PERTEMUAN 5

PERAMALAN PERMINTAAN

POKOK BAHASAN

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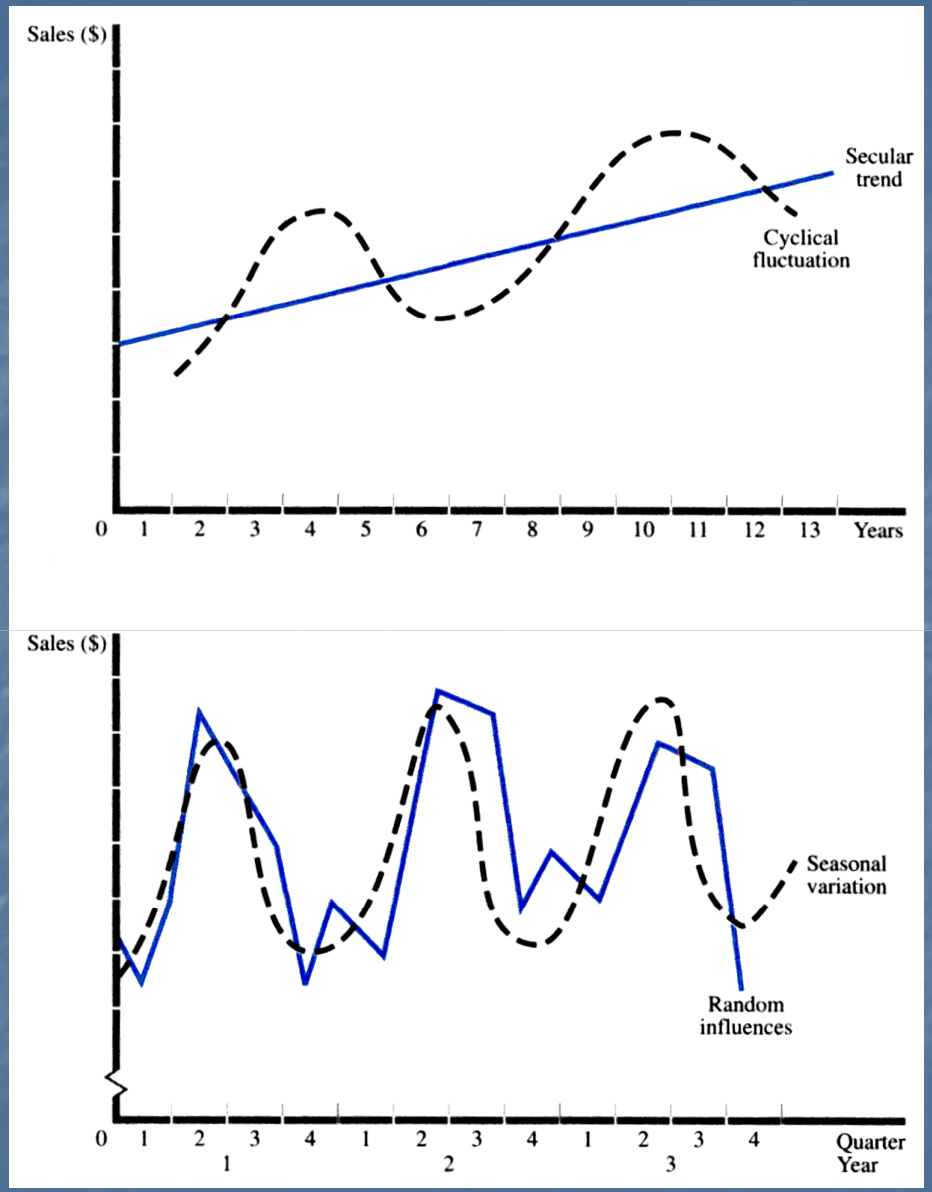
5.2. Analisis Deret-Waktu
5.3. Teknik Penghalusan
5.4. Metode Barometrik
5.5. Model Ekonometrik
5.6. Peramalan Input-Output

5.1. Peramalan Kualitatif

- Teknik Survei
  - Perencanaan Pabrik dan Belanja Alat
  - Perkiraan Penjualan dan Perubahan Persediaan
  - Rencana Belanja Konsumen
- Jajak Pendapat (Opinion Polls)
  - Eksekutif Bisnis
  - Tenaga Penjual
  - Keiinginan Konsumen

5.2. Analisis Deret-Waktu

- Trend Sekuler (Secular Trend)
  - Kenaikan atau penurunan nilai data dalam jangka panjang
- Fluktuasi Siklus (Cyclical Fluctuations)
  - Ekspansi atau kontraksi yang berulang dalam jangka panjang
- Variasi Musiman (Seasonal Variation)
  - Fluktuasi yang terjadi secara teratur
- Pengaruh Acak (Random Influences)
  - Variasi akibat peristiwa tak terduga


