

Ask the Expert

Boosting Retail & CPG Profits: Are Your Promotions Optimized?

Arpit Jain, Senior Pre-Sales Solutions Architect





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Arpit Jain is a data scientist and customer adviser for commercial industries including CPG and retail. He has extensive experience in the development and implementation of advanced analytics solutions across different industries and provides subject matter expertise on supply chain topics such as demand forecasting, promotion analytics and optimization, and pricing optimization at SAS. Prior to joining SAS, Arpit worked as a demand analyst at Nestle, where he built statistical demand forecasting and promotion optimization solutions using SAS[®] technology.

Promotion Analytics

Understand, Optimize & Enhance the impact of Promotions

Arpit Jain



What is Promo Analytics for?

Business department

Commercial

Supply chain

Operations

Marketing

Development

Main processes

- Financial & assortment planning
- Pricing strategy
- Promo planning
- Supplier's negotiations
- Demand forecasting
- Inventory planning
- Operations planning
- Workforce management
- Attraction of new consumers
- Prevent current consumers from leaving
- New stores opening
- New product launches

Examples of needs

- Assortment is not effective comparing to market
- Not optimal prices reduce margin and traffic
- Measure of true promo effectiveness
- Promo effectiveness is decreasing
- Best promo assortment formation
- Promo inventory level is too high
- High amount of out-of-stock of promo products
- Regular inventory level is too high
- High amount of out-of-stock of regular products
- Low in-store service level
- Promo effectiveness is decreasing
- Current consumers are leaving
- New stores can't reach the required KPI

Data Requirements

Data Requirements

Product Master

- Product Key / EAN
- Category
- Product description
- Manufacturer
- Brand
- Flavor
- Volume
- Product Group

Store Master

- Store ID
- Market
- Store size
- Store address
- Store demographics
- Promotion Zone
- Retail competition

Sales Transaction

- Product Key
- Store ID
- Day / Week Key
- Event ID
- Unit Sales
- Price
- Discount

Causal Factors

- Product Key
- Store ID
- Day / Week Key
- Event ID
- Promotion Price
- Promotion Type
- Feature Type
- Display Type

