXAMPLE (4 months of data)

- Your Product “Y” monthly TRX’s y_1, y_2, y_3, y_4
- Highly Correlated Product “X”, monthly TRX’s x_1, x_2, \dots, x_k
- $\tilde{y}_j = \text{trend}(y_2:y_4, x_2:x_4, x_j)$ $j=5, \dots, k$ (Months 2+ are “full months”)

Exclusions can be made on criteria that clearly falls outside the reference class
(e.g. Product is not seasonal, or product does not plan to do TV advertising.)

Archived Launch Data

IMS Health provides data time aligned from launch for a large number of brands for their product IMS New Product Spectra™.

IMS New Product Spectra

Forecasting New Product Performance

- 650+ Major Pharmaceutical Launches
- 10 New Launches in v. 12.1
- 30+ Therapy Areas
- 200+ Therapeutic Classes
- 25+ Quantitative Measures
- 26 Years of Launch Intelligence—1985 to March 2012
- 5 Data Levels: Product, Class, Molecule, Share of Class and Share of Molecule
- Monthly Data Tracked 5 Years Post-Launch
- Launches through December 2011
- Data through March 2012
- User-Friendly Software via IMS Customer Portal

Large database of Archived Brand Rx information from IMS Health which can be used as a Reference Class database source.

* Information provided by IMS Health

Correlated Reference Class Products Highest Correlations with Product "Y"

TRx's (000's)

P r o d u c t	M o n t h 1	M o n t h 2	M o n t h 3	M o n t h 4	M o n t h 5	M o n t h 6	M o n t h 7	M o n t h 8	M o n t h 9	M o n t h 10	M o n t h 11	M o n t h 12	M o n t h 13	M o n t h 14	M o n t h 15	M o n t h 16	M o n t h 17	M o n t h 18	M o n t h 19	M o n t h 20	M o n t h 21	M o n t h 22	M o n t h 23	M o n t h 24		
Y	2	8	16	27																						
X1	8	15	22	29	36	42	48	54	59	65	69	74	78	82	86	90	93	96	99	101	104	106	107	109		
X2	28	55	79	101	121	140	157	173	187	199	211	221	230	238	245	252	257	262	267	271	274	278	281	284		
X3	21	39	56	71	84	96	106	115	122	129	134	138	142	145	147	149	151	152	153	154	156	157	159	162		
X4	36	69	101	131	160	187	212	235	257	277	296	313	329	343	356	367	378	386	394	400	405	408	411	412		
X5	17	33	50	65	80	95	109	123	136	148	160	172	182	193	202	211	219	227	234	240	246	250	254	258		
X6	ALL OTHER HIGHLY CORRELATED BRANDS IN THE REFERENCE CLASS (TRANSLATED TO THE PRODUCT "Y" SCALE)																									

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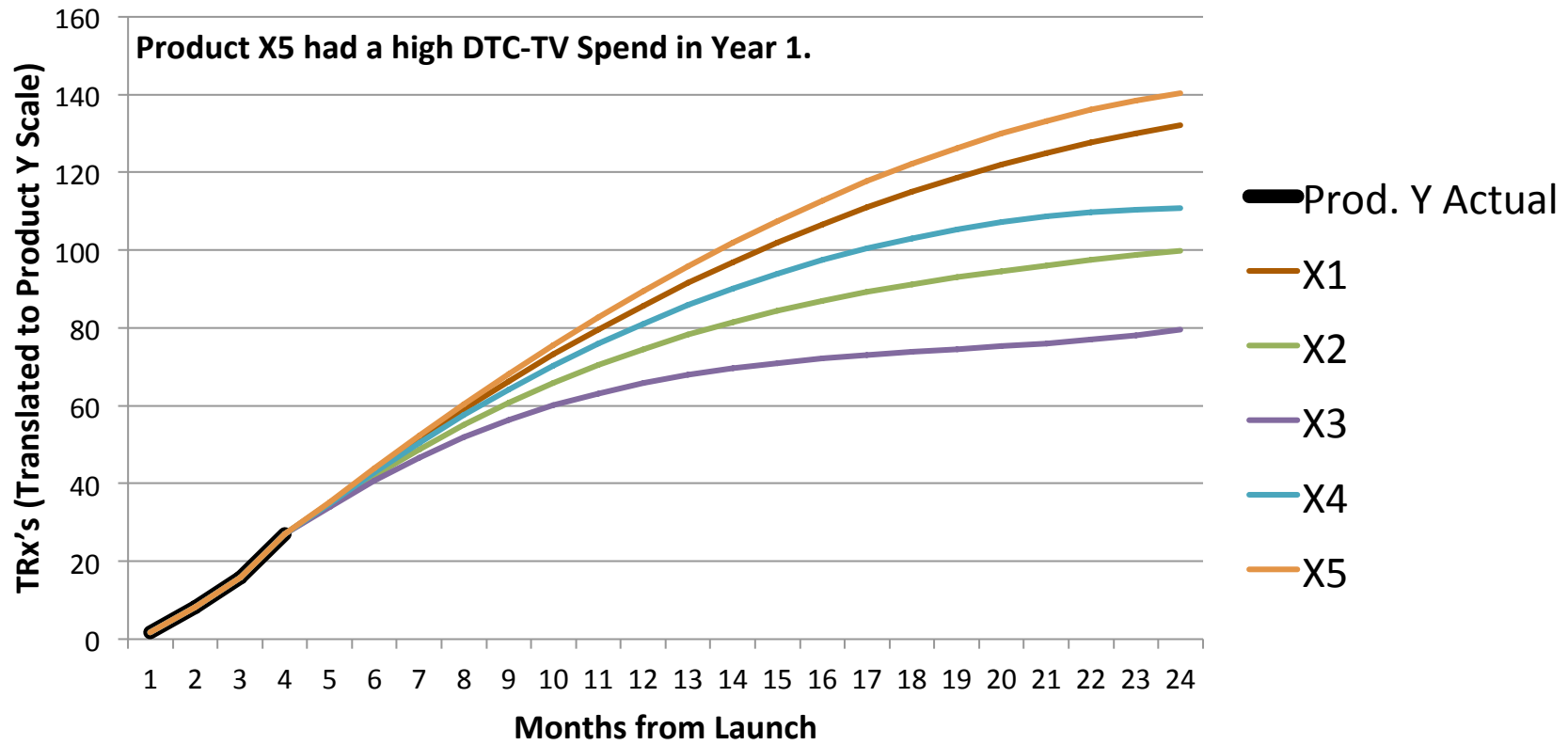
Correlated Reference Class Products Translated to the Product “Y” Scale

