# Case study: data-driven pricing

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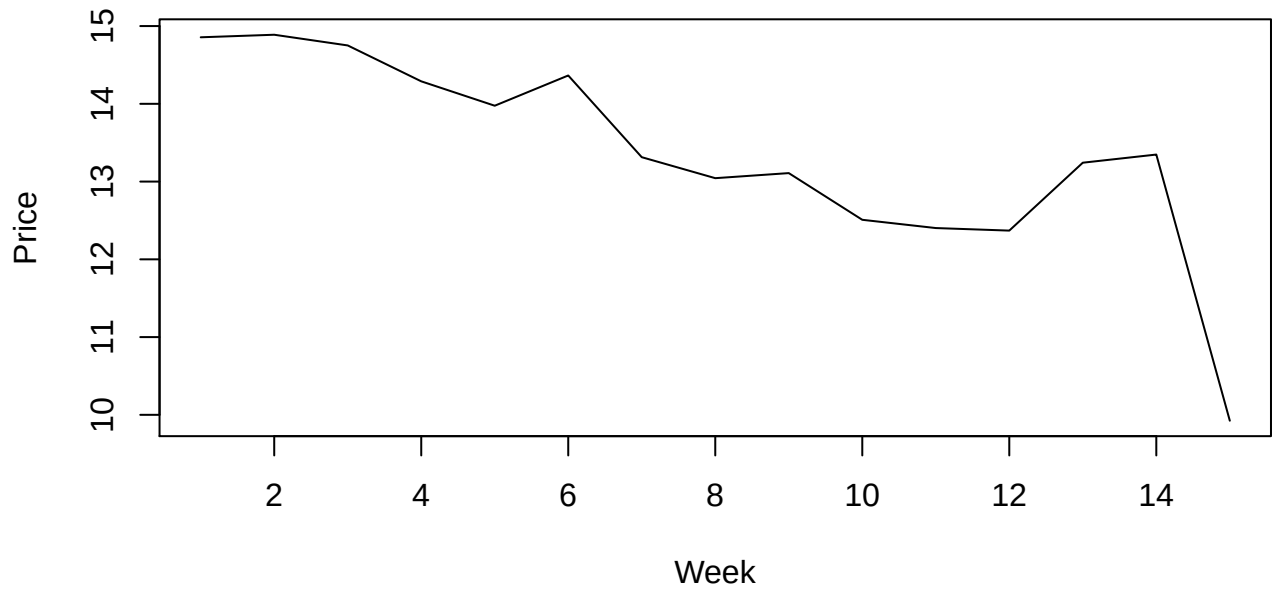
# The problem

- A retail client wanted to improve their strategy for pricing apparel.
- In the past, they would start with a base price (usually set by executives) and mark-down whatever wasn't sold towards the end of the season. It would typically look something like:

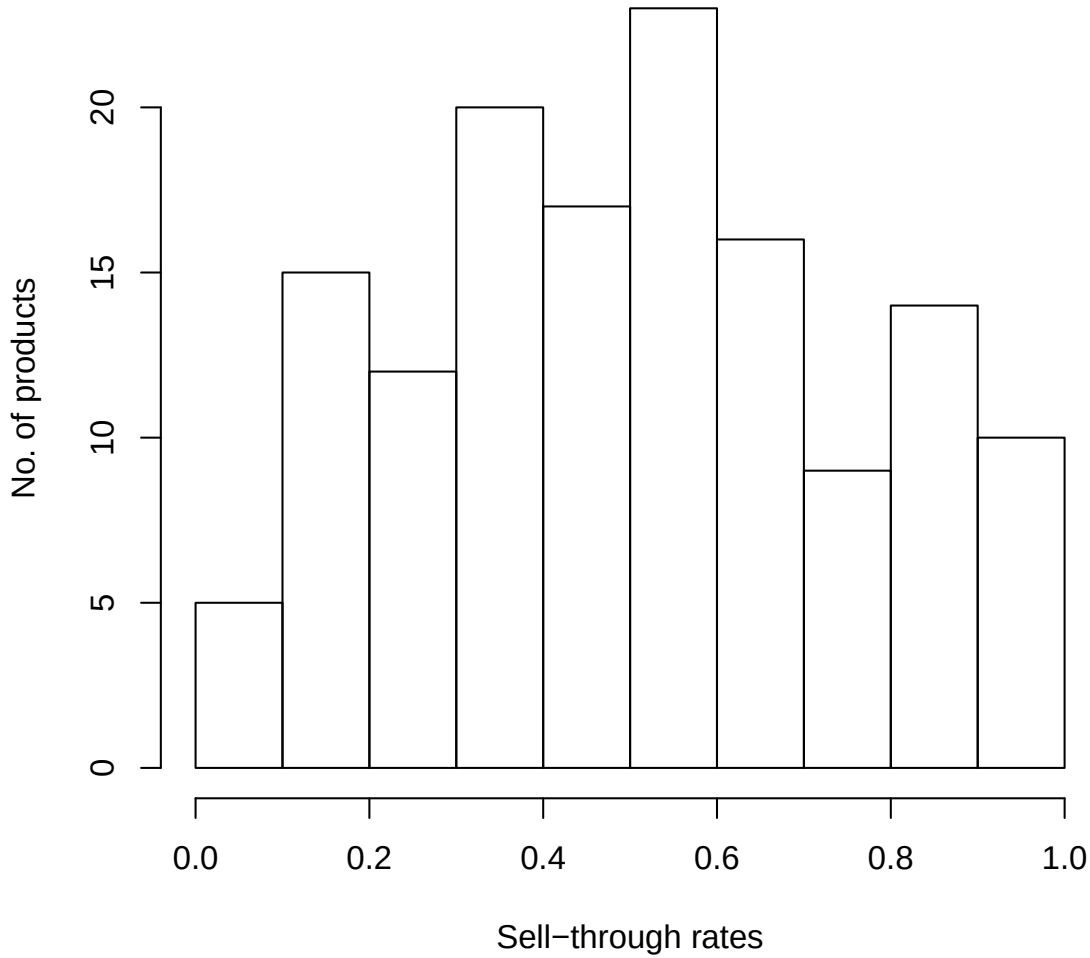


# The problem cont.

- However, this heuristic pricing led to high variance in sell-through rates at the end of the season.
- Popular products would sell out too quickly, while unpopular products would never sell out and turn into excess inventory at the end of the season.
- A better strategy would have been to raise prices on popular products (or discount them less aggressively), and vice versa for unpopular products.

# The problem cont.

- A histogram of sell-through rates at the end of the season would look like:



# Using data to improve pricing

- A bit of economics can be used to create a model that maximizes profits over the entirety of the season.
- Roughly we'd like to maximize profit ($\Pi$) by changing price (P)...

$$max_P \Pi = PQ_s - CQ_0$$

- ...where quantity sold is a function of price, demand (D), and elasticity ($\epsilon$), which is a fancy term for the responsiveness of buyers to price

$$Q_s = DP^{\epsilon}$$

- Using data to implement the model, we would take in weekly inputs such as last week's sales and time of year and output recommended prices

# Two data-mining tasks

- A common task in many fields (physics, economics, etc) is to estimate an equation from noisy data
- We observe combinations of price and quantity sold e.g. sold 10 dresses when pricing at \$10
- We could then fit a line to estimate $D$ and $\epsilon$, tracing out the price-quantity relationship and allowing for predictions.