Assessing Retail Store Efficiency Using Data Envelopment Analysis: A Case Study

Xin Zhang
Austin Peay State University

Yingtao Shen
Austin Peay State University

Pilsik Choi
Austin Peay State University

Shiyun Chen
Austin Peay State University

ABSTRACT

This paper presents a case study that applies Data Envelopment Analysis (DEA) to measure the operational efficiency of retail stores within a specific chain, incorporating marketing metrics into the analysis. By evaluating inputs such as labor and inventory against outputs like sales and customer satisfaction, this study demonstrates how DEA can serve as a powerful tool for assessing operational efficiency and providing strategic marketing insights. By distinguishing between efficient and inefficient stores, DEA generates empirical benchmarks that can inform marketing strategies to optimize resource allocation, enhance customer engagement, and strengthen competitive positioning. This integration of DEA and marketing highlights its dual functionality in operational and strategic decision-making.
Keywords: Data Envelopment Analysis (DEA), efficiency, retail, marketing strategy, resource allocation, decision-making

INTRODUCTION

Data Envelopment Analysis (DEA) is a nonparametric method for assessing the relative efficiencies of a set of similar decision-making units (DMUs) by comparing their inputs and outputs to categorize them as either efficient or inefficient. In the retail context, typical inputs include resources such as labor, operating costs, and inventory levels, while outputs could be sale and customer satisfaction. DEA enables us to identify stores operating efficiently by benchmarking them against top-performing counterparts. This efficiency analysis is beneficial not only for operations management but also for marketing, as it provides insights into how effectively resources are allocated to achieve customer-focused outcomes.

DEA's formulation as a linear programming (LP) problem makes it particularly useful in educational settings where LP is part of the curriculum, allowing students to connect optimization techniques with real-world applications. The ability of DEA to translate efficiency analysis into an LP model bridges marketing and operational decision-making, offering marketers a tool to identify stores that most effectively transform resources (such as inventory and labor) into marketing outcomes (like sales and customer satisfaction).

This study aims to provide a practical introduction to DEA through a retail case study, illustrating its value for both operational and marketing analyses. By evaluating store efficiency, DEA helps identify strategies to maximize the impact of marketing and operational resources, guiding data-driven decisions that enhance customer satisfaction and competitive positioning.

LEARNING OBJECTIVES AND CASE STUDY APPLICATION

This case study is designed to introduce students to the principles and applications of DEA in both undergraduate and graduate business courses. Through this case, students will gain hands-on experience in evaluating efficiency and applying DEA to real-world business scenarios. By the end of the study, students should be able to:

- Gain insight into DEA as a tool for evaluating efficiency in business and operational contexts, and recognize its relevance to marketing, management, and decision-making.
- Formulate DEA models to assess efficiency across various entities and grasp the significance of inputs and outputs in efficiency analysis.
- Develop the ability to select appropriate inputs and outputs for assessing the relative efficiency of decision-making units (DMUs) within a DEA framework.
- Analyze DEA model results to identify efficient and inefficient DMUs and understand their implications for business performance.
- Use DEA insights to make informed recommendations that enhance operational and marketing strategies, helping businesses optimize resource allocation and improve marketing performance.

KEY STEPS IN THE CASE STUDY

Step 1: Define the Research Objective

As the regional manager for a retail chain, you are tasked to evaluate the performance of multiple stores to identify both high-performing and underperforming locations. The objective of this analysis is to use DEA as a quantitative tool to measure and compare the efficiency of the retail stores within your chain. This analysis will help pinpoint which stores are operating efficiently and provide insights into areas where resources can be better allocated and managed.

Establishing these efficiency benchmarks will support strategic planning for improvement and resource distribution, enabling informed decisions on how to allocate resources effectively across the chain of stores.

Step 2: Select Inputs and Outputs

In Data Envelopment Analysis (DEA), selecting appropriate inputs and output is critical to achieving meaningful results. In this context, inputs represent the resources each store uses, and outputs represent the results or value each store generates. Together, these inputs and outputs form the basis for determining each store's efficiency score by assessing how effectively resources are used to maximize performance.

