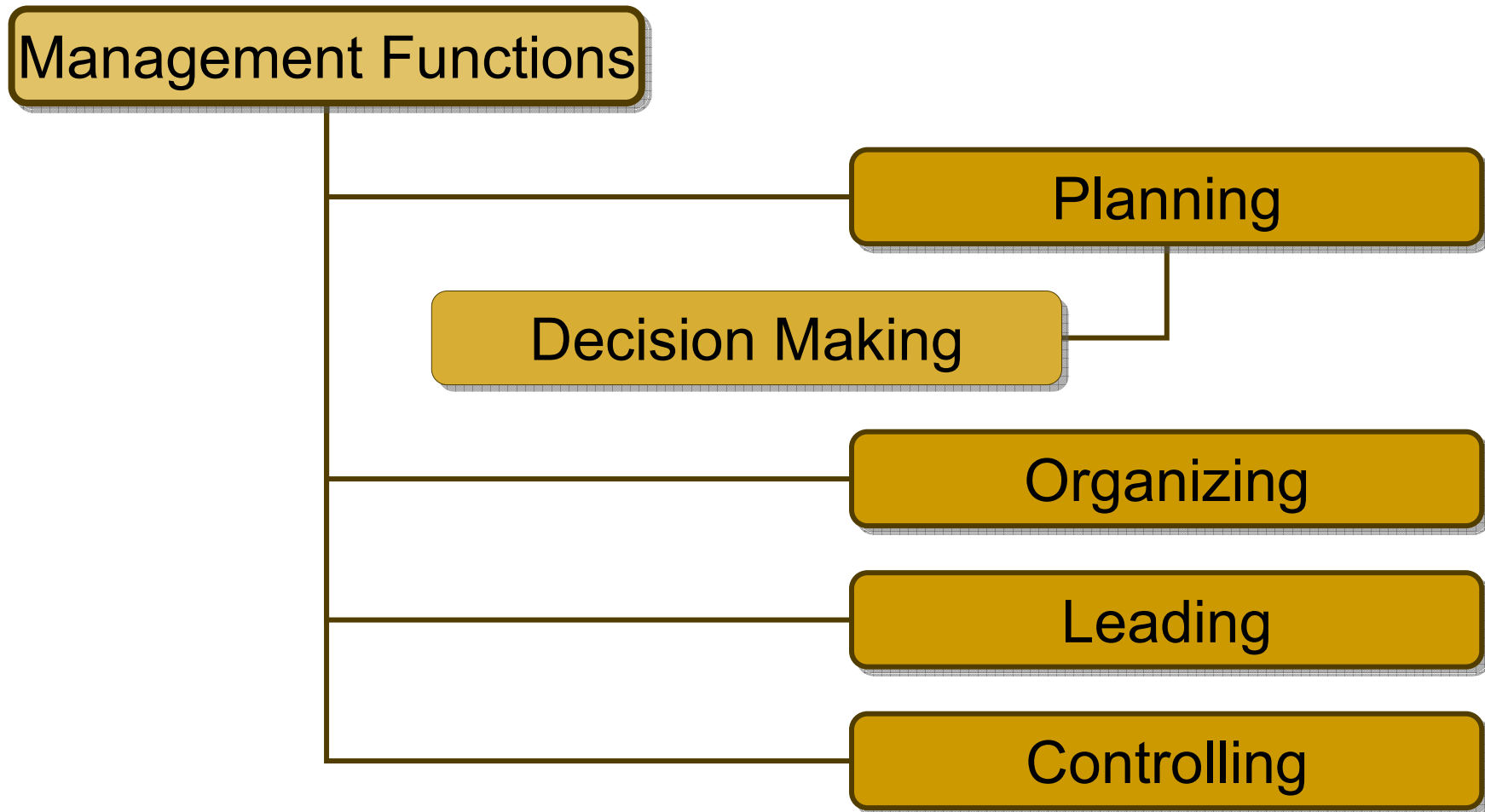

IENG 450
INDUSTRIAL MANAGEMENT

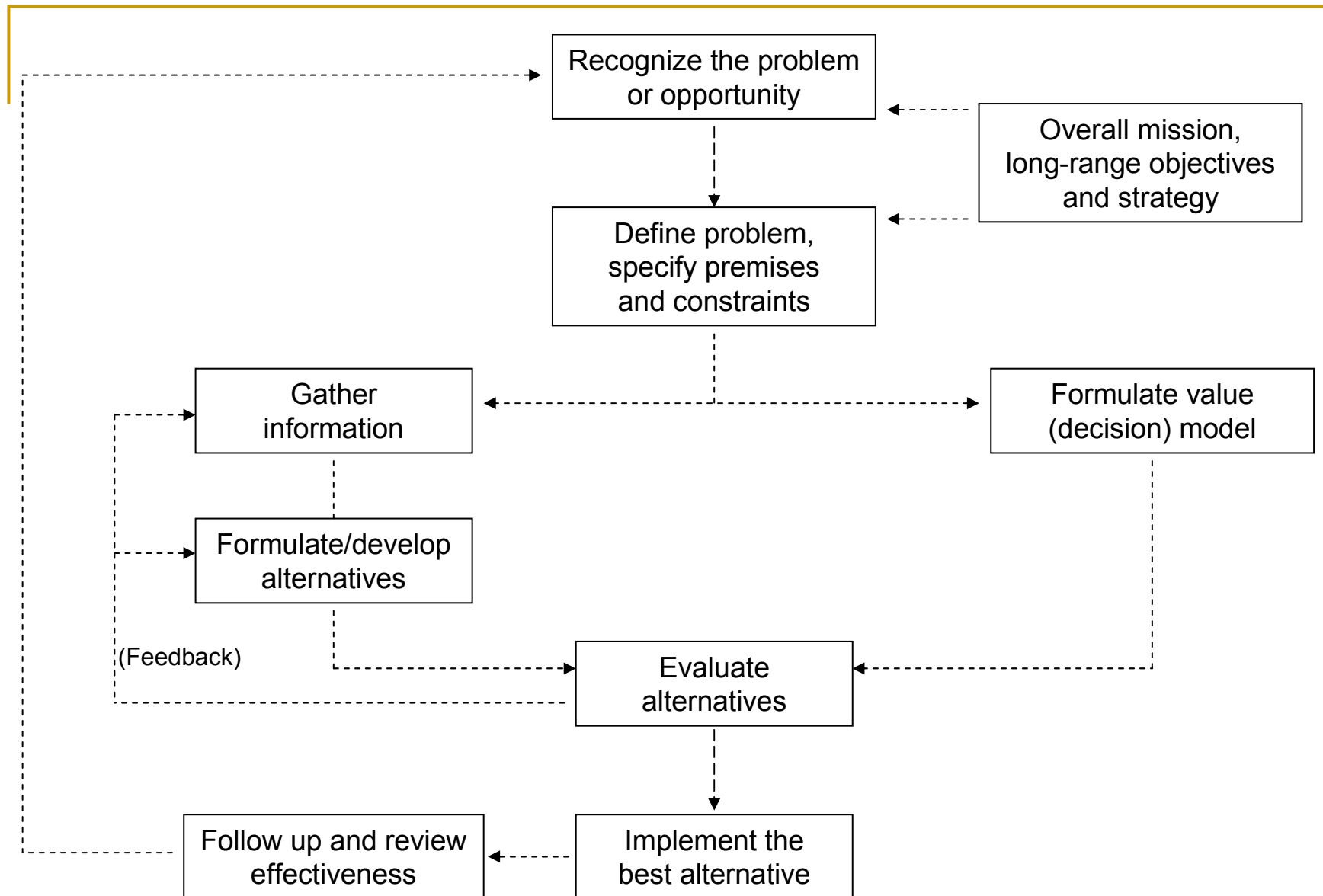
CHAPTER 3
PLANNING AND FORECASTING

Function of Management (by Fayol)



Importance of Planning

- Planning provides a method of identifying objectives and designing a sequence of programs and activities to achieve the objectives.
- Amos and Sarchet (Management for Engineers, Prentice Hall, 1981)
 - Planning is simply “deciding in advance what to do, how to do it, when to do it and who is to do it”.
 - From this definition, planning must obviously precede doing!



The planning/decision making process

The Foundation for Planning

■ Strategic Planning

- ❑ A successful enterprise needs to develop effective strategies for achieving its mission, and strategic planning is the organize process for selecting these strategies.
- ❑ Strategic planning suggests ways (strategies) to identify and to move toward desired future states.
- ❑ It consists of the process of developing and implementing plans to reach goals and objectives.

