Improving and Optimizing Your Offerings with Conjoint Analysis Market Simulators

Sawtooth Software

We ❤️ Simulators

We Love Simulators

- They turn unfamiliar “utilities” into demand predictions, revenue estimates, etc.
- The show attribute importance with an added competitive context
- They are the gateway to further estimates like price elasticity, willingness to pay, etc.

This is not a webinar on simulator basics

(been there, done that)

https://sawtoothsoftware.com/resources/events/webinars/using-the-market-simulator

or

https://sawtoothsoftware.com/resources/events/webinars/intro-to-choice-based-conjoint-with-lighthouse-studio-part-2

Today we're talking about finding improvements through recommendations and optimizations

What is a recommendation?

- Recommendations are essentially some sorting after running a sensitivity analysis (if we were trying to boost stock price we'd call it AI)
- Recommendations are available in our online platform Discover and it's standalone compliment app.sawtoothsoftware.com

Sensitivity Analysis is bit of automation

- Standard market simulations give choice predictions for a specific scenario

	Product 1	Product 2	Product 3
Brand	Visa	MasterCard	Discover
Interest Rate	15% interest	20% interest	15% interest
Credit Limit	$2,500 credit limit	$5,000 credit limit	$7,500 credit limit
Share	**54%**	**8%**	**37%**

Sensitivity Analysis is bit of automation

- Sensitivity holds the scenario constant and systematically steps through levels of an attribute

	Product 1	Product 2	Product 3
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Sensitivity Analysis is bit of automation

- Sensitivity holds the scenario constant and systematically shuffles through levels of an attribute

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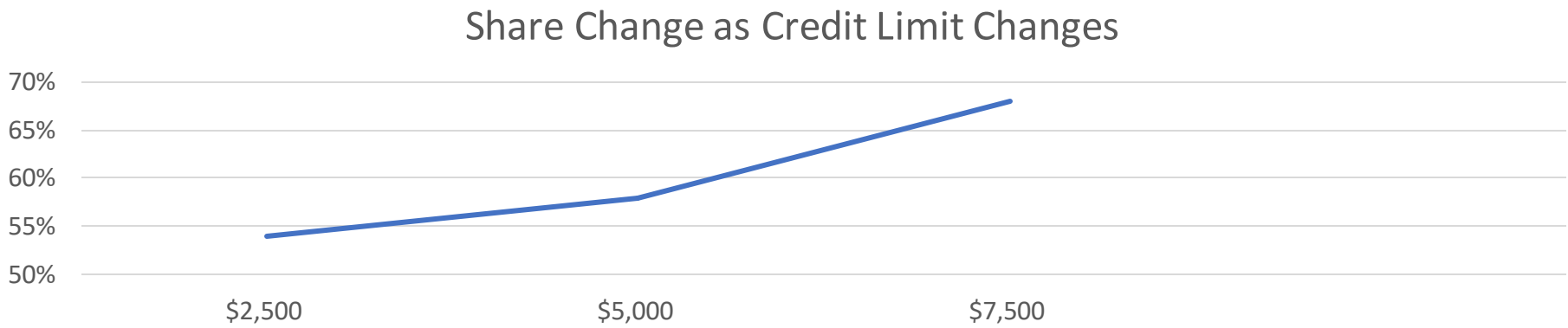
	Product 1	Product 2	Product 3
Brand	Visa	MasterCard	Discover
Interest Rate	15% interest	20% interest	15% interest
Credit Limit	$5,000 credit limit	$5,000 credit limit	$7,500 credit limit
Share	**54%**	**8%**	**37%**

	Product 1	Product 2	Product 3
Brand	Visa	MasterCard	Discover
Interest Rate	15% interest	20% interest	15% interest
Credit Limit	$7,500 credit limit	$5,000 credit limit	$7,500 credit limit
Share	**54%**	**8%**	**37%**

