FreshFoods Grocery: Gateway to a *healthier* future

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Executive Summary

Problem

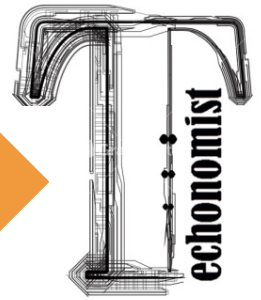
- Optimize the total profit in 483 stores while maintaining the total expense unchanged
- Data from experiments did not directly reveal best strategy

Solution

- Design a regression model that contains both **endogenous and exogenous factors** that represent the relationship between different variables
- Solve the maximization problem using **first-order condition**
- Web-based application allows quick adaptation and sustainable growth

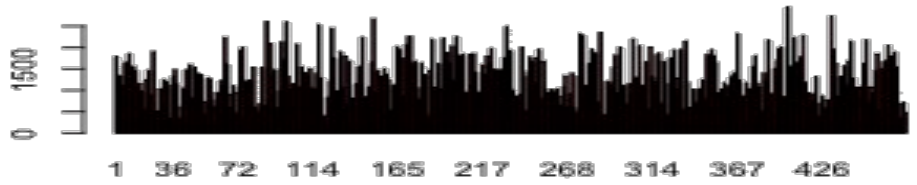
Impact

- **$1.285M** incremental profit per day

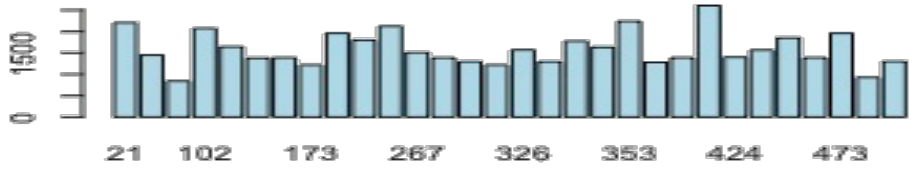


New strategies produced varying effects among different groups and within each group

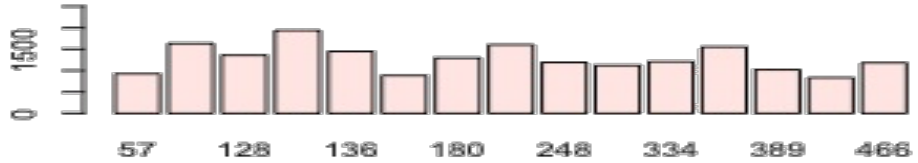
Control Group (21:00, 24 staff)



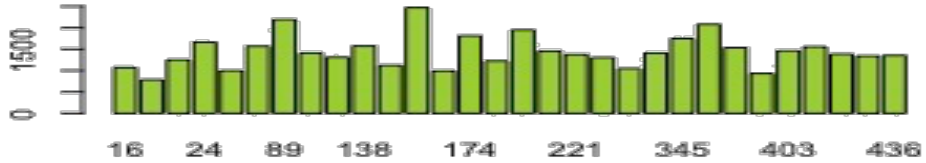
Group 1 (19:00, 24 staff)



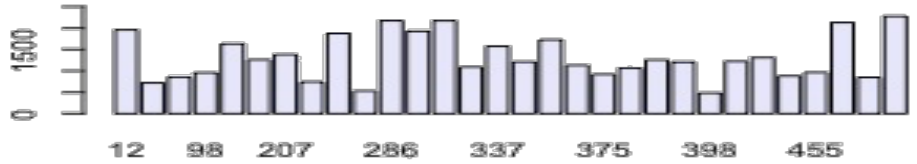
Group 2 (19:00, 28 staff)



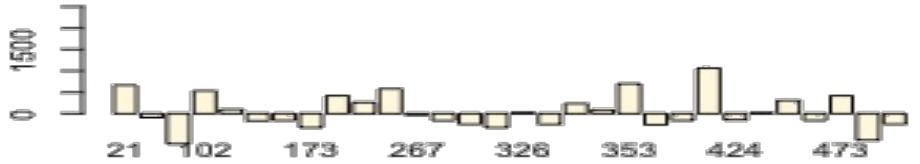
Group 3 (20:00, 24 staff)

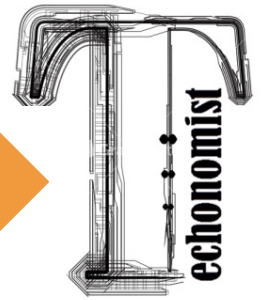


Group 4 (20:00, 26 staff)



Group 5 (21:00, 28 staff)





Percent change in revenue depends on both exogenous and endogenous factors

- Generalized Linear Model

$$y = a_1x_1 + a_2x_2 + \sum_{i=3}^{n} a_ix_i + \sum_{i,j,k=0}^{i\neq j} b_kx_ix_j$$

- Stepwise Regression with Backward Elimination

$$y = a_1x_1 + a_2x_2 + a_3x_1x_4 + a_4x_1x_8 + a_5x_2x_4 + a_6x_2x_8 + \sum_{i\in n} a_ix_i + w\phi + \sum_{(i,j)\in} b_kx_ix_j$$

x_1 change of associatives, x_2 change of operating hour
Linear term $n = \{4, 5, 6, 7, 8, 9\}$, Interactive term $m = \{(4, 6), (4, 9), (5, 7), (6, 9)\}$
ϕ, w categorical variable and weight for state,

x_4: Competition, x_5: Age, $x6$: Rent, $x7$: Store Age, $x8$: Storetype $x9$: Tenure

Constrained first-order condition maximizes profits

Integer Linear Equation to maximize:

$$\sum_{i}^{483} R_i y_i + \sum^{ROI \in S} \Delta A \cdot ROI$$

,where y_i is profit growth, ΔA is Ads cost change, S is stepwise ROI value

Subject to:

- Expense unchanged:

$$0 = \Delta A + \sum_{i}^{483} 140x_1^{(i)} + 10x_1^{(i)}x_2^{(i)} + 490x_2^{(i)}$$

- The number of associates change: $x_1^{(i)} \in \{0, +2, +4\}$
- The number of openning hours change: $x_2^{(i)} \in \{0, -1, -2\}$

New model generates quick and sustainable profit growth

Thank you!