8.04 Time Series II

Time Series Forecasting with FB Prophet

- Facebook developed an open sourcing Prophet, a forecasting tool available in Python

- It provides intuitive parameters which are easy to tune

- Even someone who lacks deep expertise in time-series forecasting models can use this to generate meaningful predictions for a variety of business use cases

Time Series Forecasting with FB Prophet

- Producing high quality forecasts is not an easy problem for either machines or for most analysts.

- FB observed two main themes in the practice of creating a variety of business forecasts:
  - Completely automatic forecasting techniques can be fragile and they are often too inflexible to incorporate useful assumptions.
  - Analysts who can product high quality forecasts are quite rare because forecasting is a specialized data science skill requiring substantial experience.

Key Highlights of FB Prophet

- Very fast, since it's built in Stan, a programming language for statistical inference written in C++

- An additive regression model where non-linear trends are fit with yearly, weekly, and daily seasonality, plus holiday effects

- Robust to missing data and shifts in the trend, and typically handles outliers

- Easy procedure to tweak and adjust forecast while adding domain knowledge or business insights

FB Prophet Forecasting Model

- FB Prophet uses a decomposable time series model with three main model components: trend, seasonality, and holidays.

- They are combined in the following equation:
    $$y(t) = g(t) + s(t) + h(t) + \varepsilon t$$

- g(t): piecewise linear or logistic growth curve for modeling non-periodic changes in time series

- s(t): periodic changes (e.g. weekly/yearly seasonality)

- h(t): effects of holidays (user provided) with irregular schedules

- εt: error term accounts for any unusual changes not accommodated by the model

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