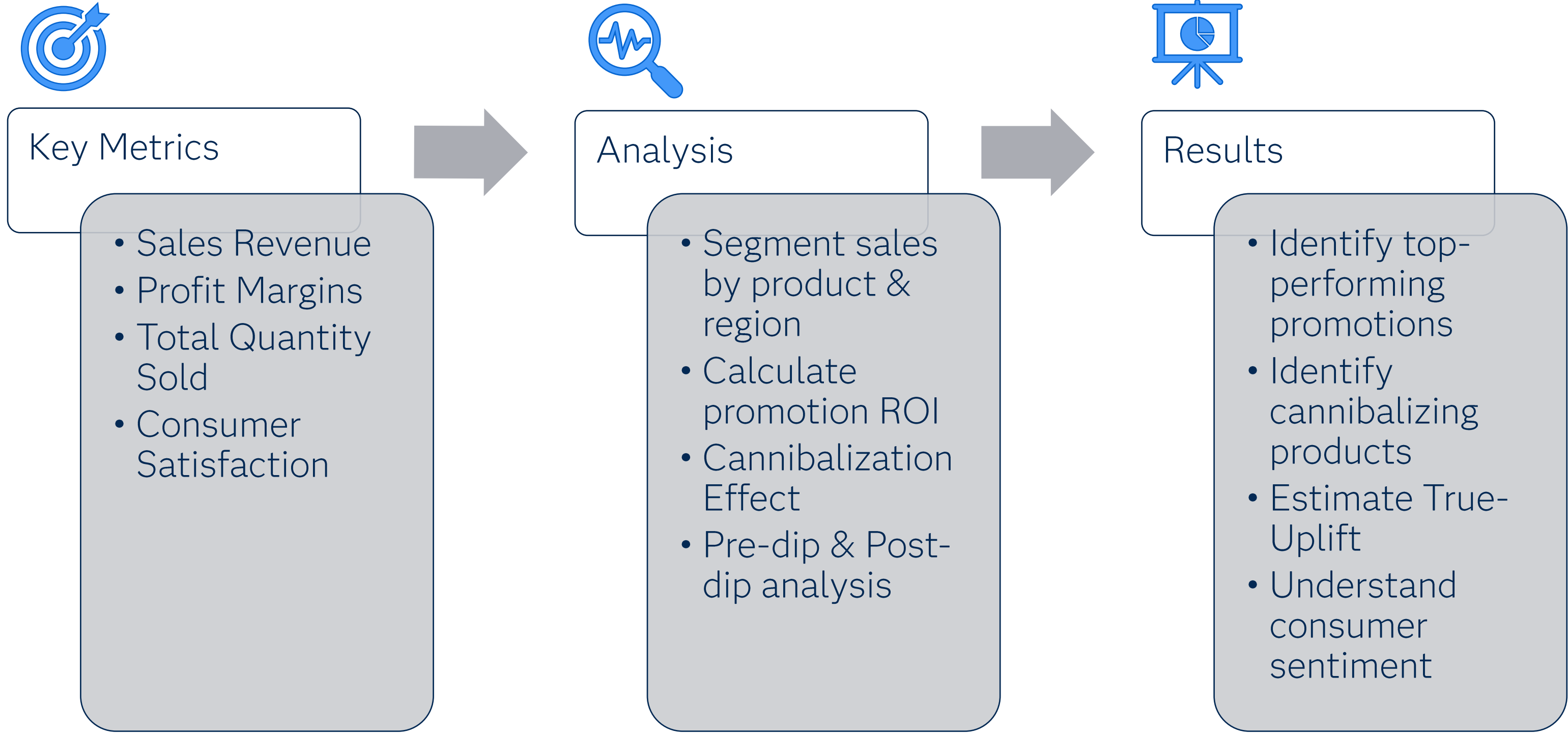
Finance Data

- Product Key
- Day / Week Key
- Event ID
- Cost of Promotions
- COGS

Post-Promotion Analytics

Understanding the effectiveness of recent promotions

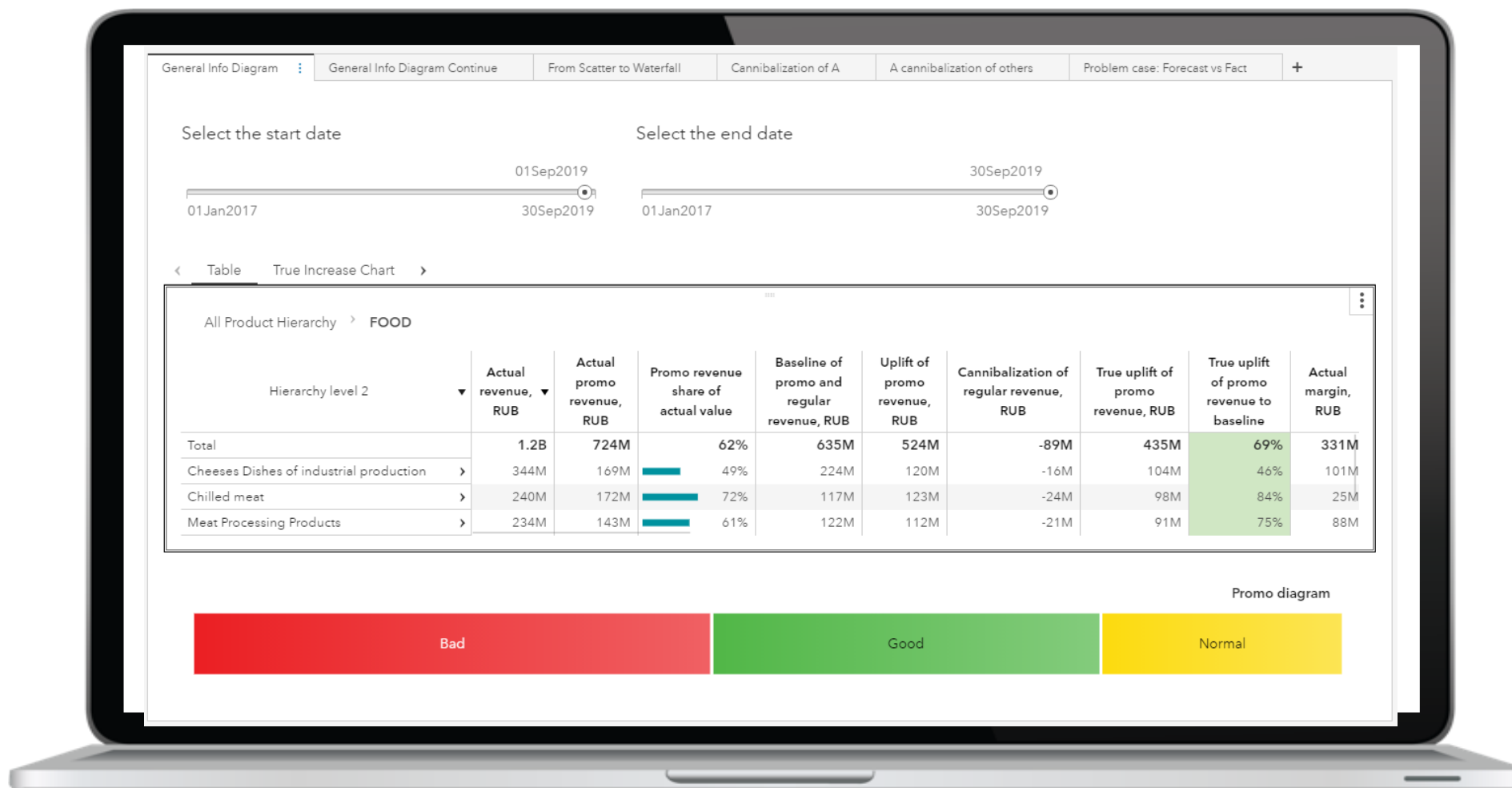
Post-Promo Analytics



Post-Promo Analytics

Understanding the effectiveness of recent promotions

Demonstration



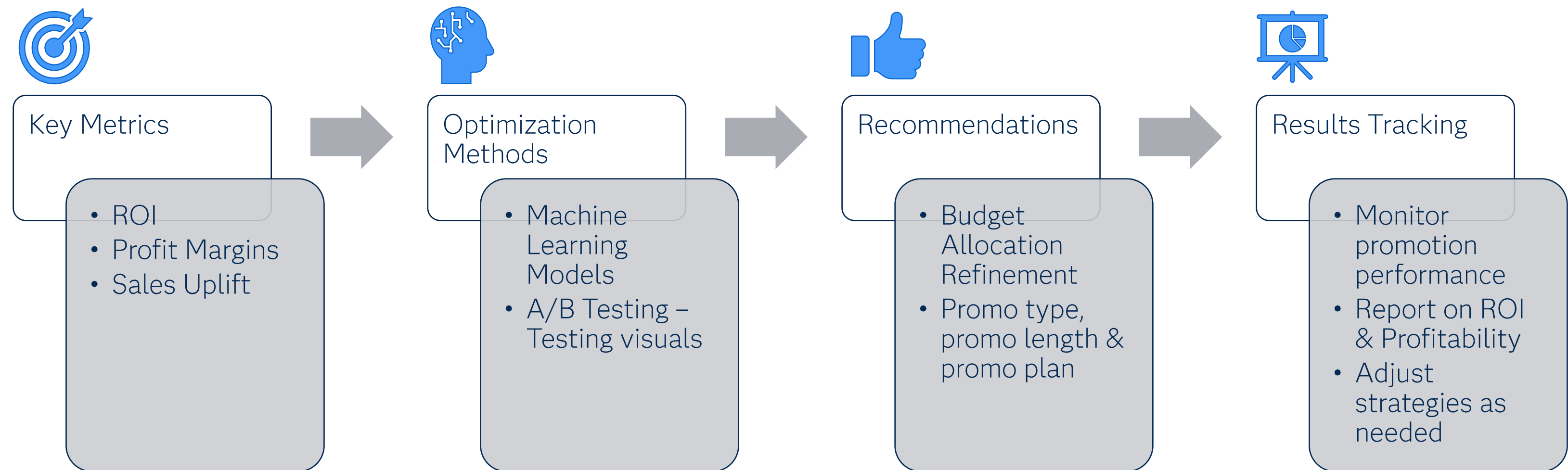
SAS Visual Analytics

Promotion Optimization

Maximize the impact and efficiency of promotions

Promotion Optimization

Maximize the impact and efficiency of promotions



Promotion Optimization

Calculate cross-elasticities between products

Cross-Elasticity: Impact of promotion of one product on the sales of another product.

| | | Juice DOBRY Apple t/pack. 1L | from a mixture of fruits t/pack. 1L | Tomato juice with salt t/pack. 1L | Juice RICH Orange t/pack. 1L | RICH Exotic with/to t/pack. 1L | Juice DOBRY Apple t/pack. 2L | Nectar DOBRY Multifruit t/pack. 2L | Nectar DOBRY Orange t/pack. 2L | children from 3 years old t/pack. 2L |
