ACME Case Study
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Background:
Your client is trying to more scientifically predict the amount of sales they will generate in each of their markets. To do so they want you to build them an algorithm that covers them in 4 different scenarios.

Company Structure:
Acme is broken into different levels that have different units within each level. The sum of the lowest level (Segment) will equal the sales for a Brand within a Category within a Geography and a Portfolio (see attached diagram). This pyramid structure means that there are branches all the way down to the segment level that you must account for. Throughout the building of this platform this structure will be referenced and is included below for reference:

Acme Levels:
- · Portfolio
- · Geography
- · Category
- · Brand
- · Segment

Within each level there will be different units that are distinct for each level. The Portfolio level will have combined segments (Hair/Body, CC/Fragrances, etc.), Geography will contain different geographies (North America, South America, etc.), Category will have the major divisions of Acme (Hair, Body, Fragrance, etc.), Brand will be the different brands that compose Acme's global portfolio (Bobbi Brown, Aveda, etc.), and Segment will be the unit that make up each of the brands (mascara, makeup, lipstick etc.).

At the Segment level, for each unit there will be the following information: Sales and Margin. Some Segments will also have additional information like Trend or Contribution. See definitions below:

Definition of Terms:
- ● Sales: Total sales for that particular unit (this will be given as an initial input)
- ● Margin: profit (this will be given as an initial input). This will most likely stay constant year to year
- ● Trend: The predicted growth Acme believes will happen in a given unit (wants to make to the market trend (this can also be negative)
- ● Contribution: % of the portfolio that a particular unit comprises. At the Segment level all Segments within a Brand have to add up to 1 (100%)

- New Sales for each Segment: This is an output that is generated after the algorithm runs
- New Contribution: This is the new contribution percentage that is generated after the algorithm runs for a Segment, Brand, Category, etc.

Constraints:
- There are two main constraints a user can put on each unit: Trend (min/max growth % of the unit) and Contribution (min/max % a unit can comprise within its particular level).
- Constraints will mainly be set on the Segment level, but the algorithm has to account for specific constraints along a branch as well as global constraints (see diagram)

Objectives:
1. Synthetic Data Set
   a. Create a synthetic data set that demonstrates you understand the structure of Acme and the idea of the constraints they wish to set up.
   b. Your synthetic data set will produce an initial sales number and margin (that are realistic) for each of the segments along with a scenario of different constraints to run the algorithm on.
2. Maximize Sales:
   a. Develop an algorithm whose output will show the absolute maximum in sales the company can hit given the constraints they set. It is meant to inform a leadership conversation so for example if the CEO comes in and says they want to grow by $100M, the Chief Financial Officer can run this portion of the algorithm and see that even at the maximum Acme can only generate $70M in sales so what they're asking for is impossible and allow them to have a more realistic conversation about growth.
   b. Show the sales, margin, trend and contribution for each unit
3. Maximize Margin:
   a. This is the same as sales but for margin so they can maximize on margin.
   b. Show the sales, margin, trend and contribution for each unit
4. Hit A Sales Target While Maximizing Margin:
   a. This output is a combination approach where the user can set a revenue target, say $50M of new sales (the output of the algorithm) and the algorithm not only produces a path to achieve $50M in sales, but that the path the algorithm generates also maximizes profit margin. See example below.
   b. Show the sales, margin, trend and contribution for each unit
5. Hit A Margin Target While Maximizing Sales:

      a. The same as objective four but for margin.

      b. Show the sales, margin, trend and contribution for each unit

6. Projections for Each Year Over a 5 Year Period

      a. The algorithm should be able to produce results annually over a 5 year period with the admins being able to adjust the constraints for across any of the years.

Inputs (from your synthetic data set):

- Initial sales
- Margin for each segment
- Constraints (entered separately for global, branch and unit)