Sensitivity Analysis is bit of automation



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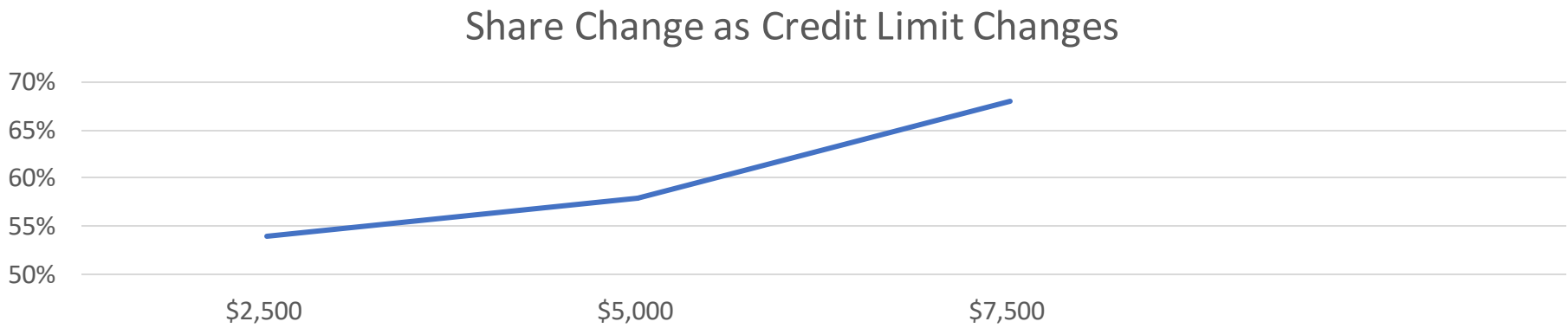
	Product 1	Product 2	Product 3
Brand	Visa	MasterCard	Discover
Interest Rate	15% interest	20% interest	15% interest
Credit Limit	$5,000 credit limit	$5,000 credit limit	$7,500 credit limit
Share	**58%**	**6%**	**36%**

	Product 1	Product 2	Product 3
Brand	Visa	MasterCard	Discover
Interest Rate	15% interest	20% interest	15% interest
Credit Limit	$7,500 credit limit	$5,000 credit limit	$7,500 credit limit
Share	**68%**	**4%**	**28%**

Sensitivity Analysis is bit of automation



- Recommendation #1: Change credit limit to $7,500 for a 14% increase in share
- Recommendation #2: Change credit limit to $5,000 for a 4% increase in share

Software Demo

Recommendations Versus Optimization

- Recommendations step through each one-way shift from the current configuration, one attribute at a time
- Not guaranteed to find the overall optimal configuration (need to shift around multiple attributes at the same time)

Recommendations Versus Optimization

- In theory, we could just do exhaustive sensitivities

1-1-1-1

1-1-1-2

1-1-1-3

1-1-2-1

1-1-2-2

1-1-2-3

1-1-3-1

1-1-3-2

1-1-3-3

And so on

Algorithms for optimizations

Exhaustive

Simple; Examines all possible combinations; Guaranteed to find the global optimal solution; Can conduct Multi-Objective Searches

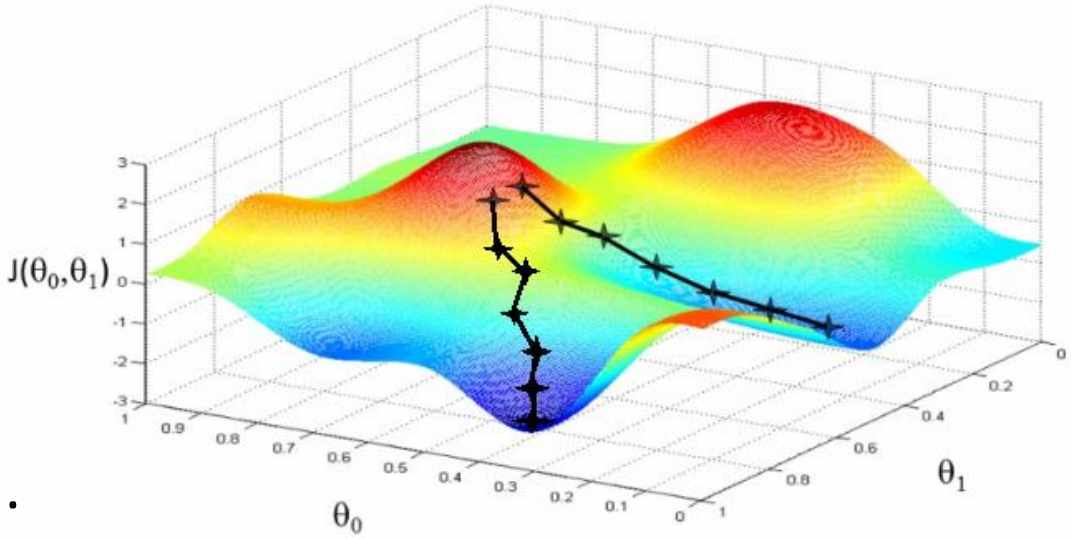
Enormous Search Space?