Here are the inputs and outputs chosen for this analysis:

- Inputs:
  - Number of Employees:
    Represents the current workforce at each store. While more employees can enhance operational capacity, a large staff without proportionate sales may indicate inefficiency.
  - Total Inventory:
    Measured as the average dollar value of available stock over the past year. Higher inventory levels may improve product availability but can also lead to increased holding costs. Efficiencies may be impacted if inventory costs are high without corresponding sales revenue.
  - Operating Costs:
    Annual expenses required to run each store, including rent, utilities, wages, and other operational costs. High operating costs without matching sales revenue could indicate inefficient resource allocation.
- Outputs:
  - Total Sales
    The annual revenue generated by each store in dollars. This output measures financial performance, with higher sales indicating effective store management and customer engagement. However, efficiency depends on the relationship between sales and inputs.
  - Customer Satisfaction Score
    A score (from 1 to 100) based on customer feedback, reflecting satisfaction with the store's services. High scores are desirable as they can correlate with repeat business and customer loyalty, which are key to long-term performance.

This case study uses a small sample of five retail stores to provide a simplified setup to clearly illustrate the application of DEA. Although a larger sample could yield a more robust efficiency insights, analyzing five stores allows for a straightforward step-by-step demonstration. Sample data for the inputs and outputs collected from these five retail stores are provided in Table 1 (Appendix I).

"This is a fictitious case. All information contained herein was fabricated by the authors. Any similarity contained herein to actual persons, businesses, events, etc. is purely coincidental and is the responsibility of the authors. Please contact the case authors directly with any concerns."

Step 3: Formulate the DEA Model

DEA models have been widely applied for performance evaluation in various fields, including banking (Yeh, 1996), healthcare (Banker, 1984), university selection (Carrico et al., 1997), and portfolio management (Edirisinghe and Zhang, 2008). In this study, the CCR model, introduced by Charnes, Cooper, and Rhodes (Charnes et al., 1978), is employed. It utilizes a nonlinear programming approach to evaluate the efficiency of DMUs by comparing the ratio of weighted outputs to weighted inputs.

The goal of the DEA model is to calculate the efficiency score for each DMU, in this case, each retail store. The efficiency score ranges from 0 to 1, where a score of 1 indicates that a store is operating at full efficiency, while a score less than 1 indicates that the store is operating below full efficiency. The CCR model provides a means of comparing each store's performance relative to others by optimizing the use of resources to produce outputs.

The CCR model can be mathematically formulated as follows:
Nonlinear Programming Formulation:

$$\textit{Maximize} \quad Z_k = \frac{\sum_{r=1}^{s} u_r y_r^k}{\sum_{i=1}^{m} v_i x_i^k} \tag{1}$$

$$\textit{Subject to} \quad \frac{\sum_{r=1}^{s} u_r y_r^j}{\sum_{i=1}^{m} v_i x_i^j} \leq 1 \quad \forall j$$

$$u_r \geq 0, v_i \geq 0 \quad \forall r, i$$

where:

- Z_k is the efficiency score of DMU *k*,
- y_r^k and x_i^k are the outputs and inputs for DMU *k*,
- u_r and v_i are the weights for outputs and inputs, respectively,
- *s* and *m* represent the number of outputs and inputs.

In this model, the objective is to maximize the efficiency score Z_k by adjusting the weights u_r and v_i while ensuring that the efficiency score for every DMU cannot exceed 1. This allows for a fair comparison of each DMU's performance relative to others.

Linear Programming Transformation:

To simplify this nonlinear problem, Banker et al. (1984) employed a linear transformation that converts it into a linear programming formulation, making it easier to solve. The equivalent linear programming version of the CCR model is as follows:

$$\textit{Maximize} \quad \sum_{r=1}^{s} u_r y_r^k \tag{2}$$

$$\textit{Subject to} \quad \sum_{i=1}^{m} v_i x_i^k = 1$$

$$\sum_{r=1}^{s} u_r y_r^j - \sum_{i=1}^{m} v_i x_i^j \leq 0 \quad \forall j$$

$$u_r \geq 0, v_i \geq 0 \quad \forall r, i$$

This linear programming model aims to determine which store are DEA-efficient by identifying the optimal weights for inputs and outputs that maximize each store's efficiency score without violating the constraints.

For this analysis, three inputs, including Number of Employees, Total Inventory, and Operating Cost, and two outputs, including Sales and Customer Satisfaction, are used to calculate the efficiency score of each store. Once the data is input into the model, the DEA will produce efficiency scores for each store, with a score of 1 indicating efficiency. Stores with scores less than 1 will be considered inefficient, signaling potential areas for improvement.