|----|---|------------------------------|-------------------------------------|-----------------------------------|------------------------------|--------------------------------|------------------------------|------------------------------------|--------------------------------|--------------------------------------|
| 1 | | | | | | | | | | |
| 2 | id | 1604 | 1606 | 3289 | 13032 | 13034 | 28733 | 28734 | 28756 | 29038 |
| 3 | Juice DOBRY Apple t/pack. 1L | 1604 | -4,91469 | 0 | 0 | 0,048177 | 0 | 0 | 1,271965 | 0 |
| 4 | Nectar DOBRY Multifruit from a mixture of fruits | 1606 | 0 | -6,27866 | 0,652981 | 0 | 0 | 0 | 1,080248 | 0 |
| 5 | DOBRY Tomato juice with salt t/pack. 1L | 3289 | 0 | 0 | -4,98708 | 0 | 0 | 0 | 0,923887 | 0 |
| 6 | Juice RICH Orange t/pack. 1L | 13032 | 0 | 0 | 0 | -3,91535 | 0 | 0 | 0,153261 | 0 |
| 7 | Juice RICH Exotic with/to t/pack. 1L | 13034 | 0,024318 | 0 | 0,131832 | 0 | -5,56941 | 0 | 0,10591 | 0 |
| 8 | Juice DOBRY Apple t/pack. 2L | 28733 | 0,016456 | 0 | 0 | 0 | 0 | -5,04456 | 0 | 0 |
| 9 | Nectar DOBRY Multifruit t/pack. 2L | 28734 | 0 | 0 | 0 | 0,084975 | 0 | 0 | -5,39928 | 0 |
| 10 | Nectar DOBRY Orange t/pack. 2L | 28756 | 0 | 0 | 0 | 0,280095 | 0 | 0 | 0 | -5,12235 |