- Suppose we have 10 attributes, each with 5 levels.
- There are then 5^{10} possible product configurations, or almost 10 million!
- If optimizing multiple products simultaneously, the problem gets even bigger. (9,765,625 *9,765,624*…)
- For larger optimization problems, even the fastest computers could take hours, days or weeks to evaluate all possible combinations

Grid Algorithm

- It isn't necessary to try all possible combinations to find really good solutions

- Grid changes one attribute at a time (holding all others constant) and keeps any change that improves the solution. This repeats until no other change results in a better solution.



- If the response surface is single-peaked, it is guaranteed to find the global optimum.

Algorithms for optimizations

Exhaustive

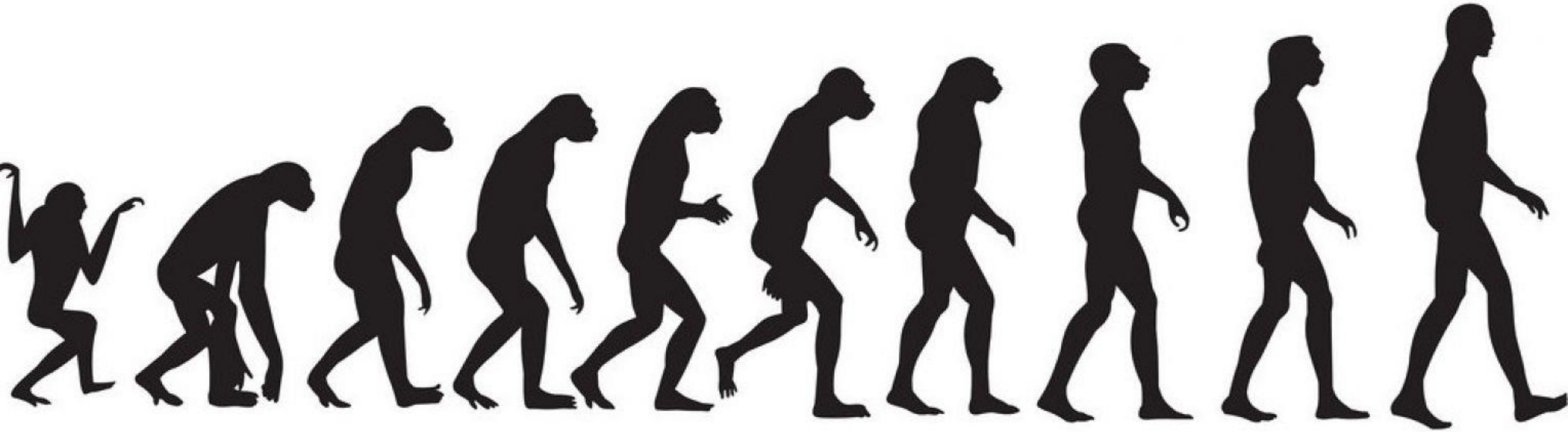
Simple; Examines all possible combinations; Guaranteed to find the global optimal solution; Can conduct Multi-Objective Searches

Grid

Extremely fast if search space is large; Accurate if search space is single-peaked; Used to reduce Exhaustive search domain

What About a Middle Ground?

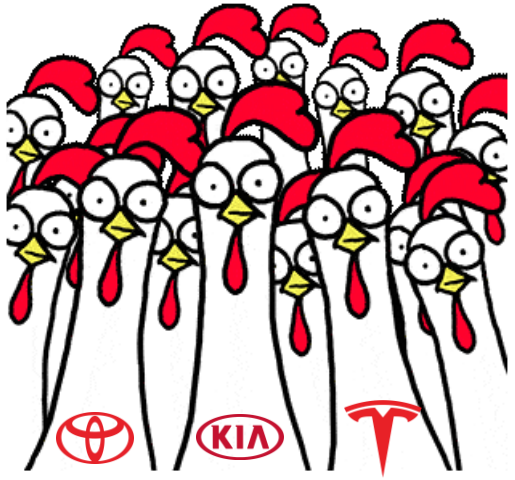
- Do we need to test all possible combinations?
  - Some levels are just plain bad
- Can we avoid getting stuck on smaller hills?
  - Add some elements of randomness