The DEA models for evaluating the efficiency of each of the five stores are provided in Appendix II.

Step 4: Analyze Data

After solving the DEA model using Excel Solver, the efficiency scores and corresponding weights for each store are obtained, as shown in Table 2 (Appendix I). Detailed instructions for using Solver to solve the DEA model are provided in Appendix III.

The objective value column in Table 2 represents the relative efficiency of each store. Stores 1, 3, and 5 have efficiency scores of 1, indicating that they are operating on the efficiency frontier, meaning they are performing at their maximum efficiency. In contrast, stores 2 and 4 have efficiency scores of 0.8 and 0.89, respectively, which suggests these stores could improve their efficiency by optimizing resource use. The DEA results provide a benchmark for each store, comparing their resource usage and output levels to those of the efficient stores.

In addition to efficiency scores, the variables v and u in the table represent the weights assigned to inputs and outputs for each store. These weights represent the relative importance of each factor in determining efficiency. Nonzero weights indicate inputs or outputs that significantly contribute to a store's efficiency, while zero weights suggest factors that do not contribute. For example, store 3 assigns nonzero weights to inventory, sales, and customer satisfaction, indicating that these factors are prioritized in achieving efficiency. By examining the weights for each store, a better understanding can be gained of which inputs or outputs are emphasized and how these priorities affect the store's relative efficiencies.

Step 5: Interpret Results

The DEA model results show that stores 1, 3, and 5 are performing efficiently, each with an efficiency score of 1. This means these stores are using their resources, such as employees, inventory, and operating costs, effectively to generate high outputs in terms of sales and customer satisfaction. As such, these stores are considered benchmarks for efficient operations and set the standard for how resources should be allocated.

Stores 2 and 4, however, have lower efficiency scores (0.8 and 0.89 respectively), which indicates they are less efficient. This does not mean these stores are failing, but it does suggest there is room for improvement. Specifically, it could mean that these stores are using more resources than necessary or generating lower outputs compared to the efficient stores. For example, they might be spending too much on certain inputs, such as labor or inventory, or not achieving as much as possible in terms of sales or customer satisfaction. By analyzing the practices of the efficient stores, stores 2 and 4 can identify specific areas where they could improve.

The weights assigned to each store's inputs and outputs provide additional insights into their areas of focus. For instance, store 3 has nonzero weights on inventory, sales, and customer satisfaction, indicting that these factors are critical to its efficiency. This suggests that store 3 relies on effective inventory management to meet customer demand and effectively converts inventory into sales, ensuring a strong performance in customer satisfaction.

Store 4, on the other hand, has nonzero weights on employees, operating costs, and sales, showing that its efficiency depends heavily on these areas. While it is beneficial that store 4 focuses on employees and sales, its significant reliance on operating costs might suggest inefficiencies in how resources are allocated. Reducing staff, for example, could lower operating costs but might impact service quality or lead to other operational challenges. Instead, store 4 could explore strategies such as training employees to work more efficiently or finding ways to reduce non-labor costs, like energy consumption or inventory waste. Achieving a balance between improving employee performance and reducing unnecessary expenses could help the store improve efficiency without sacrificing important aspects of its operation.

Overall, stores 1, 3, and 5 serve as role models for the other store in the chain. Stores 2 and 4 can learn from their practices by identifying ways to allocate resources effectively or improve their outputs. For example, reducing unnecessary expenses, improving customer satisfaction, and adjusting resources utilization could help these stores enhance their efficiency. This analysis is valuable for managers as it provides a clear picture of each store's performance and offers actionable insights for improving efficiency across the entire retail network.

DISCUSSION QUESTIONS

The following discussion questions are designed to help students gain a deeper understanding of the DEA analysis, exploring both the implications of the results and the practical steps that can be taken based on these insights. Each question encourages students to engage critically with DEA findings, understand the factors affecting retail store efficiency, identify opportunities for improvement, and consider how DEA's role in strategic decision-making within a retail context. By addressing these questions, students will work towards the learning objectives of understanding DEA, applying it to real-world data, and making data-informed recommendations.

Question 1: What are the main factors that contribute to the efficiency or inefficiency of the retail stores?

