ECON/FIN 250: Forecasting in Finance and Economics: Section 4.1 Forecasting Fundamentals

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Spring 2016
Course Overview

1. Loss Functions
2. Forecast Statement
3. Forecast Horizons
4. Information Set
5. Parsimony and Bias
Loss Functions

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Decision Environment

- Forecasts $\rightarrow$ Decisions
- Decisions $\rightarrow$ Gains or Losses
Agent wants to minimize losses:

<table>
<thead>
<tr>
<th></th>
<th>Demand High</th>
<th>Demand Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase Inventory</td>
<td>0</td>
<td>10,000</td>
</tr>
<tr>
<td>Reduce Inventory</td>
<td>10,000</td>
<td>0</td>
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Forecaster wants to minimize losses:

<table>
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<tr>
<th></th>
<th>High Sales</th>
<th>Low Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecast High Sales</td>
<td>0</td>
<td>500</td>
</tr>
<tr>
<td>Forecast Low Sales</td>
<td>1,000</td>
<td>0</td>
</tr>
</tbody>
</table>
Forecast Losses: Loss Function (L)

- Squared Error: $L(e) = e_t^2 = (y_t - \hat{y}_t)^2$
- Absolute Error: $L(e) = |e_t| = |y_t - \hat{y}_t|$
- Asymmetric Losses
  - Sign Matching
    \[
    L(e) = \begin{cases} 
    1, & \text{if } \text{sign}(\Delta y) \neq \text{sign}(\Delta \hat{y}) \\
    0, & \text{otherwise.}
    \end{cases}
    \] (1)
- Trading rule profits
  \[
  E[\alpha_t(l_t)r_{t+1} + (1 - \alpha_t(l_t))r_f]
  \] (2)
Forecast Statement

1 Loss Functions

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Forecast Object

- Point Forecast: $\hat{y}_t$
- Interval Forecast: $[\hat{y}_L, \hat{y}_H]$
- Density Forecast
- Discrete Forecast / Probability Forecast
  - Euro collapse, market crash, super bowl
  - Stata is actually good at this (logistic regression)
  - We will not have time for this
- Timing Forecast (when will a bubble burst)
- Alternative Histories (Counter Factual)
Forecast Horizons

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Forecast Horizon

- How far into the future?
  - Data observations from 1 to T
  - Forecasts T+1, T+2, ..., T+h
- Methods for h-step ahead forecasts
  - Direct to T+h
  - Dynamic to T+h
Information Set

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Information Set

- Current and lagged target series: $y_t, y_{t-1}, y_{t-2}, \ldots$
- Other series: $x_t, x_{t-1}, x_{t-2}, \ldots$
- Need to be very careful
  - Trading rules (exactly what is known)
  - Macro forecasting (revised numbers)
- Real time forecasts
1. Loss Functions

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In sample bias and/or “overfitting”

- Complex models fit current data well, but lousy forecasts
- Fitting every little wiggle in sample (even random wiggles)

Push toward simple models

- Fewer parameters
- Much more on this
In Sample Bias

- Data (1960-2013), monthly
- “In sample” forecasting
  - Fit model \( y_t = \rho y_{t-1} + \epsilon \) using all the data (1960-2013)
  - Generate 1 month ahead forecasts for 2012-2013
- This is somewhat unfair (why?)
- True “out of sample” experiment
  - Estimate using only data in (1960-2011)
  - Forecast 2012-2013
“Essentially, all models are wrong, but some are useful.”


“Just as the ability to devise simple but evocative models is the signature of the great scientist, so overelaboration and overparameterization is often the mark of mediocrity.”