Statistical Risk Management

Project-based Internship | Autumn 2023

NRGi ELCON

Outline

01 Motivation

02 Preliminary Problems

03 Scientific Methods and Data

04 Expected Output

Motivation

- The Contracting Division at ELCON is a large part of the business model and plays key role in the overall strategy.
  - At ELCON, contracting involves all the electrical work in building under construction, often involving fire systems, HVAC, and more.
  - ELCON is among the few electrical contractors in Denmark who have the capacity to work on large projects spanning over several years.
- In 2022, Contracting accounted for 25% of total revenue and had a 43% total effect on EBIT.
  - Contracting is ripe with risk and the margin for error is small.
  - Contracting has great influence on ELCON's overall finances.
- Currently, there is no formal statistical model in place to evaluate these risks, and all risk assessments, provisions, and impairments are based on a subjective assessment backed by fundamental calculations.
- A model based on a sound statistical foundation can turn hard facts into clear stories, and support the management at ELCON.

Preliminary Problems

A

Develop Time Series Model with Actuals, KPIs and KRIs

A time series model is essential, since it allows project managers to monitor changes in a project.

Model should include materials, hours worked, billable rate, invoiced amounts

B

Identify Key Risk Indicators (KRIs)

Identification of indicators is based on statistical analyses and a priori knowledge.

Defining the right KRIs will be essential, and tests must be conducted to be sure inference can be drawn from the indicators.

C

Utilize Machine Learning Methods to Highlight Causal Effects

Each project is unique and drawing on the benefits from ML allows for a standardized model capable of adapting to different circumstances.

ML will somewhat futureproof the analyses conducted and allows use beyond this project.

D

Construct Dashboard with KPIs and KRIs of Risky Projects

A simple dashboard allows for quick assessment and action.

Interpretability is of the essence since the targeted end users are not required an in depth understanding of statistics.

The mantra: “Hard facts, clear stories” should be lived by.

Scientific Methods and Data

ELCON stores a vast amount of data, and before any analyses can be conducted, the data must be cleaned and sorted.

Literature review will largely focus on advancements made in fields regarding data science.

Data Analysis Methods

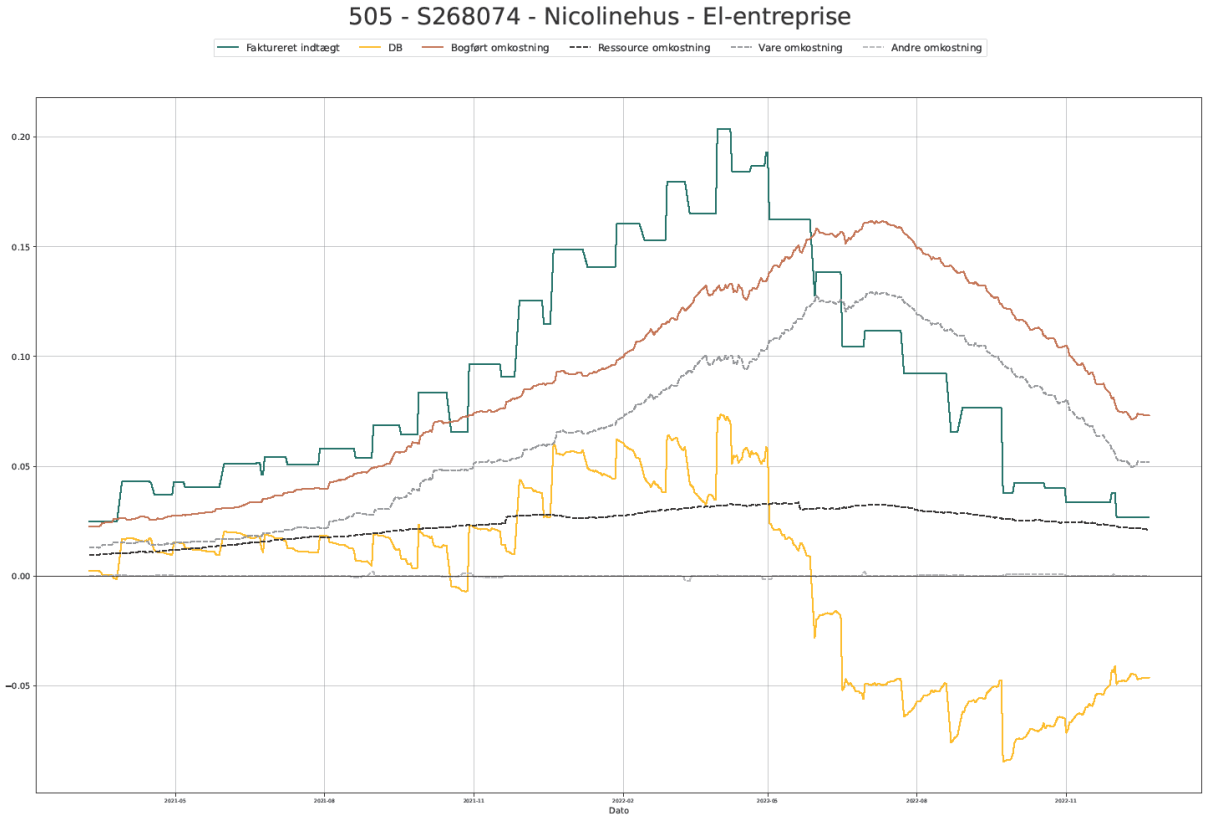
- Factor Analysis
  - Reduce dimensions from the get-go and establish a more manageable dataset.
- Random Forest
  - Serves as a proof of concept for the use of Machine Learning Methods.
- PLS-SEM
  - Relation between latent variables and observed data.
- AutoML
  - Blackbox ML allows ELCON to continue using the methods developed without expert knowledge of statistics and ML.