| 11 | Dobry Tomato juice with salt and pulp. restore h | 29038 | 0,048291 | 0,034997 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | Juice RICH Apple light. t/pack 1L | 42970 | 0 | 0 | 0 | 0 | 0 | 0 | 0,058081 | 0 |
| 13 | Juice Ya Orange with pulp. d/d.p. from 3 years o | 49673 | 0,389203 | 0,037948 | 0 | 0 | 0,201804 | 0,143552 | 0 | 0 |
| 14 | Juice I Apple light. restore d/d.p. from 3 years t/ | 49675 | 0 | 0,077048 | 0 | 0 | 1,206878 | 0 | 0,076053 | 0,137983 |
| 15 | Juice Ya Grapefruit with pulp. d/d.p. from 3 year | 49676 | 0 | 0 | 0 | 0,183196 | 0 | 0,12396 | 0 | 0,357863 |
| 16 | Nectar I am Cherry Light. t/pack 0.97L | 49677 | 0 | 0,384584 | 0 | 0 | 0,074817 | 0 | 0,376241 | 0,041053 |
| 17 | Nectar XXX XXX Orange t/pack. 0.95L | 50749 | 0,201247 | 0 | 0 | 0 | 0 | 0 | 0,114816 | 0 |
| 18 | Nectar XXX XXX Apple t/pack. 0.95L | 50750 | 0,185245 | 0 | 0 | 0 | 0,053552 | 0 | 0,145995 | 0 |
| 19 | Nectar DOBRY Pineapple t/pack. 2L | 59017 | 0 | 0 | 0 | 0,018189 | 0 | 0 | 0 | 0 |
| 20 | RICH Tomato juice with salt reduced. t/pack 1L | 62481 | 0,000694 | 0 | 0 | 0,35232 | 0 | 0 | 0 | 0,280626 |