TRx's (000's)

P r o d u c t	M o n t h 1	M o n t h 2	M o n t h 3	M o n t h 4	M o n t h 5	M o n t h 6	M o n t h 7	M o n t h 8	M o n t h 9	M o n t h 0	M o n t h 1	M o n t h 2	M o n t h 3	M o n t h 4	M o n t h 5	M o n t h 6	M o n t h 7	M o n t h 8	M o n t h 9	M o n t h 0	M o n t h 1	M o n t h 2	M o n t h 3	M o n t h 4	
Y	2	8	16	27																					
X1					35	43	51	59	66	73	80	86	92	97	102	107	111	115	119	122	125	128	130	132	
X2					34	42	49	55	61	66	70	75	78	81	84	87	89	91	93	95	96	97	99	100	
X3					34	41	47	52	56	60	63	66	68	70	71	72	73	74	75	75	76	77	78	80	
X4					35	43	50	58	64	70	76	81	86	90	94	97	100	103	105	107	109	110	110	111	
X5					35	44	52	60	68	76	83	89	96	102	107	113	118	122	126	130	133	136	138	140	
X6	ALL OTHER HIGHLY CORRELATED BRANDS IN THE REFERENCE CLASS (TRANSLATED TO THE PRODUCT “Y” SCALE)																								