The Foundation for Planning

- Strategic Planning
 - The identification of organization's vision and mission is the first step of any strategic planning process.
 - A **vision statement** describes where the goal setters want to position themselves in the future.
 - Ex. Dept. of EENG's vision statement: We envision a department that is one of the best in the region with a diverse and stimulating intellectual environment that provides leadership in the field through its education and research agenda.
 - A **mission statement** sets forth what the company is attempting to do and is usually what the public sees.
 - Ex. Dept. of EENG's mission statement: Our mission is to serve society through excellence in education, research, and public service. We aspire to instill in our students the attitudes, values, and vision that will prepare them for professionalism and life-long learning. We strive to generate new knowledge and technology and aim to educate our graduates for following technological and theoretical developments, and use them to serve the society.

The Foundation for Planning

- Strategic Planning

- It is difficult to develop future strategies for the business without knowing the current status and their success at this point.
- An analysis of the status needs to be made.
- One tool which is often used is the **SWOT analysis** (Strengths, Weaknesses, Opportunities, and Threats).

Strategic Planning

- ***SWOT analysis***

- Strengths and weaknesses are basically internal to an organization and may include the following:
 - Management,
 - Marketing,
 - Technology,
 - Research,
 - Finances,
 - Systems.

- The external opportunities and threats may be in some of the following areas:
 - Customers,
 - Competition,
 - New technologies,
 - Government policies.

SWOT Analysis Nike, Inc.

■ Strengths

- Nike is a very competitive organization.
- Nike is strong at research and development, as is evidenced by its evolving and innovative product range. They then manufacture wherever they can produce high quality product at the lowest possible price. If prices rise, and products can be made more cheaply elsewhere.
- Nike is a global brand. It is the number one sports brand in the World.

SWOT Analysis Nike, Inc.

■ Weaknesses

- ❑ The organization does have a diversified range of sports products. However, the income of the business is still heavily dependent upon its share of the footwear market.
- ❑ The retail sector is very price sensitive.

SWOT Analysis Nike, Inc.

■ Opportunities

- Product development offers Nike many opportunities. The brand is fiercely defended by its owners whom truly believe that Nike is not a fashion brand.
- There is also the opportunity to develop products such as sport wear, sunglasses and jewellery.
- The business could also be developed internationally, building upon its strong global brand recognition.

SWOT Analysis Nike, Inc.

■ Threats

- ❑ Nike is exposed to the international nature of trade. It buys and sells in different currencies and so costs and margins are not stable over long periods of time. Such an exposure could mean that Nike may be manufacturing and/or selling at a loss.
- ❑ The market for sports shoes and garments is very competitive.
- ❑ The retail sector is becoming price competitive. This ultimately means that consumers are shopping around for a better deal.

Assignment

- Write down ***vision and mission statements*** of Eastern Mediterranean University.
- Prepare a ***SWOT analysis*** for Eastern Mediterranean University.

Forecasting – Qualitative Methods

■ **Jury of Executive Opinion**

- The executives of the organization (VP's of various divisions) each provide an estimate (educated guess) of future volume and the president provides a considered average of the estimates.
- This method is inexpensive and quick (simplest method).

Forecasting – Qualitative Methods

■ Sales Force Composite

- Members of the sales force estimate sales in their own territory.
- Regional sales managers adjust these estimates for their opinion of the optimism or pessimism of individual salespeople, and the general sales manager “massages” the figures to account for new products or factors of which individual sales people are unaware.

Forecasting – Qualitative Methods

■ **Users' Expectation**

- When a company sells most of its product to a few customers, the simplest method is to ask the customers to project their needs for the future period (market testing / market surveys).

■ **Choice of Method**

- Companies with effective planning will combine a variety of methods to achieve the best sales forecast.
- Qualitative estimates from the sales force and customer surveys may be compared with more quantitative estimates obtained from moving average or regression models.