Promotion Optimization

Optimal promo discounts, optimal SKUs mix

| | | | | | | MAPE | 27% | | | | | | | Fcst, opt. discounts | Opt vs. actuals | Opt vs fcst | KPI not less | Recommended to delist |
|----------|---|--------------|-------------|----------------|------------|----------------------------------|-----|------------------------------------|---------------------------------|--------------|-------------------------|-----------------|---------------|-----------------------|-----------------|-------------|--------------|-----------------------|
| | | | | | | WMAPE (by revenue) | 25% | | | | | | | 19.628 | -13% | 0% | | 0 |
| | | | | | | WMAPE (by margin) | 26% | | | | | | | 1.431.779 | -8% | 0% | 1.800.000 | 0% |
| | | | | | | TOTAL APE | 13% | | | | | | | 523.117 | -9% | 0% | | |
| | | | | | | Model parameters | | | | | Optimization parameters | | | | | | | |
| SKU code | SKU Name | Revenue, RUB | Margin, RUB | Num. of stores | Reg. price | Fcst Units with actual discounts | APE | Fcst Revenue with actual discounts | Fcst Margin with opt. discounts | Min discount | Max discount | Actual discount | Opt. discount | Recommended to delist | | | | |
| 1604 | Juice DOBROY Apple t/pack. (XX) 1L | 62.860 | 23.365 | 52 | 101 | 279 | 70% | 28.096 | 16.183 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 1606 | Nectar GOOD Multifruit from a mixture of fruits t / p | 25.891 | 10.695 | 52 | 100 | 463 | 22% | 31.431 | 12.965 | 0,00 | 0,40 | 0,32 | 0,32 | 0 | | | | |
| 3289 | Juice DOBROY Tomato with salt t/pack. (XX) 1L | 47.561 | 17.652 | 52 | 101 | 691 | 1% | 46.899 | 17.256 | 0,00 | 0,40 | 0,33 | 0,33 | 0 | | | | |
| 13032 | Juice RICH Orange t/pack. (XX) 1L | 11.809 | 6.879 | 52 | 132 | 83 | 7% | 10.932 | 5.637 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 13034 | Juice RICH Exotic with / to t / pack. (XX) 1L | 3.429 | 2.101 | 52 | 147 | 29 | 28% | 4.304 | 2.612 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 28733 | Juice DOBROY Apple t/pack. (XX) 2L | 36.526 | 19.048 | 52 | 181 | 128 | 39% | 23.186 | 12.515 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 28734 | Nectar GOOD Multifruit t / pack. (XX) 2L | 19.301 | 10.531 | 52 | 186 | 66 | 40% | 12.342 | 7.114 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 28756 | Nectar GOOD Orange t/pack. (XX) 2L | 17.912 | 9.503 | 52 | 185 | 65 | 35% | 12.107 | 6.601 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 29038 | Juice GOOD Tomato with salt with pulp. restore hom | 10.989 | 5.891 | 50 | 185 | 42 | 33% | 7.752 | 4.359 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 42970 | Juice RICH Apple light. t/pack (XX) 1L | 17.888 | 10.682 | 52 | 143 | 71 | 42% | 10.101 | 5.957 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 49673 | Juice Ya Orange with pulp. d/d.p. from 3 years restor | 21.398 | 6.380 | 52 | 149 | 356 | 49% | 32.015 | 9.635 | 0,00 | 0,40 | 0,40 | 0,40 | 0 | | | | |
| 49675 | Juice I Applelight. restore d/d.p. from 3 years old t / | 23.679 | 7.816 | 49 | 143 | 244 | 20% | 21.898 | 7.244 | 0,00 | 0,40 | 0,37 | 0,37 | 0 | | | | |
| 49676 | Juice I Grapefruit with pulp. d/d.p. from 3 years resto | 16.747 | 5.275 | 49 | 143 | 241 | 29% | 21.653 | 6.718 | 0,00 | 0,40 | 0,37 | 0,37 | 0 | | | | |
| 49677 | Nectar I Cherry light. t/pack (XX) 0.97L | 23.864 | 6.954 | 47 | 139 | 440 | 57% | 37.085 | 9.468 | 0,00 | 0,40 | 0,39 | 0,39 | 0 | | | | |
| 50749 | Nectar XXX XXX Orange t/pack. (XX) 0.95L | 2.139 | 717 | 44 | 34 | 66 | 5% | 2.234 | 747 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 50750 | Nectar XXX XXX Apple t/pack. (XX) 0.95L | 6.161 | 2.055 | 39 | 34 | 94 | 48% | 3.192 | 1.071 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 59017 | Nectar GOOD Pineapple t / pack. (XX) 2L | 8.575 | 4.525 | 52 | 185 | 34 | 32% | 6.242 | 3.508 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 62481 | Juice RICH Tomato with salt recon. t/pack (XX) 1L | 7.402 | 4.435 | 52 | 145 | 50 | 2% | 7.240 | 4.333 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 64638 | Juice DOBROY Apple t/pack. (XX) 0.2L | 5.647 | 3.036 | 49 | 29 | 175 | 12% | 5.152 | 2.850 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 67094 | Nectar FRUIT GARDEN Orange with pulp. d/d.p. t/pac | 70.761 | 18.160 | 51 | 173 | 910 | 10% | 81.792 | 21.248 | 0,00 | 0,50 | 0,48 | 0,48 | 0 | | | | |
| 67095 | Nectar FRUIT GARDEN Peach-apple with pulp. d/d.p. t | 58.539 | 15.417 | 51 | 173 | 434 | 33% | 39.023 | 10.089 | 0,00 | 0,50 | 0,48 | 0,48 | 0 | | | | |
| 67096 | Nectar FRUIT GARDEN Multifruit with pulp d/d.p. t/pa | 61.904 | 16.205 | 52 | 176 | 643 | 6% | 57.831 | 14.910 | 0,00 | 0,50 | 0,49 | 0,49 | 0 | | | | |
| 77894 | Juice SADY PRIDONIA Apple direct extraction t/pak. (| 12.486 | 8.254 | 52 | 93 | 151 | 13% | 14.089 | 9.312 | 0,00 | 0,00 | 0,00 | 0,00 | 0 | | | | |
| 92181 | Nectar J-7 Peach with soft t/pack (XX) 0.97L | 11.683 | 4.442 | 52 | 135 | 170 | 18% | 13.604 | 5.041 | 0,00 | 0,50 | 0,41 | 0,41 | 0 | | | | |
| 92182 | Juice J-7 Apple Clarified d/d.p. t/pack (XX) 0.97L | 30.574 | 11.327 | 52 | 135 | 385 | 1% | 30.795 | 11.271 | 0,00 | 0,50 | 0,41 | 0,41 | 0 | | | | |
| 92183 | Juice J-7 Orange with pulp. d/d.p. t/pack (XX) 0.97L | 26.600 | 8.862 | 52 | 135 | 389 | 17% | 31.090 | 10.299 | 0,00 | 0,50 | 0,41 | 0,41 | 0 | | | | |
| 92185 | Nectar J-7 Pineapple with soft. t/pack (XX) 0.97L | 15.773 | 5.687 | 52 | 135 | 304 | 54% | 24.271 | 8.716 | 0,00 | 0,50 | 0,41 | 0,41 | 0 | | | | |