Genetic Algorithm

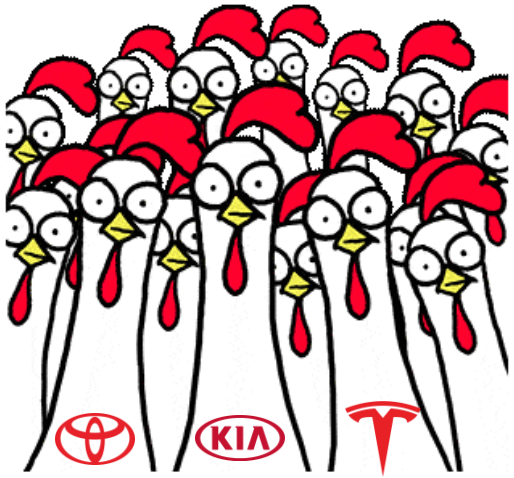
- Based on concepts of evolutionary biology and Darwinian theory (survival of the fittest)

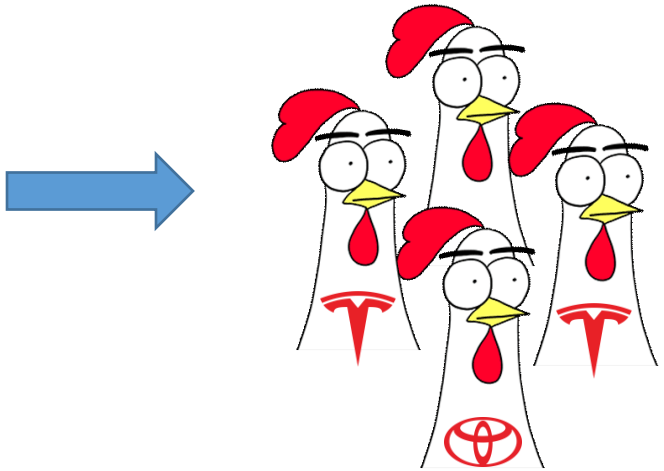
- Step 1: Create the herd
  - Generate 300 product configurations (randomly, grid, etc.)



Genetic Algorithm

- Step 2: Release the predators
  - Top 150 “fittest” members of the herd survive (e.g. highest share)

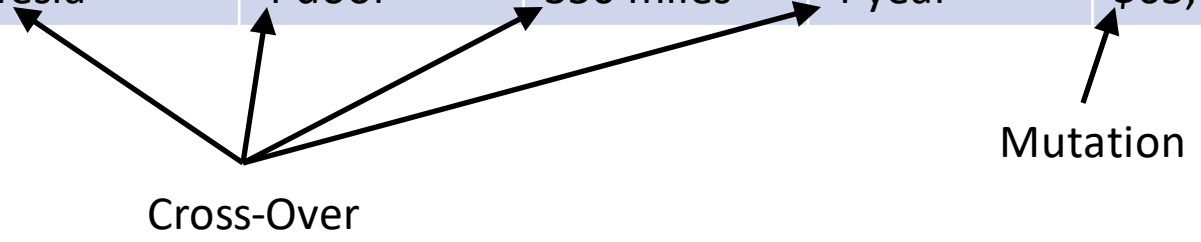




Genetic Algorithm

- Step 3: Survivors mate and produce next generation
  - Fittest survivors have a higher probability of producing offspring with other fittest survivors
  - Mutations can occur

	A1	A2	A3	A4	A5
Parent “A”	Tesla	2 door	350 miles	4 year	$55,000
Parent “B”	Kia	4 door	350 miles	3 year	$55,000
Offspring “C”	Tesla	4 door	350 miles	4 year	$65,000



Genetic Algorithm

- Rinse and repeat until several generations produce no significant gains (or a set number of iterations is run)

Algorithms for optimizations

Exhaustive

Simple; Examines all possible combinations; Guaranteed to find the global optimal solution; Can conduct Multi-Objective Searches

Total search space can be enormous (10 attributes w/ 5 levels each makes for 5^10, or 10 million combinations!)

Grid

Extremely fast if search space is large; Accurate if search space is single-peaked; Used to reduce Exhaustive search domain

Not guaranteed to find the global optimal solution if several peaks

Genetic

Faster than Exhaustive if search space is large (but longer than Grid); Finds a variety of near-optimal solutions, and most times the single best optimal solution; Can conduct Multi-Objective Searches

Still not guaranteed to find the global optimal solution, but Genetic is less vulnerable than Grid search to finding the local optimum

https://sawtoothsoftware.com/resources/technical-papers/advanced-simulation-module-asm-technical-paper

Software Demo

THANK YOU

Questions?

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