This question prompts students to examine the impact of each input (e.g., employees, inventory, operating costs) and output (e.g., sales, customer satisfaction) on the stores' efficiency scores. Students could analyze the significance of each factor, considering whether certain inputs are being used more effectively or if certain outputs are prioritized over others. Additionally, they could discuss how strategic choices, such as staffing levels, inventory management, and customer service practices, affect efficiency differences among stores. This exploration aligns with the learning objective of understanding DEA applications and evaluating the role of key business variables in driving efficiency.

Question 2: How can underperforming stores improve their efficiency based on DEA results?

Students are encouraged to develop strategies for improving efficiency in stores with scores below 1. They could discuss potential adjustments in resource allocation, such as optimizing staffing, managing inventory levels, or reducing operating costs, and explore initiatives to increase sales or customer satisfaction. This question also encourages students to benchmark underperforming stores against the most efficient stores, identifying best practices and resources reallocations that could enhance performance. This exercise supports the learning objective of analyzing and interpreting DEA results to make data-driven, actionable recommendations.

Question 3: How might the choice of inputs and outputs impact the DEA results?

This question encourages students to reflect on the importance of selecting appropriate inputs and outputs for the DEA model. For example, including marketing expenses as an input is relevant because it could influence customer satisfaction and sales, which are critical outputs. Additionally, store size or floor space could also be considered as an input, as they determine how much product a store can display, how many customers it can serve, and how many resources (e.g., staff, utilities) are needed to manage that space. These additional inputs provide further context for understanding store efficiency and could enhance the accuracy of DEA results by accounting for factors that impact performance, but may not be captured by more traditional inputs such as labor or inventory. This discussion helps students think critically about how the selection of variables influences DEA results and reinforces the objective of creating a relevant and effective DEA model for performance analysis.

Question 4: How can DEA results guide future decision-making and strategy for the retail chain?

This question asks students to consider how DEA insights can shape managerial decisions and strategic planning within the retail chain. They could discuss using DEA findings to set performance benchmarks, optimize resources allocation, or implement new policies aimed at improving efficiency. Additionally, students might explore ways to integrate DEA insights into broader company strategies, such as employee training programs or customer experience enhancements. This question emphasizes the learning objective of using DEA results to inform practical, data-driven strategies for enhancing retail performance across the chain.

Question 5: Despite the valuable insights that DEA provides, what are the limitations of using it in this case study?

While DEA is a powerful tool for evaluating relative efficiency, this question encourages students to consider its limitations. Students can reflect on potential drawbacks, such as the sensitivity of DEA results to outliers, the reliance on accurate input and output selection, and the challenges posed by zero weights in the model. They might also consider whether DEA alone offers a complete picture of efficiency or if supplementary analyses, such as qualitative assessments of store operations, are needed to gain a deeper understanding. This question fosters critical thinking and reinforce the importance of evaluating both the strength and constraints of DEA as an analytical tool.

REFERENCES

Banker, R.D. (1984). Estimating most productive scale size using data envelopment analysis. *European Journal of Operational Research*, 17(1), 35-44.

Banker, R.D., Charnes, A., & Cooper. W. W. (1984). Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis. *Management Science*, 30 (9), 1078-1092.

Carrico, C.S., Hogan, S.M., Dyson, R.G., and Athanassopoulos, AD. (1997). Data envelopment analysis and university selection. *The Journal of the Operational Research Society*, 48, 1163-1177.

Charnes, A., Cooper, W.W., & Rhodes, E. (1978). Measuring the efficiency of decision-making units. *European Journal of Operational Research*, 2(6), 429-444.

Edirisinghe, N.C.P. & Zhang, X. (2008). Portfolio selection under DEA-based relative financial strength indicators: case of US industries. *The Journal of the Operational Research Society*, 59, 842-856.

Yeh, Q.J. (1996). The application of data envelopment analysis in conjunction with financial ratios for bank performance evaluation. *The Journal of the Operational Research Society*, 47(8), 980-988.

