Seminar on

FORECASTING AND Methods of FORECASTING

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Forecasting

- Forecasting is a process of estimating a future event by casting forward past data.
- The past data are systematically combined in a predetermined way to obtain the estimate of the future.
- In business applications, forecasting serves as a starting point of major decisions in finance, marketing, productions, and purchasing.

Objective

- To predict demand for planning purposes

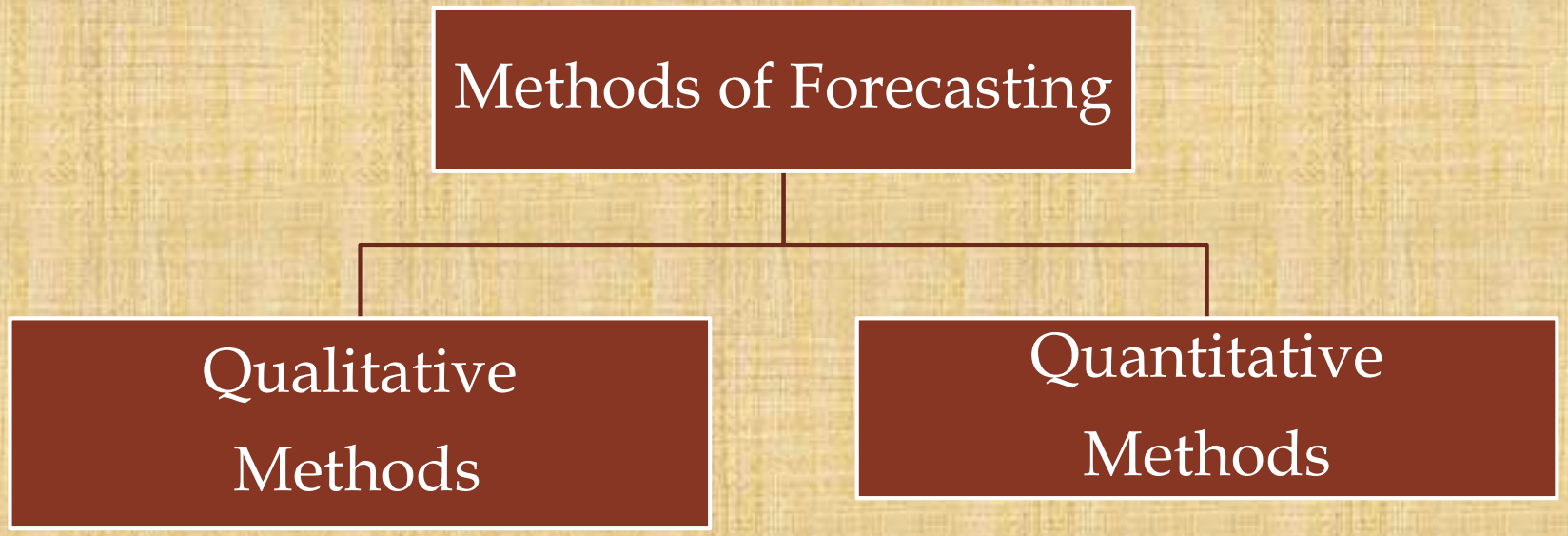
Laws of Forecasting

- Forecasts are always wrong.
- Forecasts always change.
- The further into the future, the less reliable the forecast will be.

Steps of Forecasting

- **Determine the purpose of the forecast.** How will it be used and when will it be needed?
- **Establish a time horizon.** The forecast must indicate a time interval, keeping in mind that accuracy decreases as the time horizon increases.
- **Obtain, clean, and analyse appropriate data.** Obtaining the data can involve significant effort. Once obtained, the data may need to be “cleaned” to get rid of outliers and obviously incorrect data before analysis.
- **Select a forecasting technique.**
- **Make the forecast.**
- **Monitor the forecast.** A forecast has to be monitored to determine whether it is performing in a satisfactory manner.

Methods of Forecasting



Qualitative Methods

- Unaided Judgements/ Expert Opinion/ Hunch Method
- Collective Opinion
- Perdiction Markets
- Delphi Technique
- Judgemental Bootstraping
- Test Marketting

Quantitative Methods

- Quantitative Models are classified into two models

1) Time Series Models

A time series is an uninterrupted set of data observations that have been ordered in equally spaced intervals (units of time).

