PERENCANAAN & PENGENDALIAN PRODUKSI

TIN 4113
Pertemuan 2

• **Outline:**
  – Karakteristik Peramalan
  – Cakupan Peramalan
  – Klasifikasi Peramalan
  – Metode Forecast: *Time Series*
  – Simple Time Series Models:
    • Moving Average (Simple & Weighted)

• **Referensi:**
  – Pujawan, Demand Forecasting Lecture Note, IE-ITS, 2011.
Peramalan...

Kenapa???
Memprediksi masa depan...

Hal yang sangat sulit!!!!!

Every woman is frightened of a mouse.
MGM head Louts B. Mayer in 1926, to young cartoonist named Walt Disney

640k ought to be enough for anybody.
Bill Gates, Microsoft founder, 1981

The Internet will collapse within a year.
Bob Metcalf, founder of 3Com Corporation, in December 1995

Sumber: Forecasting for the Pharmaceutical Industry (Cook, 2006)
Cakupan Peramalan

• Berdasarkan Kategori Tingkat Keputusan
  – Tingkat Kebijakan
  – Tingkat Produk
  – Tingkat Proses
  – Tingkat Desain Pabrik
  – Tingkat Operasional
Cakupan Peramalan

• Berdasarkan Unit Bisnis
  – Perencanaan Keuangan
  – Perencanaan Pemasaran
  – Perencanaan Produksi
  – Perencanaan Penjadwalan
Characteristic of Forecasts

- Forecast involves error >>>> they are usually wrong
- Family forecast are more accurate than item forecast. Aggregate forecasts are more accurate.
- Short-range forecasts are more accurate than long-range forecasts
- A good forecast is more than a single number.
Demand Management

Where possible, calculate demand rather than forecast. If not possible...

Independent Demand
(finished goods and spare parts)

Dependent Demand
(components)
Demand Estimates
Sales Forecast
Production Resource Forecast
## Examples of Production Resource Forecasts

<table>
<thead>
<tr>
<th>Forecast Horizon</th>
<th>Time Span</th>
<th>Item Being Forecast</th>
<th>Units of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-Range</td>
<td>Years</td>
<td>• Product lines&lt;br&gt;• Factory capacities&lt;br&gt;• Planning for new products&lt;br&gt;• Capital expenditures&lt;br&gt;• Facility location or expansion&lt;br&gt;• R&amp;D</td>
<td>Dollars, tons, etc.</td>
</tr>
<tr>
<td>Medium-Range</td>
<td>Months</td>
<td>• Product groups&lt;br&gt;• Department capacities&lt;br&gt;• Sales planning&lt;br&gt;• Production planning and budgeting</td>
<td>Dollars, tons, etc.</td>
</tr>
<tr>
<td>Short-Range</td>
<td>Weeks</td>
<td>• Specific product quantities&lt;br&gt;• Machine capacities&lt;br&gt;• Planning&lt;br&gt;• Purchasing&lt;br&gt;• Scheduling&lt;br&gt;• Workforce levels&lt;br&gt;• Production levels&lt;br&gt;• Job assignments</td>
<td>Physical units of products</td>
</tr>
</tbody>
</table>
Klasifikasi Peramalan

• Kualitatif
  – Sales force composite
  – Survey Pasar
  – Keputusan Manajemen (*Jury of executive opinion*)
  – The Delphi Method

• Kuantitatif
  – Time series
Time Series

• Selalu menggunakan data historis (Naïve methods)

• Komponen time series:
  – Trend
  – Seasonality
  – Cycles
  – Randomness
Simple Time Series Models

- Moving Average (Simple & Weighted)
- Exponential Smoothing (Single)
- Double Exponential Smoothing (Holt’s)
- Winter’s Method for Seasonal Problems
Simple Moving Average

- Forecast $F_t$ is average of $n$ previous observations or actuals $D_t$:

\[
F_{t+1} = \frac{1}{n} \left( D_t + D_{t-1} + \cdots + D_{t+1-n} \right)
\]

\[
F_{t+1} = \frac{1}{n} \sum_{i=t+1-n}^{t} D_i
\]

- Note that the $n$ past observations are equally weighted.
- Issues with moving average forecasts:
  - All $n$ past observations treated equally;
  - Observations older than $n$ are not included at all;
  - Requires that $n$ past observations be retained;
  - Problem when 1000's of items are being forecast.
Example of Simple Moving Average

<table>
<thead>
<tr>
<th>Week</th>
<th>Demand</th>
<th>3-Week</th>
<th>6-Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>650</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>678</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>720</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>785</td>
<td>682.67</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>859</td>
<td>727.67</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>920</td>
<td>788.00</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>850</td>
<td>854.67</td>
<td>768.67</td>
</tr>
<tr>
<td>8</td>
<td>758</td>
<td>876.33</td>
<td>802.00</td>
</tr>
<tr>
<td>9</td>
<td>892</td>
<td>842.67</td>
<td>815.33</td>
</tr>
<tr>
<td>10</td>
<td>920</td>
<td>833.33</td>
<td>844.00</td>
</tr>
<tr>
<td>11</td>
<td>789</td>
<td>856.67</td>
<td>866.50</td>
</tr>
<tr>
<td>12</td>
<td>844</td>
<td>867.00</td>
<td>854.83</td>
</tr>
</tbody>
</table>
Weighted Moving Average

Forecast is based on \( n \) past demand data, each given a certain weight. The total weight must equal to 1.

\[
F_{t+1} = (w_t D_t + w_{t-1} D_{t-1} + \cdots + w_{t+1-n} D_{t+1-n})
\]

Re-do the above example, using 3 past data, each given a weight of 0.5, 0.3, and 0.2 (larger for more recent data)
Pertemuan 3 - Persiapan

• **Tugas Baca:**
  – Metode Peramalan:
    • Simple Time Series Model:
      – Exponential Smoothing (Single)
      – Double Exponential Smoothing (Holt’s)
      – Winter’s Method for Seasonal Problems
    – *Error Forecast*
      • MAD
      • MSE
      • MAPE
      • MFE atau Bias
SAMPAL JUMPA MINGGU DEPAN