Sales ($)
Secular trend
Cyclical fluctuation
0 1 2 3 4 5 6 7 8 9 10 11 12 13 Years
Sales ($)
Seasonal variation
Random influences
0 1 2 3 4 1 2 3 4 1 2 3 4 Quarter
1 2 3 Year

Proyeksi Trend

- Trend Linier:
  $S_t = S_0 + b\ t$
  b = Pertumbuhan per periode waktu
- Tingkat Pertumbuhan Tetap:
  $S_t = S_0 (1 + g)^t$
  g = Tingkat pertumbuhan
- Estimasi Tingkat Pertumbuhan:
  $\ln S_t = \ln S_0 + t \ln (1 + g)$

Variasi Musiman

Metode Rasio Trend

$$\text{Rasio Trend} = \frac{\text{Aktual}}{\text{Ramalan Trend}}$$

$$\text{Penyesuaian Musiman} = \text{Rata-rata rasio untuk tiap periode musim}$$

$$\text{Ramalan yang Disesuaikan} = \text{Ramalan Trend} \bullet \text{Penyesuaian Musiman}$$

Variasi Musiman

Contoh Perhitungan untuk Kuartal 1

Ramalan Trend untuk 2010.1 = 11.90 + (0.394)(17) = 18.60

Ramalan yang Disesuaikan untuk 2010.1 = (18.60)(0.8869) = 16.50

Tahun	Ramalan Trend	Aktual	Rasio
2006.1	12.29	11.00	0.8950
2007.1	13.87	12.00	0.8652
2008.1	15.45	14.00	0.9061
2009.1	17.02	15.00	0.8813
Penyesuaian Musiman =			0.8869

5.3. Teknik Penghalusan

Rata-rata Bergerak

Hasil peramalan merupakan rata-rata dari nilai data selama w periode sebelumnya sampai titik data yang akan diramalkan.

$$F_t = \sum_{i=1}^{w} \frac{A_{t-i}}{w}$$

Penghalusan Eksponensial

Hasil peramalan merupaan rata-rata tertimbang dari nilai ramalan dan nilai aktual selama periode sebelumnya.

$$F_{t+1} = wA_t + (1-w)F_t$$

$$0 \le w \le 1$$

Kesalahan Akar Rata-rata Kuadrat (Root Mean Square Error = RMSE)

Mengukur Keakuratan Metode Peramalan

$$RMSE = \sqrt{\frac{\sum (A_t - F_t)^2}{n}}$$

5.4. Metode Barometrik

- National Bureau of Economic Research
- Department of Commerce
- Leading Indicators
- Lagging Indicators
- Coincident Indicators
- Composite Index
- Diffusion Index

5.5. Model Econometrik

Model Persamaan Tunggal untuk Permintaan Cereal

$$Q_X = a_0 + a_1P_X + a_2Y + a_3N + a_4P_S + a_5P_C + a_6A + e$$

Q_X = Jumlah Cereal

P_X = Harga Cereal

Y = Pendapatan Konsumen

N = Jumlah Penduduk

P_S = Harga Muffins

P_C = Harga Susu

A = Periklanan

e = Kesalahan Acak

Model Econometrik

Model Persamaan Simultan untuk Pendapatan Nasional (GNP)

$$C_t = a_1 + b_1 GNP_t + u_{1t}$$

$$I_t = a_2 + b_2 \pi_{t-1} + u_{2t}$$

$$GNP_t \equiv C_t + I_t + G_t$$

Bentuk Persamaan yang Disederhanakan

$$GNP_t = \frac{a_1 + a_2}{1 - b_1} + \frac{b_2 \pi_{t-1}}{1} - b_1 + \frac{G_t}{1 - b_1}$$

5.6. Peramalan Input-Output

Tabel Alur Input-Output Tiga Sektor

	Producing Industry				
Supplying Industry	A	B	C	Final Demand	Total
A	20	60	30	90	200
B	80	90	20	110	300
C	40	30	10	20	100
Value Added	60	120	40		220
Total	200	300	100	220	

Matriks Kebutuhan Langsung

$$\text{Kebutuhan Langsung} = \frac{\text{Kebutuhan Input}}{\text{Kolom Total}}$$

	Producing Industry		
Supplying Industry	A	B	C
A	0.1	0.2	0.3
B	0.4	0.3	0.2
C	0.2	0.1	0.1

Matriks Kebutuhan Total

	Producing Industry		
Supplying Industry	A	B	C
A	1.47	0.51	0.60
B	0.96	1.81	0.72
C	0.43	0.31	1.33

Matriks Kebutuhan Total				Vektor Permintaan Akhir		Vektor Permintaan Total
1.47	0.51	0.60	•	90	=	200
0.96	1.81	0.72		110		300
0.43	0.31	1.33		20		100

Tabel Alur Input-Output Perbaikan

	Producing Industry				
Supplying Industry	A	B	C	Final Demand	Total
A	22	62	31	100	215
B	88	93	21	110	310
C	43	31	10	20	104

LATIHAN 5

1. The table below shows annual demand (in 100,000 units per year) for Fridgets (they're like Widgets, only cooler). Use this information to calculate a linear trend forecasting model using regression analysis. Use your trend estimate to forecast demand for the years 2011 and 2016.