Potential Sources of Data

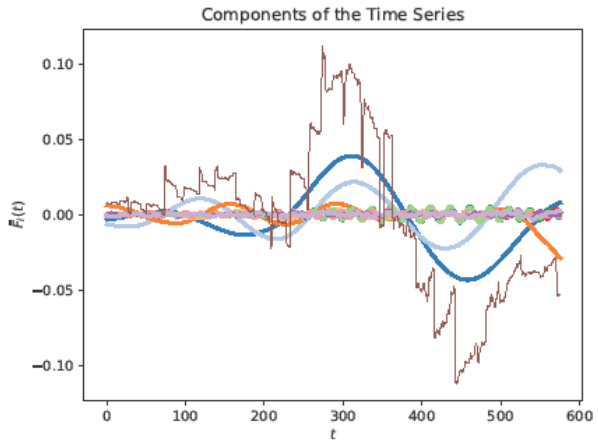
- Time Series Data
  - Hours registered by workers.
  - Materials purchased.
  - Invoices.
  - Budget from the tender processes.
- Macroeconomic Data
  - Overall sentiment.
  - Interest rate
  - Unemployment rate.
- Industry Specific Data
  - Overall activity
  - Order backlog
  - Unemployment rate.

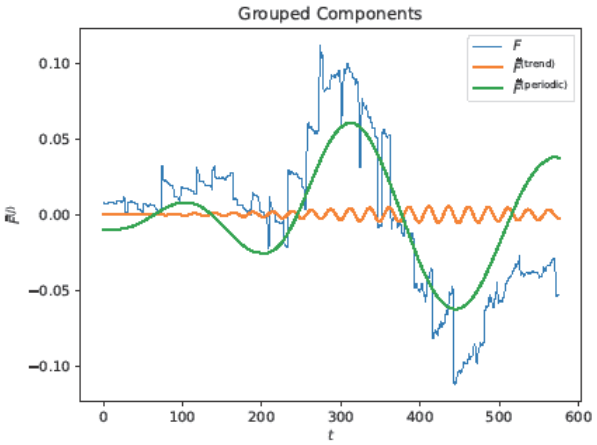
Expected Output

- Comprehensive data model with a variety of use cases.
- Contracting Dashboard with KPIs and KRIs.
  - Identification of risky projects.
  - Identification of areas of improvement.
  - Highlight trends and patterns in data.
- Insight into underlying risk factors.



The right-hand side shows a draft of the time series model, coupled with a Principal Component Analysis of contribution margin (DB).





NRGi ELCON