Prescriptive Analytics

Lab Assignment 2

Description

A current research project aims to identify directions for improvement of the justice courts in Poland. Specifically, the project aims to identify potential savings in the operation of courts as well as a potential increase in their production, i.e., how much the solved cases can increase. The results of this analysis are expected to facilitate the implementation of regulations and structural reforms to achieve an efficient allocation of public resources and rapid support to the citizens.

You have access to the data provided in the Excel file *"Courts_data_2024.xlsx"*. The dataset consists of 84 district courts that were responsible for dealing with criminal, civil and family cases in 2024. For each court, the number of employees, grouped into 6 categories (judges, clerks, court clerks, probation officers, assistants, other workers), as well as the average salary per category are provided. Generally, the salaries are considered fixed in each category. However, within each category, variations may be observed due to differences in the years of past experience that the employees may have had. In addition, the categories of court clerks, probation officers, assistants and other workers include several other sub-categories of employees with varying salary levels. The value of assets (tangible and intangible), the number of solved cases (criminal, civil, family) as well as the number of pending cases at the end of 2024, per each type of case, are also provided.

You are requested to answer the following questions:

Questions

1. Based on the provided dataset, identify which factors will be considered as inputs and as outputs in order to assess the courts' efficiency. *(15 points)*
2. In such a real case study, which returns to scale assumption is more realistic? *(15 points)*
3. Identify whether the assumption of common and exogenously fixed salaries is valid in this case study for all categories of employees. *(20 points)*
4. Based on your answers to the previous questions, build a model to estimate the cost efficiency of each court. *(25 points)*
5. Analyze the results. (*25 points*)

Bonus:

6. Develop a framework to estimate which courts can reduce the number of pending cases and which will be the associated extra cost. (30 points)

Note: You need to justify your answers.

Team formation

This is a team assignment. Every team will consist of 2-3 members. The members of a team may come from different groups. However, during the presentation day all members of a team are required to appear in the same group.

Important dates

- By 02/06/2025: Notification by email regarding the members of the team (one email by each team).
- By 16/06/2025: Every team will send by email the code developed and a presentation in which they will answer the above questions. In case the members of the team come from different groups, you need also to define in which group you will present.
- 16/06/2025: 5-minute presentation followed by questions.