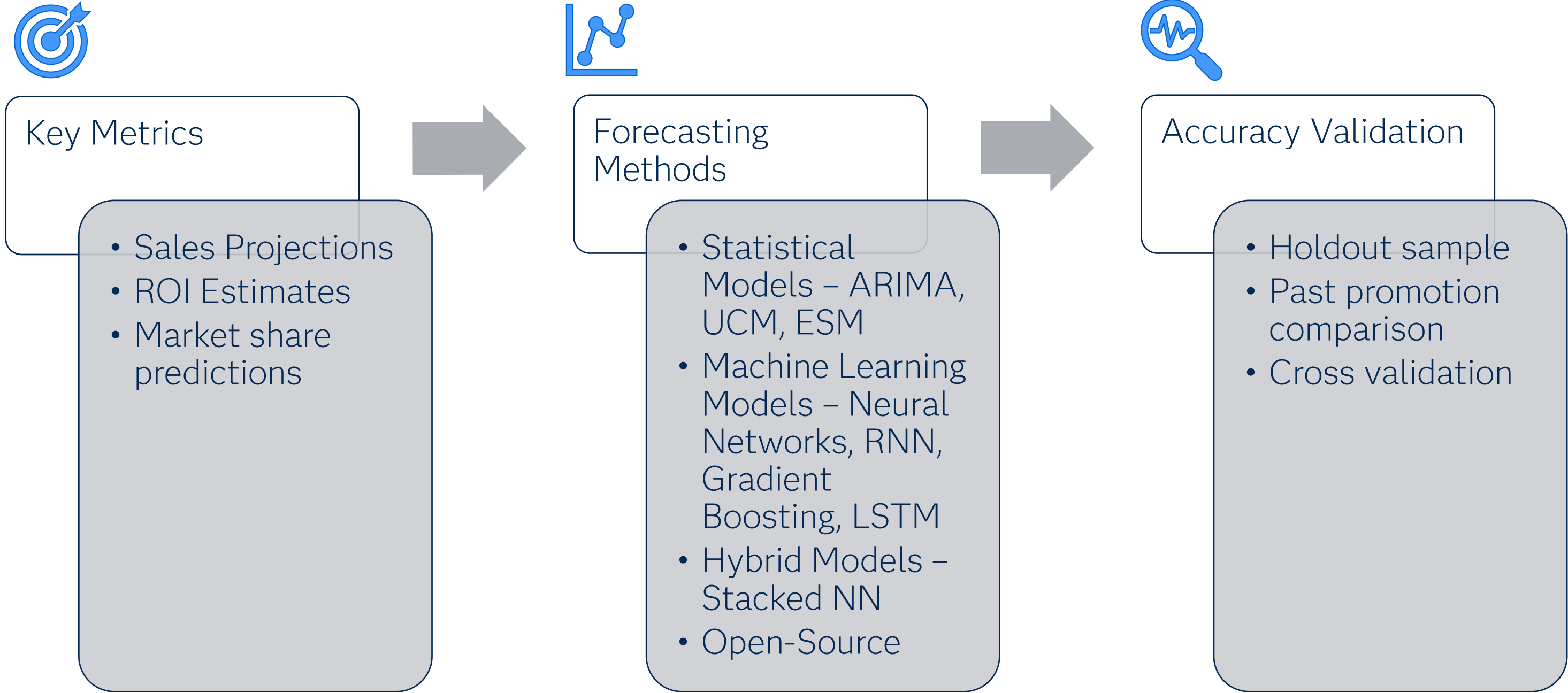


Promotion Forecasting

Predicting the impact of upcoming Promotions

Promotion Forecasting

Predicting the impact of upcoming Promotions



Promotion Forecasting

Clean data

Typical cleansing steps

1. Detect outliers in sales, inventory, prices, etc.
2. Imputing missing data
3. Out-of-stock detection
4. Product listing/delisting mapping (same SKU but with different ID)
5. Promo extension detection

| 33337 | |
|------------|-----|
| 09.02.2018 | 12 |
| 23.03.2018 | 15 |
| 15.06.2018 | 5 |
| 06.07.2018 | 5 |
| 17.08.2018 | 1 |
| 28.09.2018 | 6 |
| 19.10.2018 | 327 |
| 30.11.2018 | 14 |
| 18.01.2019 | 18 |
| 08.02.2019 | 3 |

| 33804 | |
|------------|-----|
| 15.06.2018 | 1 |
| 06.07.2018 | 0 |
| 17.08.2018 | 2 |
| 07.09.2018 | 0 |
| 19.10.2018 | 610 |
| 09.11.2018 | 0 |
| 30.11.2018 | 0 |
| 18.01.2019 | 0 |
| 08.02.2019 | 1 |

| Campaign | Code | Page | Key Section |
|----------|-------|------|-------------|
| 201508 | 23296 | 2 | |
| 201508 | 30717 | 2 | |
| 201508 | 23346 | 2 | |
| 201508 | 28273 | 3 | |
| 201508 | 31830 | 5 | PLT |
| 201508 | 31831 | 5 | PLT |

