

Time Series Analysis - Project 3

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Try to identify some structural equation for these three, show some effort and then this should be straight forward.
Not all of the data should be in the model, we need to find the key variables.

Project 3 consist of three different assignments. The emphasis is to learn how to conduct causal time series analysis. Additional efforts can result in extra points that could make up for lack of points in other assignments.

Brain storming excersice (10%)

Identify causal variables and hypothesize an econometric structural equation for the following variables;

- Stock price index, for your home country,
- Scandinavian electricity market(Nordpool) or the electrical market of your home country(for foreign students only, as there is no spot market in Iceland),
- Inflation.

Comment on the sign and possible magnitudes and discuss whether all of the required data are available.

Housing Economics (40%)

Housing is the highest spending category for most people, so general knowledge of house price dynamics should be something known to smart people (referring to yourself). The objective of this task is to provide you with the basic knowledge so that you can solve the economic question, “*buy or lease*”, for yourself. Foreign students can use similar data from their home economy.

The data *hpi.csv* consist of the following variables;

- House price index (flats)
- Lease index
- Construction cost index
- Number of real estate sales
- Central bank rates
- Loans from banks to households
- New housing starts
- New housing finished
- Purchasing power index
- Purchasing power of wages index
- Un-indexed loans in the economy
- Indexed loans in the economy

- Currency dependent loans in the economy

Task 1 Construct a structural equation for house prices. Theorize on the expected sign of the parameter estimates on each of the variables. Does it make sense to use all of the data? Theorize, which data to use and explain your data selection.

Task 2 Plot the relationship between house prices and leasing over time. Theorize on the relationship between the two variables. Is there an endogenous relationship between the two? Do some preliminary analysis, plotting all variables with the house price index.

Task 3 Create a model for the house price index using the relevant available data.

Task 4 Identify two major periods of economic change from the time series. Create a dummy variables to describe the economic change. Discuss what you could use the model for.

Sales modeling (50%)

Sales are a variable of great interest in retail. Marketing is one variable that can easily be measured, so a causal model can be used to estimate the effect of marketing on sales.

This case study is on a building supply store in Norway and consists of many stores located throughout the country.

The data *BuildingSupplyStore.csv* consist of the following variables;

Fundamental data

- Date
- Sales
- Season - in order to speed up the modeling process
- Kalendar
- Week.of.Month - could be modelled as a factor()
- Salgdage - Sum of days that stores are open that week

Week.of.Month - er bara að segja okkur hvaða vika er í mánuðinum, þ.e. 1 þýðir bara 1 vika mánaðarins, fólk oft að eyða meira 1 viku mánaðarins, minna í viku 2, í 3ju viku er fólk farið að spara því peningarnir að verða búnir.

Kennari vonar að það sé nóg að eyða tveimur kvöldum í þetta og þá ættum við að vera búnin með þetta (með því að mæta á laugardaginn 18.okt) en mögulega hefur hann rangt fyrir sér.

Economy

- Unemployment.rate

building hardware store calls people and ask "where do you go to buy blabla", the answer is registered as either 0 or 1 (depending on whether they buy at that store or someplace else, (I think))

Tracking

- Tracking - Top-of-mind awareness
- Tracking.smoothed

Weather variables

- Sol.Oslo - sun hours in Sunny Oslo
- Oslo... Mean.temperature
- Oslo... Total.precipitation
- Bergen... Mean.temperature - Bergen is Norways second largest city
- Bergen... Total.precipitation - Rainy Bergen

Media spendings

Included the season, just to speed up, don't have to calculate the season ourselves.

Do a basic regression and use that to include new variables trying to identify which variables to use.

- Print
- InStore
- DirectMarketing
- RADIO
- TV.Taktisk
- TV.Image
- Respons.Media - how the media variable could look like - compare your to this one
- Competitor.spending

Task 1 Construct a sales model for the data. Theorize on the expected sign of the parameter estimates on each of the variables. Does it make sense to use all of the data? Theorize, which data to use and explain your data selection.

Task 2 Do some preliminary analysis. Plotting, decomposition, etc.

Task 3 Create a preliminary sales model and create adstock variables of the media spendings so that you only have one variable for adstocked media. Likewise, use the preliminary model to select a weather variable and a tracking variable.

Task 4 Create a best fit sales model. A new season variable and monthly season variables would help in making the fit better.

Task 5 Calculate the effect of all variables and standardize the effects so that each effect reflects the true effect. Calculate the $ROI = \text{Media effect on sales} / \text{Sum of all media spendings}$