Forecasting – Quantitative Methods

■ Simple Moving Average

- Where the values of a parameter show no clear trend with time, a forecast F_{n+1} for the next period can be taken as the simple average of some number n of the most actual values A_t :

$$F_{n+1} = \frac{1}{n} \sum_{t=1}^n A_t$$

- Ex: if sales for years 2000, 1999, 1998 and 1997 ($n=4$) were 1600, 1200, 1300, and 1100 respectively, sales for 2001 would be forecast as

$$F_{2001} = \frac{1600 + 1200 + 1300 + 1100}{4} = 1300$$

Forecasting – Quantitative Methods

■ Weighted Moving Average

- Simple Moving Average has disadvantage that an earlier value (e.g. 1996) has no influence at all, but a value n years in the past (1997) is weighted as heavily as the most recent value (2000).
- We can improve on our model by assigning a set of weights w_t that total unity (1.0) to the previous n values:

$$F_{n+1} = \sum_{t=1}^n w_t A_t, \quad \text{where} \quad \sum_{t=1}^n w_t = 1.0$$

Forecasting – Quantitative Methods

■ Weighted Moving Average

- Ex: Using the weights of 0.4, 0.3, 0.2, and 0.1 for the most recent (n=4) past years;

$$\begin{aligned}F_{2001} &= 0.4A_{2000} + 0.3A_{1999} + 0.2A_{1998} + 0.1A_{1997} \\ &= 0.4(1600) + 0.3(1200) + 0.2(1300) + 0.1(1100) \\ &= 1370\end{aligned}$$

Forecasting – Quantitative Methods

■ Exponential Smoothing

- The weighted moving average techniques have the disadvantage that you (or your computer) must record and remember n previous values and n weights for each parameter being forecast, which can be burdensome if n is large.
- In this technique the forecast value for the next period F_{n+1} is taken as the sum of
 - The forecasted value F_n for the current period, plus
 - Some fraction α of the difference between the actual (A_n) and forecasted (F_n) values for the current period:

$$F_{n+1} = F_n + \alpha(A_n - F_n)$$

$$F_{n+1} = \alpha A_n + (1 - \alpha)F_n$$

Forecasting – Quantitative Methods

■ Exponential Smoothing

Year (t)	Actual Value A(t)	Forecast F(t)	
		$\alpha = 0.3$	$\alpha = 0.6$
1998	1100	1100	1100
1999	1300	1100	1100
2000	1200	1160	1220
2001	1600	1172	1208
2002		1300	1443

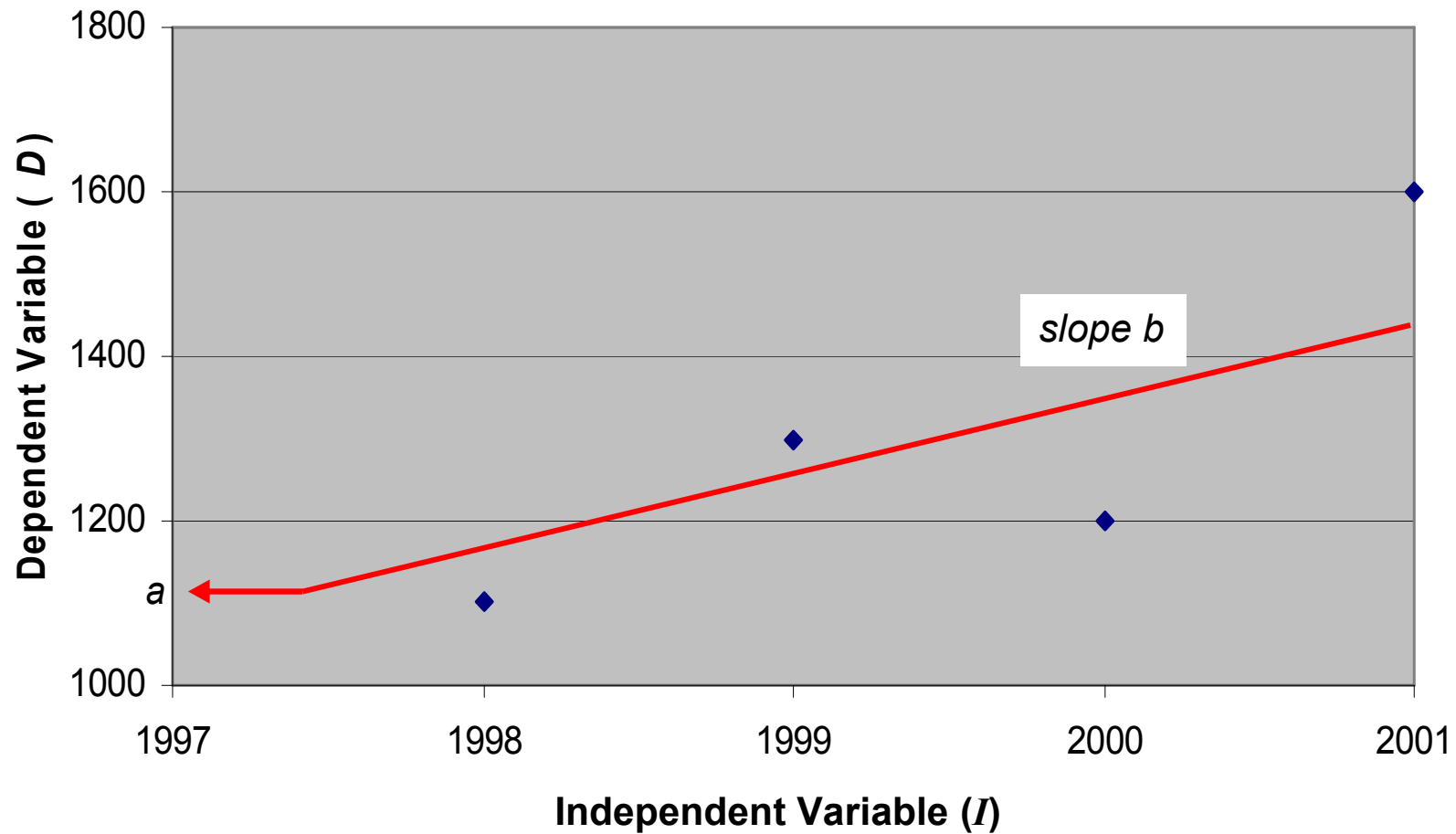
$$\begin{aligned}F_{2000} &= 0.3A_{1999} + 0.7F_{1999} \\ &= 0.3(1300) + 0.7(1100) = 1160\end{aligned}$$