APPENDIX

Appendix I:

Table 1: Sample Data for DEA Analysis

	Inputs			Outputs	
Retail Store	Employees	Inventory	Operating Costs	Sales	Customer Satisfaction
	$i = 1$	$i = 2$	$i = 3$	$r = 1$	$r = 2$
Store 1	12	$100,000	$50,000	$500,000	85
Store 2	15	$120,000	$60,000	$480,000	80
Store 3	10	$90,000	$45,000	$430,000	82
Store 4	18	$150,000	$70,000	$620,000	88
Store 5	11	$85,000	$40,000	$400,000	77

Table 2: DEA Efficiency Results for the Five Retail Stores

Retail Store	Objective Value	Variable				
		v_1	v_2	v_3	u_1	u_2
Store 1	1	0	0.00001	0	0.000002	0
Store 2	0.8	0	8.33E-06	0	1.667E-06	0
Store 3	1	0	1.11E-05	0	1.373E-06	0.004994
Store 4	0.89	3.47E-18	0	1.43E-05	1.429E-06	0
Store 5	1	0	1.07E-05	2.31E-06	0	0.012987

Appendix II: DEA Model Formulation

<u>Store 1</u>: *Maximize* $500{,}000u_1 + 85u_2$
Subject to $12v_1 + 100{,}000v_2 + 50{,}000v_3 = 1$
$-12v_1 - 100{,}000v_2 - 50{,}000v_3 + 500{,}000u_1 + 85u_2 \leq 0$
$-15v_1 - 120{,}000v_2 - 60{,}000v_3 + 480{,}000u_1 + 80u_2 \leq 0$
$-10v_1 - 90{,}000v_2 - 45{,}000v_3 + 430{,}000u_1 + 82u_2 \leq 0$
$-18v_1 - 150{,}000v_2 - 70{,}000v_3 + 620{,}000u_1 + 88u_2 \leq 0$
$-11v_1 - 85{,}000v_2 - 40{,}000v_3 + 400{,}000u_1 + 77u_2 \leq 0$
$u_1, u_2, v_1, v_2, v_3 \geq 0$

<u>Store 2</u>: *Maximize* $480{,}000u_1 + 80u_2$
Subject to $15v_1 + 120{,}000v_2 + 60{,}000v_3 = 1$
$-12v_1 - 100{,}000v_2 - 50{,}000v_3 + 500{,}000u_1 + 85u_2 \leq 0$
$-15v_1 - 120{,}000v_2 - 60{,}000v_3 + 480{,}000u_1 + 80u_2 \leq 0$
$-10v_1 - 90{,}000v_2 - 45{,}000v_3 + 430{,}000u_1 + 82u_2 \leq 0$
$-18v_1 - 150{,}000v_2 - 70{,}000v_3 + 620{,}000u_1 + 88u_2 \leq 0$
$-11v_1 - 85{,}000v_2 - 40{,}000v_3 + 400{,}000u_1 + 77u_2 \leq 0$
$u_1, u_2, v_1, v_2, v_3 \geq 0$

<u>Store 3</u>: *Maximize* $430{,}000u_1 + 82u_2$
Subject to $10v_1 + 90{,}000v_2 + 45{,}000v_3 = 1$
$-12v_1 - 100{,}000v_2 - 50{,}000v_3 + 500{,}000u_1 + 85u_2 \leq 0$
$-15v_1 - 120{,}000v_2 - 60{,}000v_3 + 480{,}000u_1 + 80u_2 \leq 0$
$-10v_1 - 90{,}000v_2 - 45{,}000v_3 + 430{,}000u_1 + 82u_2 \leq 0$
$-18v_1 - 150{,}000v_2 - 70{,}000v_3 + 620{,}000u_1 + 88u_2 \leq 0$
$-11v_1 - 85{,}000v_2 - 40{,}000v_3 + 400{,}000u_1 + 77u_2 \leq 0$
$u_1, u_2, v_1, v_2, v_3 \geq 0$

<u>Store 4</u>: *Maximize* $620{,}000u_1 + 88u_2$
Subject to $18v_1 + 150{,}000v_2 + 70{,}000v_3 = 1$
$-12v_1 - 100{,}000v_2 - 50{,}000v_3 + 500{,}000u_1 + 85u_2 \leq 0$
$-15v_1 - 120{,}000v_2 - 60{,}000v_3 + 480{,}000u_1 + 80u_2 \leq 0$
$-10v_1 - 90{,}000v_2 - 45{,}000v_3 + 430{,}000u_1 + 82u_2 \leq 0$
$-18v_1 - 150{,}000v_2 - 70{,}000v_3 + 620{,}000u_1 + 88u_2 \leq 0$
$-11v_1 - 85{,}000v_2 - 40{,}000v_3 + 400{,}000u_1 + 77u_2 \leq 0$
$u_1, u_2, v_1, v_2, v_3 \geq 0$

