Application of Data Envelopment Analysis on Banking

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INTRODUCTION

DEA is used to develop the excel model for this project

- The data envelopment analysis (DEA) method can be used to determine whether an organization/business is operating efficiently.
- Specifically, DEA can be used by inefficient organizations to benchmark efficient and best-practice organizations.
- **DEA provides an objective way to identify best practices in these service organizations and has consistently generated new insights that lead to substantial productivity gains that were not otherwise identifiable.**

METHODS AND APPROACH

- DATA & SCOPE FOR THE PROBLEM

- JPMorgan Chase Bank Dataset
- Data Source: Kaggle
- Number of Branches: 312
- Location: New York
- Data contains Institution name, branch name, branch number, Established Data, Address, City, county, state, zip code, inputs, and outputs.

For simplicity, the data has been downsized significantly (Only last 6 years data has been taken).

Inputs & Outputs of the DEA model

Inputs

- Direct staff cost
- Number of facilities
- Number of salespersons
- Existing customer base

Outputs

- Mortgage application secured
- Insurance sales
- Saving account sales
- Number of new saving accounts opened

MODEL APPROACH:

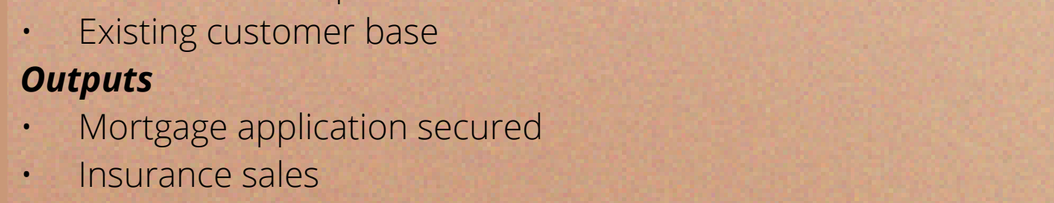
The following would be the anticipated result.

The efficiency of a bank is defined as

Efficiency of bank = Value of bank's outputs / Value of bank's inputs

Objective:

To develop an LP spreadsheet model, using the DEA methodology, to determine whether each bank branch of the JP Morgan chase organization is efficient in terms of using its inputs to produce its outputs.



Decision variables (changing cells): Unit inputs values, unit output values for selected branch

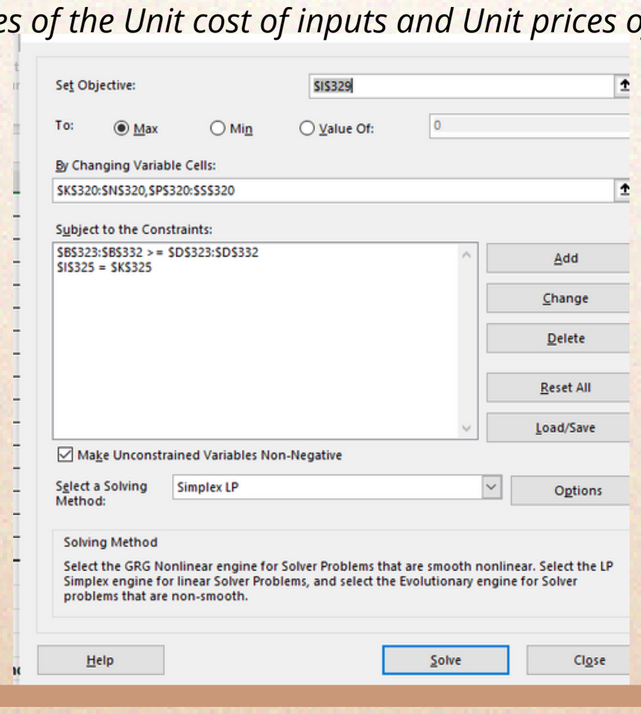
Objective (target cell): Total output value of selected bank branch

Other calculated variables: Total input cost, the total output value (for each branch)

CONSTRAINTS:

- Selected branch input cost must be equal to the nominal value.
- For branch numbers, input values must be greater than or equal to output values.

1. *Input cost of the selected branch = 1. This constraint sets the total value of each branch's inputs to 1.*
2. *Efficiency constraint: Input values >= Output values. This ensures that no branch is more than 100% efficient.*
3. *The solver replaces the values of the Unit cost of inputs and Unit prices of outputs with optimal values.*



RESULT

To maximize the selected branch output value and check whether the selected branch is efficient or not.

In this model, only 196 were found to be efficient. So, if we used the model result to close 125 branches, it may have a severe negative effect on the company, as we may close branches that are running efficiently. It would likely be a good idea to also supplement our model with analysis on how JPMorgan compares in performance to other banks in order to determine what course of actions needs to be taken based on the results of this model. If JPMorgan performs well, then look to improve to model the efficient branches. But, if JPMorgan performs poorly, then look for how the less efficient branches are held back, and potentially consider closing especially inefficient branches.

CONCLUSION

Ultimately, we found the model that we created to have several very useful applications for JPMorgan or any other large bank. It can accurately help to determine what branches of a bank are efficient, which can help the company make important decisions about these branches. One important way that this model can be useful is to help minimize risk by determining if some branches are so inefficient that they may need to be put out of operation. Furthermore, this model can help greatly improve a bank's profits by allowing the company to determine which branches perform better. This way, these branches can be further analyzed to understand how and why they perform better, which can be applied in the future to improve efficiency in all branches and increase profits. Overall, the DEA model is very useful and can help a bank learn important information about its branches that are vital to the future success of the company.

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