MGMT 675

AI-ASSISTED FINANCIAL ANALYSIS

RICE | BUSINESS
Jones Graduate School of Business

AUTOREGRESSION

OVERVIEW

- We want to forecast a time series.
  - returns, interest rates, oil price, cash flows, …
- Possible models:
  - ARIMA (autoregressive integrated moving average)
  - exponential smoothing
  - neural networks
- We'll do AR models.

AUTOCORRELATIONS

- Autocorrelation = correlation of a variable with its lagged value
- First-order autocorrelation $= \text{corr}(x_t\,, x_{t+1}\,)$
- p–th order autocorrelation $= \text{corr}(x_t\,, x_{t+p}\,)$
  - E.g., $p = 12$ in monthly data or $p = 4$ in quarterly data because of seasonality

AUTOCORRELATION OF HML

- Ask Julius to use pandas-datareader to download the monthly Fama-French factors from Ken French's data library.
- Ask Julius to produce a plot of the autocorrelation function (acf) for HML.

AUTOREGRESSIONS

- An autoregression is a regression of a variable on its own lags:

$$x_t = \alpha + \beta_1 x_{t-1} + \cdots + \beta_p x_{t-p} + \varepsilon_t$$

- Ask Julius to fit an AR(1) for HML.
- Ask Julius to use the AR(1) model to forecast HML for the next 12 months and to plot the last 2 years and the forecasts.

MORE EXAMPLES

Ask Julius to plot the ACF, fit an AR model, and forecast the following:

- Percent change in crude price: Ask Julius to use pandas-datareader to download crude oil prices starting in 1980 from FRED, to downsample to end-of-month, and to compute percent changes.
- Change in Treasury yields: Ask Julius to use pandas-datareader to download 10-year Treasury yields starting in 1980 from FRED, to downsample to monthly, and to compute changes.

VECTOR AUTOREGRESSION

- Forecast related variables based on their mutual lags
- Example: does this month's SMB return forecast next month's HML return?
- Ask Julius to run a VAR(1) on the Fama-French factors and provide a summary of the results.