<u>Store 5</u>: *Maximize* $400{,}000u_1 + 77u_2$
Subject to $11v_1 + 85{,}000v_2 + 40{,}000v_3 = 1$
$-12v_1 - 100{,}000v_2 - 50{,}000v_3 + 500{,}000u_1 + 85u_2 \leq 0$
$-15v_1 - 120{,}000v_2 - 60{,}000v_3 + 480{,}000u_1 + 80u_2 \leq 0$
$-10v_1 - 90{,}000v_2 - 45{,}000v_3 + 430{,}000u_1 + 82u_2 \leq 0$
$-18v_1 - 150{,}000v_2 - 70{,}000v_3 + 620{,}000u_1 + 88u_2 \leq 0$
$-11v_1 - 85{,}000v_2 - 40{,}000v_3 + 400{,}000u_1 + 77u_2 \leq 0$
$u_1, u_2, v_1, v_2, v_3 \geq 0$

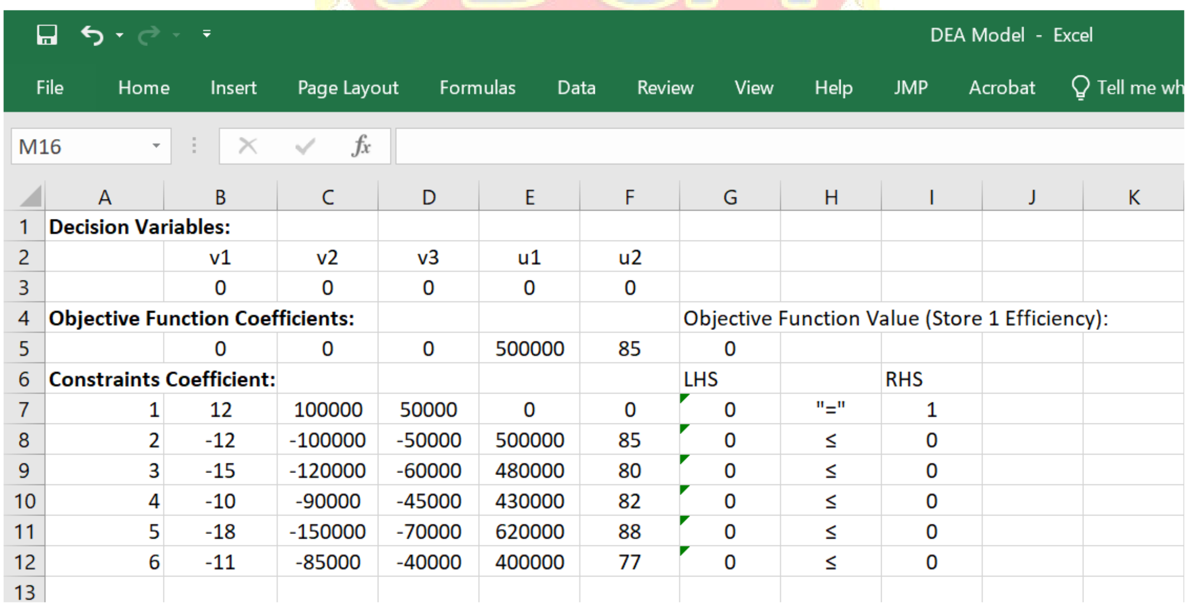
Appendix III: Solving the DEA Model Using Excel

This section provides step-by-step instructions on using Excel Solver to evaluate the relative efficiency of store 1 as an example. This process can be adapted for other stores by updating the relevant data.