Year	2006	2007	2008	2009
Demand	1	4	5	8

2. The table below shows annual demand (in 100,000 units per year) for Smidgets (they're like Widgets, only smaller). Use this information to calculate a linear trend forecasting model using regression analysis. Use your trend estimate to forecast demand for the years 2012 and 2017.

Year	2006	2007	2008	2009
Demand	2	4	5	9

3. The table below shows annual demand (in 1,000,000 units per year) for Widgets. Use this information to calculate a constant growth forecasting model. Use your growth model to forecast demand for the years 2011 and 2016.

Year	2006	2007	2008	2009
Demand	1.1	1.5	1.5	1.8

4. The table below shows annual demand (in 1,000 units per year) for Widjets (they're like Widgets, only faster). Use this information to calculate a constant growth forecasting model. Use your growth model to forecast demand for the years 2012 and 2017.

Year	2006	2007	2008	2009
Demand	1.0	1.4	1.5	1.7

5. The table below shows semi-annual demand (in 1,000s) for Shidgets (they're like Widgets, only quieter). A linear trend has been estimated using this data set with t = 1 for 2006.1 and t = 8 for 2009.2. It has an intercept of 0.76 and a slope of 0.20. Use the ratio-to-trend method to calculate seasonal adjustment factors for the first and second half of the year and then forecast the level of demand for 2011.1 and 2011.2. Note: round all intermediate calculations to two decimal places.

Year	Demand
2006.1	1.0
2006.2	1.1
2007.1	1.4
2007.2	1.5
2008.1	1.8
2008.2	1.9
2009.1	2.3
2009.2	2.3

6. The table below shows semi-annual demand (in 1,000s) for Didgets (they're like Widgets, only they're easier to work). A linear trend has been estimated using this data set with t = 1 for 2007.1 and t = 6 for 2007.2. It has an intercept of 1.66 and a slope of 0.24. Use the ratio-to-trend method to calculate seasonal adjustment factors for the first and second half of the year and then forecast the level of demand for 2012.1 and 2012.2. Note: round all intermediate calculations to two decimal places.

Year	Demand
1991.1	1.8
1991.2	2.4
1992.1	2.2
1992.2	2.8
1993.1	2.5
1993.2	3.3

7. The table below shows the demand for Fidgets (they're like Widgets, only they're more active) over an eight month period. Calculate a four-period moving average forecast for September. Also evaluate the quality of the four-period moving average forecasting model by calculating the root mean square error for the data set. Note: round all intermediate calculations to two decimal places.

Month	Demand
Jan	10
Feb	11
Mar	5
Apr	8
May	6
Jun	11
Jul	5
Aug	11

8. The table below shows the demand for Gadgets (they're like Widgets, only they're more mechanical) over a five-month period. Calculate exponential smoothing forecasts for each month and for July. Use a coefficient of 0.5 and assume that the forecast for January was 8. Also evaluate the quality of the exponential smoothing model by calculating the root-mean-square error for the data set. Note: round all intermediate calculations to two decimal places.

Month	Demand
Jan	10
Feb	5
Mar	10
Apr	8
May	5
Jun	10

9. A firm has determined that its average level of sales (S_t) per week in \$1,000s during a given year depends on the previous year's level of sales (S_{t-1}), the previous year's level of advertising (A_{t-1}) per month in \$1,000s, and the current year's rate of annual industry growth (G_t) in percentage terms. The firm has also determined that the level of industry growth in the current period depends on the previous period's rate of industry growth (G_{t-1}) and on current period sales by the firm. During the current period, the firm's level of sales was \$100,000, advertising was \$40,000, and the rate of growth in the industry was 4%. The firm estimated the following two-equation econometric model:

   $S_t = 4 + 0.40\ S_{t-1} + 0.10\ A_{t-1} + G_t$ and $G_t = 1 + 0.5\ G_{t-1} + 0.5\ S_t$

   (i) Formulate a single-equation forecasting equation from this model.

   (ii) Forecast the level of sales in the next period.

10. A firm has determined that its average level of sales (S_t) per week in \$1,000s during a given year depends on the previous year's level of sales (S_{t-1}), the previous year's level of advertising (A_{t-1}) per month in \$1,000s, and the current year's rate of annual industry growth (G_t) in percentage terms. The firm has also determined that the level of industry growth in the current period depends on the previous period's rate of industry growth (G_{t-1}) and on current period sales by the firm. During the current period, the firm's average level of sales was \$100,000, advertising was \$10,000, and the rate of growth in the industry was 2%. The firm estimated the following two-equation econometric model:

$S_t = 5 + 0.50\ S_{t-1} + 0.10\ A_{t-1} + 2\ G_t$ and $G_t = 0.5\ G_{t-1} + 0.25\ S_t$

(i) Formulate a single-equation forecasting equation from this model.

(ii) Forecast the level of sales in the next period.