$$\begin{aligned}F_{2001} &= 0.3A_{2000} + 0.7F_{2000} \\ &= 0.3(1200) + 0.7(1160) = 1172\end{aligned}$$

Forecasting – Regression Models

- Regression models attempt to develop logical relationship that not only provide useful forecasts, but also identify the causes and factors leading to forecast value.
- Regression models assume that a *linear relationship* exists between a variable designated the *dependent (unknown) variable* and one or more other *independent (known) variables*.

Simple Regression Model



Forecasting – Regression Models

■ Simple Regression Model

- The simple regression model assumes that the independent variable I depends on a single dependent variable D .
- The regression problem is to identify a line;

$$D = a + bI$$

$$b = \frac{n \sum (I_i D_i) - \sum I_i \sum D_i}{n \sum (I_i^2) - (\sum I_i)^2} \quad a = \sum \frac{D_i}{n} - b \sum \frac{I_i}{n} = \bar{D} - b\bar{I}$$

where \bar{D} and \bar{I} are the mean values of D and I , respectively.

Forecasting – Regression Models

- **Simple Regression Model**

	<i>I</i>	<i>D</i>	<i>DI</i>	<i>I</i> ²
	0	1100	0	0
	1	1300	1300	1
	2	1200	2400	4
	3	1600	4800	9
Total	6	5200	8500	14
Mean	1,5	1300		

Forecasting – Regression Models

■ Simple Regression Model

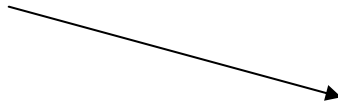
$$b = \frac{4(8500) - 6(5200)}{4(14) - (6)^2} = 140$$

$$a = \frac{5200}{4} - 140\left(\frac{6}{4}\right) = 1300 - 140(1.5) = 1090$$

and we can forecast a value for 2000:

$$D_{2000} = 1090 + (4)(140) = 1090 + 560 = 1650$$

0=1996, 1=1997, 2=1998, 3=1999, 4=2000, ...



Forecasting – Regression Models

■ Multiple Regression

- In multiple regression, the dependent variable D is assumed to be function of more than one independent variable I_j , such as;

$$D = c_0 + c_1 I_1 + \frac{c_2}{I_2} + c_3 I_3^2 + \dots$$

Forecasting – Regression Models

■ Multiple Regression

- The dependent variable can be assumed to be proportional directly or inversely, proportional to a power or a root, proportional in some other way to independent variables.
- Past values of dependent and independent variables are then used in regression analysis to reduce the independent variables to the most important ones and to find the values for the constants c_i that give the best fit.
- Ex: a manufacturer of replacement automobile tires might find that the demand for tires varied with the cost of gasoline, the current unemployment rate, sales of automobiles two years before, and the weight of those automobiles.