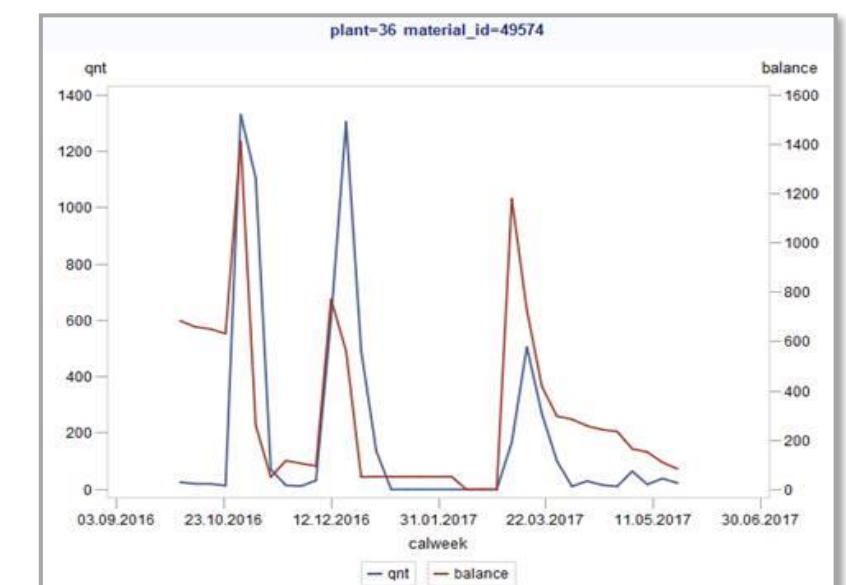
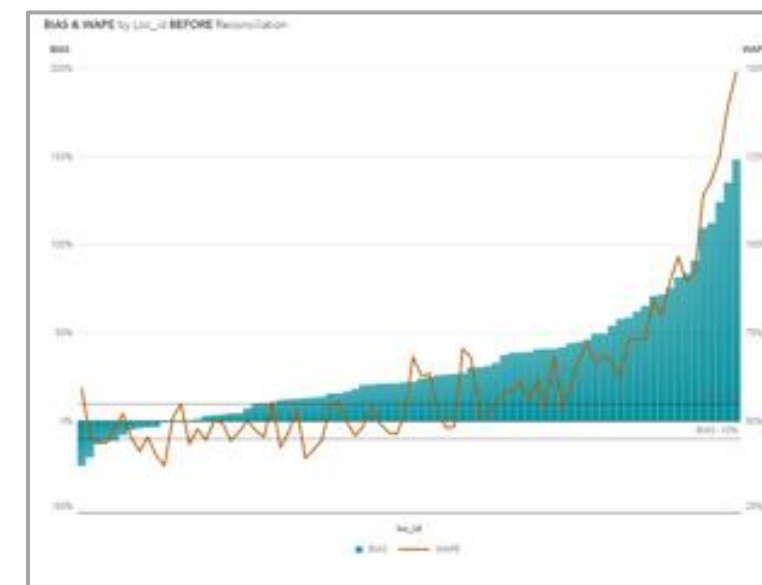
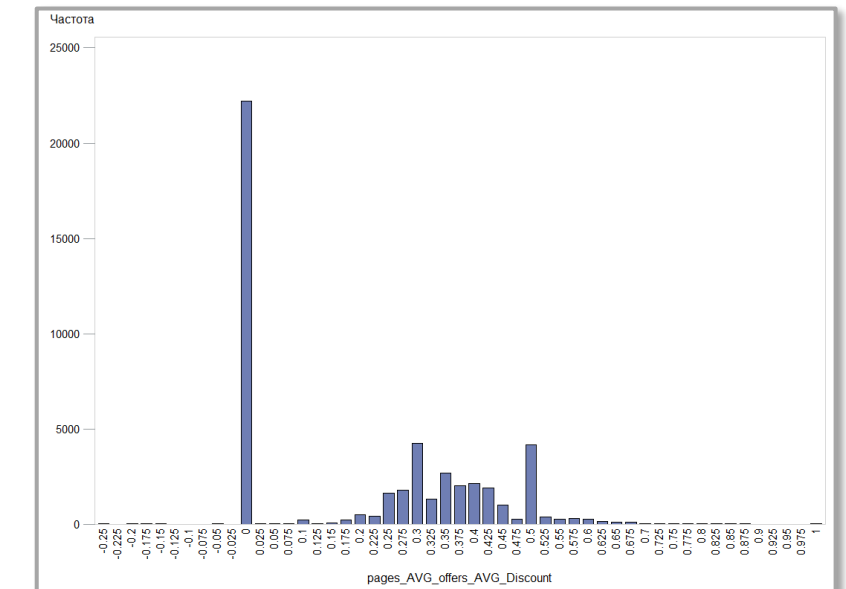
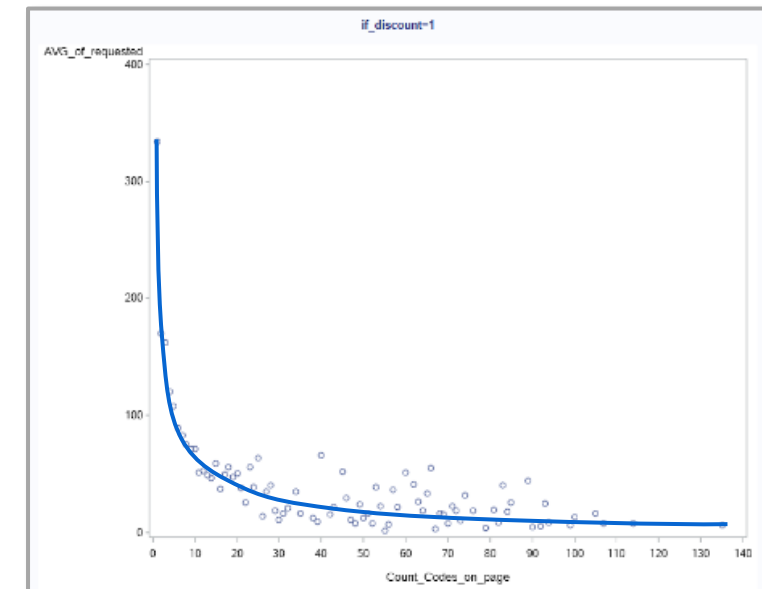
| | Brand | COUNT_of_Code |
|----|-------------------------------------|---------------|
| 1 | Activelle | 377 |
| 2 | Amber Elixir | 124 |
| 8 | Bioclinic | 77 |
| 9 | Born To Fly | 24 |
| 10 | Colourbox | 2094 |
| 11 | DO NOT USE (EXPIRED) SunMoonEclipse | 1 |

Promotion Forecasting

Explore data

Typical data to explore

1. Category trend-seasonality
2. Products classification high sales/low sales, new/old
3. Insights search
4. Price elasticity estimation
5. Features correlation estimation



Promotion Forecasting

Datamart & Forecasting Models – Statistical & Machine Learning

Basic Datamart:

