Prescriptive Analytics: Recommending Optimal Actions

This document introduces prescriptive analytics, a data-driven approach to decision-making that goes beyond predicting future outcomes to recommending the best course of action. It explores key concepts like optimization, setting up optimization models using Excel Solver, and real-world applications of prescriptive analytics.

by Zenson Tran

What is Prescriptive Analytics?

Prescriptive analytics goes beyond descriptive (what happened) and predictive (what might happen) analytics by focusing on what we should do next. It’s a data-driven approach to decision-making, recommending the best course of action.

Prescriptive analytics empowers decision-makers to take action confidently, using insights and optimization techniques to guide choices.

For example, a retail company uses prescriptive analytics to determine the optimal stock levels to minimize holding costs and avoid overstock, ensuring they meet customer demand without excess inventory.

Introduction to Optimization

Optimization is the process of finding the most efficient solution within defined limits (constraints). In prescriptive analytics, optimization means maximizing or minimizing an objective, such as profit, cost, or time.

Businesses face resource constraints—limited budgets, storage, or staffing. Optimization helps businesses make the most of what they have, achieving goals within these constraints.

Setting Up an Optimization Model Using Excel Solver

Solver is a powerful tool in Excel that allows users to find the best solution to a problem by adjusting certain variables within specified constraints.

- Define the Objective Cell: The objective is what you want to optimize, such as minimizing costs or maximizing profits.
- Identify Decision Variables: These are the inputs Solver will adjust to reach the objective (e.g., quantity of products to produce).
- Set Constraints: Constraints limit the model, ensuring it reflects real-world limitations (e.g., budget, capacity).

Solver enables complex decision-making without advanced coding, making it an accessible tool for prescriptive analytics.

Constraints and Objectives in Optimization

Constraints are real-world limits, such as budget, staffing, or space. Constraints guide the model, ensuring solutions are practical and achievable.

The objective is the main goal, like maximizing revenue or minimizing costs. It drives the optimization, directing Solver to find the best way to reach this goal within the given constraints.

Effective optimization requires balancing ambitious goals with realistic limits. For example, aiming to maximize production while respecting a budget constraint.

Real-World Optimization Example

A retail business wants to optimize inventory to minimize costs while meeting customer demand.

Optimization Process:

1. Create an inventory model with data like product costs, holding costs, and demand.
2. Define the objective (e.g., minimizing holding costs) and set constraints (e.g., budget, storage capacity).
3. Run Solver to calculate the optimal quantity of each product, balancing cost savings with demand fulfillment.

This approach allows the business to use data to make informed decisions, reducing costs while ensuring they meet demand.

Practical Applications of Prescriptive Analytics

1 **Inventory Optimization**

Managing inventory to avoid overstocking or understocking, optimizing costs while ensuring customer satisfaction.

2 **Resource Allocation**

Distributing resources like staffing and budget in ways that maximize output or minimize costs.

3 **Supply Chain Optimization**

Balancing costs and delivery times to improve efficiency and service quality.

Key Takeaways

Prescriptive analytics transforms insights into recommended actions, making data work for real-world decision-making.

Solver allows you to create optimization models without complex programming, making it accessible for solving practical business problems.

Setting realistic constraints while focusing on objectives ensures optimized solutions that are practical and impactful.

Prescriptive analytics is the next level of data-driven decision-making. It’s not just about understanding what’s happened or what might happen; it’s about choosing the best path forward. By combining insights with action, prescriptive analytics enables you to make optimized decisions that drive success in the real world.