Step 1: Set Up the DEA Model in Excel

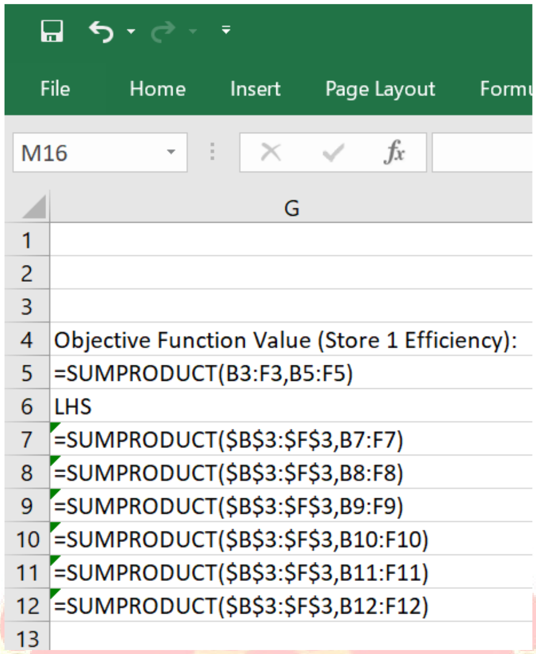
1. Set up decision variables v_1, v_2, v_3, u_1, and u_2 with initial values (e.g., 0). Any starting values should work. See rows 2 and row 3 in Figure 1. v_1, v_2, and v_3 represent weights for inputs: employees, inventory, and operating costs, respectively. u_1 and u_2 represent weights for outputs: sales and customer satisfaction.
2. Enter the coefficients in the objective function. Refer to cells B5:F5 in Figure 1 for the set up.
3. Enter the coefficients for each constraint, as shown in cells B7:F12.
4. Compute the objective function value, which represents store 1's efficiency score, in cell G5. The formula used in cell G5 can be seen in Figure 2.
5. For each constraint, calculate the left-hand-side (LHS) values in cells G7:G12. The formulas in these cells are shown in Figure 2.
6. Enter the constraint signs (≤ or =) and right-hand-side (RHS) values in columns H and I (cells H7:I12).

Figure 1: Screenshot of the DEA Model Setup for Store 1 in Excel



	A	B	C	D	E	F	G	H	I	J	K
1	Decision Variables:										
2		v1	v2	v3	u1	u2					
3		0	0	0	0	0					
4	Objective Function Coefficients:						Objective Function Value (Store 1 Efficiency):				
5		0	0	0	500000	85	0				
6	Constraints Coefficient:						LHS		RHS		
7	1	12	100000	50000	0	0	0	"="	1		
8	2	-12	-100000	-50000	500000	85	0	≤	0		
9	3	-15	-120000	-60000	480000	80	0	≤	0		
10	4	-10	-90000	-45000	430000	82	0	≤	0		
11	5	-18	-150000	-70000	620000	88	0	≤	0		
12	6	-11	-85000	-40000	400000	77	0	≤	0		
13											

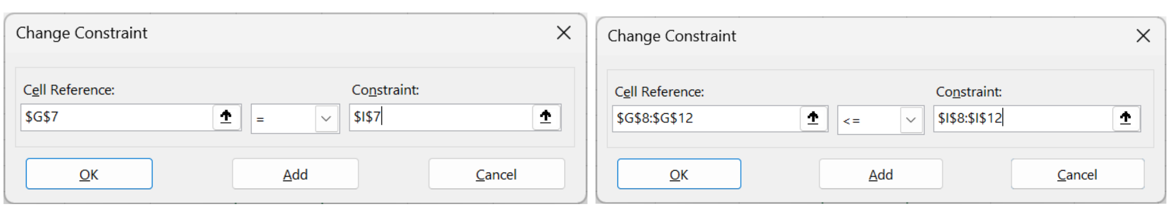
Figure 2: Screenshot of Formulas for Computing the Objective Function and Constraints in Excel



Step 2: Configure Solver to maximize store 1 efficiency

1. If Solver is not loaded, follow the instructions in [this Microsoft support guide].
2. Go to the 'Data' tab and select 'Solver' in the 'Analyze' group.
3. Set the 'Objective' cell as G5 (the calculated efficiency score for store 1). See Figure 4 for details.
4. Choose 'Max' to maximize store 1's efficiency score.
5. In the 'By Changing Variable Cells' field, enter B3:F3 (the cells containing the decision variables).
6. Add constraints to ensure the efficiency score for each store does not exceed 1. Refer to the screenshots below and Figure 3 for the complete Solver setup.

Figure 3: Setting up Constraints in Solver Parameter



7. Check the box for 'Make Unconstrainted Variables Non-Negative' to ensure the decision variables are non-negative.
8. Select 'Simplex LP' as the solving method since this is a linear programming model.
9. Click 'Solve' to calculate the optimal weights that maximize store 1's efficiency while satisfying the constraints. After Solver finds a solution, the values in cells B3:F3 will update to show the optimal weights for inputs and outputs, allowing store 1 to achieve maximum relative efficiency. The efficiency score for store 1 will be updated in cell G5.

Figure 4: Solver Parameter Input