

Business Analytics

Take Home Assignment: Facility location problem

A company wants to set up a new European distribution network. There are N possible locations for a distribution center (DC). Fixed costs per year for opening a distribution center at location i are $F(i)$. Each DC can ship at most $S(i)$ pallets. The total demand per year (in pallets) for each delivery address (DA) j is $D(j)$. The transport costs (in EURO) for one pallet between the DCs and delivery addresses are $c(i,j)$.

The question is: which DCs will be opened such that total costs are minimized?

Questions:

A. Develop a linear optimization model to answer this question.

B. Solve the model for the following data:

- $N=37$, the possible locations are given in the Excel spreadsheet.
- Set of possible locations for DCs is same as set of DAs.
- Capacity $S(i)$ is 4000 pallets for all i .
- $D(j)$ is 100 pallets, for all locations j .
- $c(i,j)$ is equal to the distance between locations (1 euro per kilometer per pallet), for all locations i and j . The distances between locations are given in the Excel spreadsheet.

How many DCs are opened and in which locations when $F(i) = 100,000$ euro for all locations i ? Same questions for $F(i) = 150,000$ euro.

C. Make a short description (about ½ page) of a problem you encountered where optimization models could be applied.

Some remarks:

- You can use Excel, AIMMS or any other package of your choice.
- The input data can be found at www.fransderuiter.com/JADS.
- If you use Excel you need to download an extension to Excel, since the model size exceeds the limits of the native Excel solver. You can download the *OpenSolver* for this via: <https://opensolver.org/>. A description how to download and install this solver can be found on the website. The website also includes instructions for downloading and installing the extension, as well as a youtube tutorial video.
- You can send an e-mail to Frans de Ruiter (deruiter@cqm.nl) to check your model (part A), or to ask for hints if you get stuck on part A and/or B.
- You can send your answers to Frans de Ruiter (deruiter@cqm.nl) before Thursday June 7, 11.00 am.
- We will ask 1 or 2 of you to present your solution on June 8.