- Sales lags for “forecasting horizon”, month, quarter, half-a-year, year
- Sales percentiles for “forecasting horizon”, month, quarter, half-a-year, year
- Promo types encoding
- Holidays flags
- Prices, discounts
- Product hierarchy encoding
- Date decomposition (month, DoW, WoY)

Basic training grouping:

- Model per product category
- Basic algorithms ARIMA, LSTM, Random Forest, Gradient Boosting

Promotion Forecasting

Enrich Datamart and tune models

Typical hypothesis for forecast improvement

- Move some promo types / products / categories to separate forecasting models
- Add cross-effects features (max discount in category, price indices, number of products in category, etc.)
- Add information from site (banners size, placeholder type, etc.)
- Add elasticity information
- Reconcile on a lower level (top levels are forecasted with TS, lowest levels are forecasted with ML)



Aktionszeitraum: 14.02. - 27.03.2022

*Gilt für die teilnehmenden Marken (außer Proble- und Testgrößen): Prial Somat Bref biff GENERAL Sidolin Wc Frisch



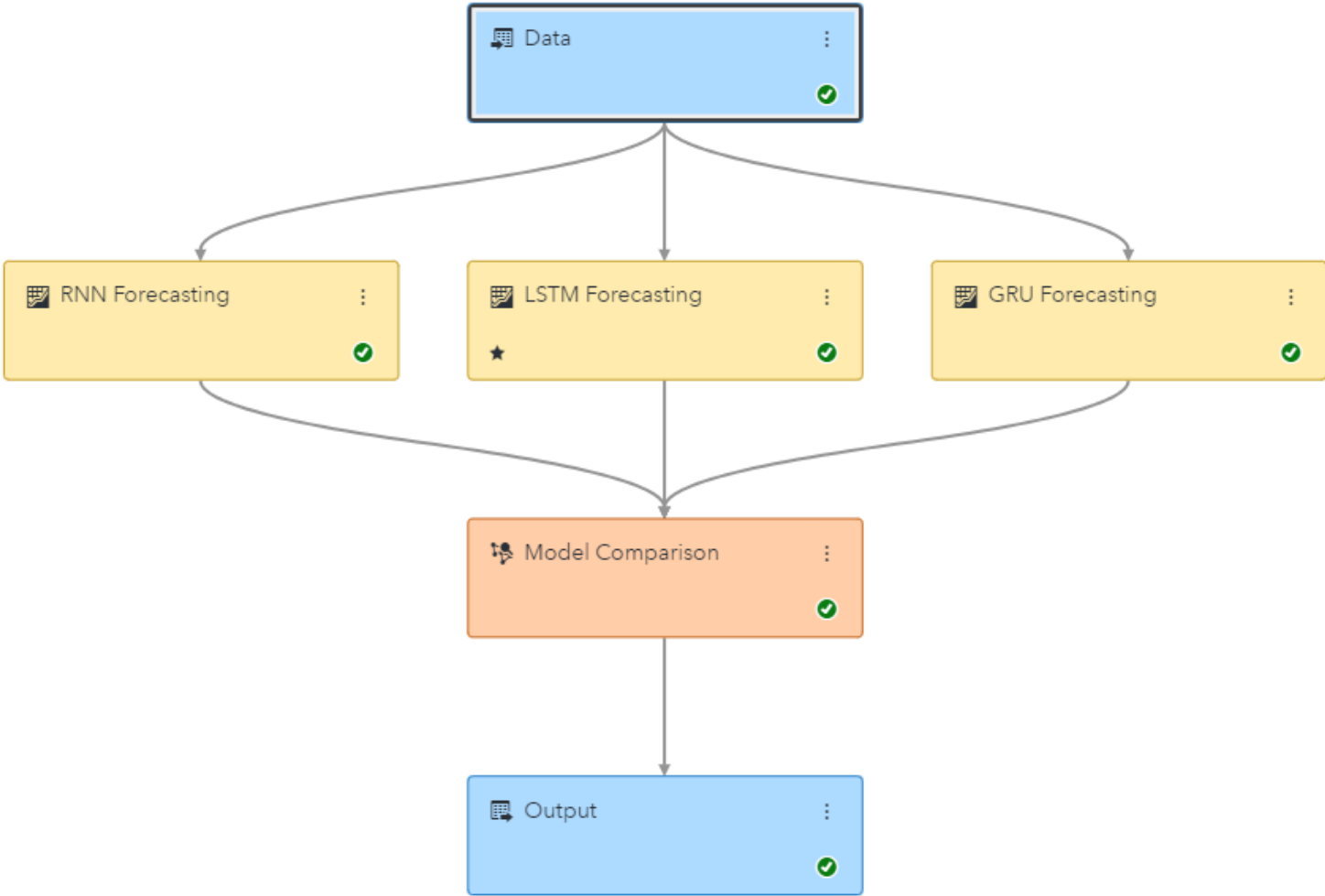
Promotion Forecasting

Enrich Datamart and tune models

Ensemble forecast

- Models stacking
- Choosing the best model for each group

| | Naïve | Time series | ML | Ensemble |
|-------|-------|-------------|-----|----------|
| Promo | 37% | 41% | 56% | 58% |
| Reg | 51% | 67% | 66% | 69% |



SAS Visual Forecasting

Thank You

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