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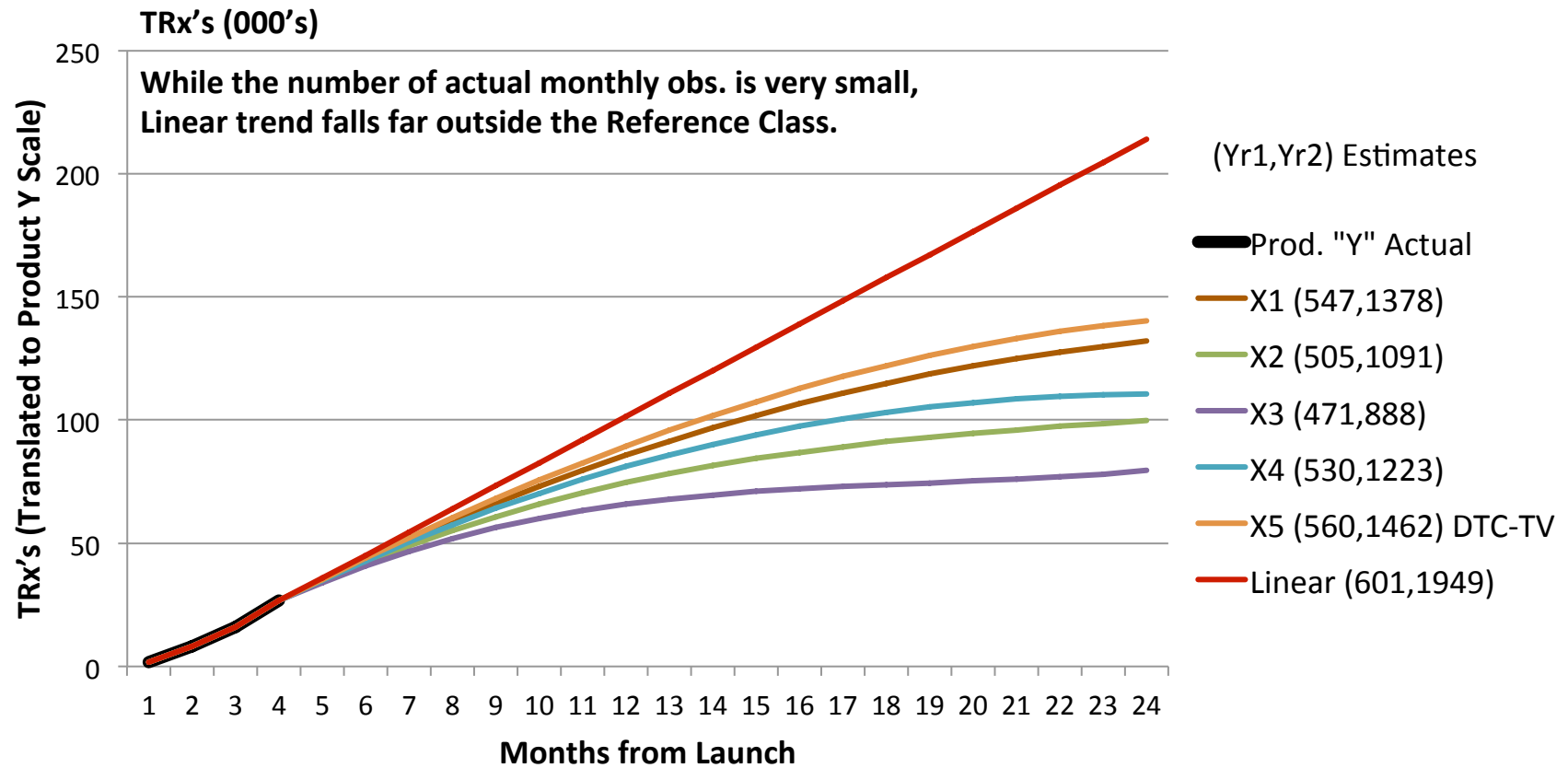
Example of Correlation Reference Class



X1-X5 ∈ "Correlation" Reference Class

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Example of Correlation Reference Class



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Correlation Reference Class

- As more points become available the Reference class upper and lower trajectories become a bit tighter.
- Usually performs better than curve fitting (linear, log, log-linear, power functions) and time-series models.
- Outperforms Patient-Based Approach.

Promotional “Audits”

- There is also third party (estimated) information on Brand Spending
 - Sales Force Spending
 - Contacts, Details
 - Sampling
 - Direct to Consumer Spending
 - Advertising Dollars
- Data Providers : IMS Health, Encuity Research (SDI data)

Use of Promotional Audit Data

- Sales Force Resourcing
 - What was the detailing effort as a function of their overall sales?
- Direct to Consumer TV Advertising.
 - Did any of the particular brands have a strong DTC-TV effort.
 - Did they have 100% DTC share of voice?

Impacts of Under and Over Forecasting

- Over-Forecasting
 - Brand and sales teams feel they're underperforming
 - Constant feeling of urgency (Lots of fire-drills).
 - Sales Goals are not met. Sales Associates have lower payout on their Incentive Plan.
 - Danger of people doing just enough to look busy.
 - Possible over-supply of product. Idle staff at manufacturing plants expecting high demand.
- Under-Forecasting
 - Brand and sales teams feel very confident.
 - Tendency to pull back effort.
 - Sales Goals are exceeded. Associates possibly getting "over-paid".
 - Possible product shortages due to poorly forecasted demand.
 - Overtime hours at manufacturing plants.

Reference Classes for Key Events

- Large DTC-TV campaigns.
- Generic Erosion (Percent erosion months 1-6).
- Product or Class impacts to key label changes
 - Warnings, Precautions
 - New Indications.
- Positive/Negative study results.

Common Critique of the Reference Class or even simple Product Analog Approach

“Those Products
have nothing to
do with us.”

“I used to work on that
Brand Analog you’re using.
I can tell you from first-
hand experience that we
did things very differently
back then. “

“The environment is
completely different
today. You can’t apply
previous results for any
product.”

“We have a much stronger
team today and that collective
experience is a factor you’re
not considering”.

“You can’t compare our
company to those other
company launches.
They’re not known for this
disease state.”

“Digital media was not as
advanced as it is today. On
the TV side, more households
have cable. There are a lot
more patients getting
information about these
products.”

Summary

- Reference Class Forecasting has been shown in many settings to be much more accurate than other “Inside View” Approaches.
- However its general adoption is not as common as one would expect.
- Gaining experience with reference class approaches that work makes one a much better forecaster (though not everyone might be excited to hear your “Outside View”).