2) Associated Models

Associative (causal) forecasting is based on identification of variables (factors) that can predict values of the variable in question

Time Series Analysis Technique

- A **time series** is a time-ordered sequence of observations taken at regular intervals.
- Forecasting techniques based on time-series data are made on the assumption that future values of the series can be estimated from past values.
- Analysis of time-series can often be accomplished by merely *plotting the data* and visually examining the behaviour of the series.
- One or more patterns might appear: trends, seasonal variations, cycles, or variations around an average. In addition, there will be random and perhaps irregular variations.

These behaviours can be described as follows:

- **Trend** refers to a long-term upward or downward movement in the data. Population shifts, changing incomes, and cultural changes often account for such movements.
- **Seasonality** refers to short-term, fairly regular variations generally related to factors such as the calendar or time of day.
- **Cycles** are wavelike variations of more than one year’s duration. These are often related to a variety of economic, political, and even agricultural conditions.
- **Irregular variations** are due to unusual circumstances such as severe weather conditions, strikes, or a major change in a product or service. Whenever possible, these should be identified and removed from the data.
- **Random variations** are residual variations that remain after all other behaviour's have been accounted for.

Linear Regression

- *A trend line fitted to historical data points can project into the medium to long-range*
- *Linear trends can be found using the least squares technique*

$$y = a + bx$$

Where,

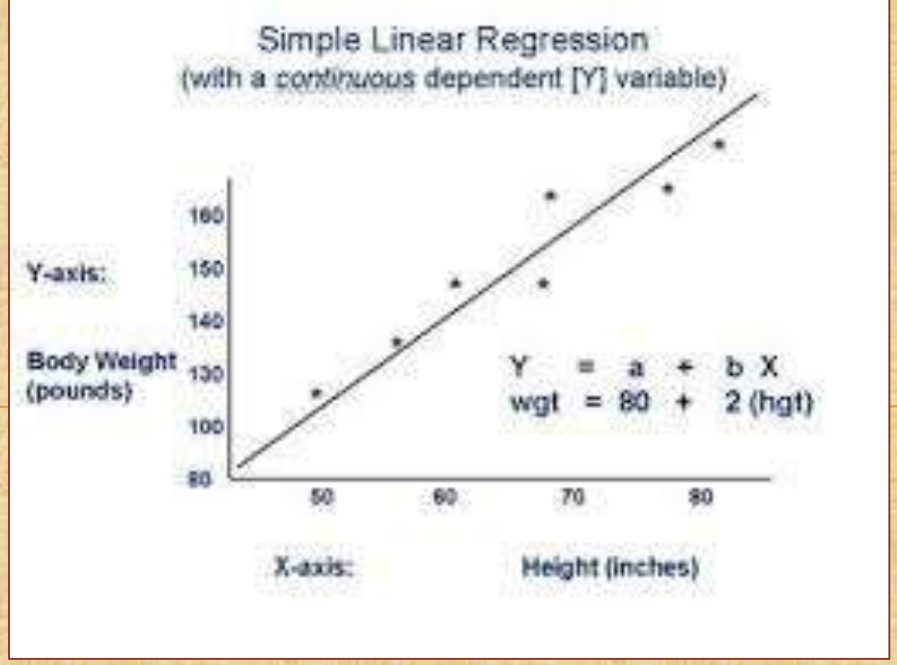
y= computed value of the variable to be predicted (dependent variable)

a= y-axis intercept

b= slope of the regression line

x= the independent variable

Estimated by least squares method



- Criteria of finding *a* and *b*:

Equation: $\hat{Y}_i = a + bx_i$

Slope: $b = \dfrac{\sum_{i=1}^{n} x_i y_i - n\bar{x}\,\bar{y}}{\sum_{i=1}^{n} x_i^2 - n\bar{x}^2}$

Y-Intercept: $a = \bar{y} - b\bar{x}$

Simple Moving Average Method

- MA is a series of arithmetic means
- Used if little or no trend, seasonal, and cyclical patterns
- Used often for smoothing
  - Provides overall impression of data over time

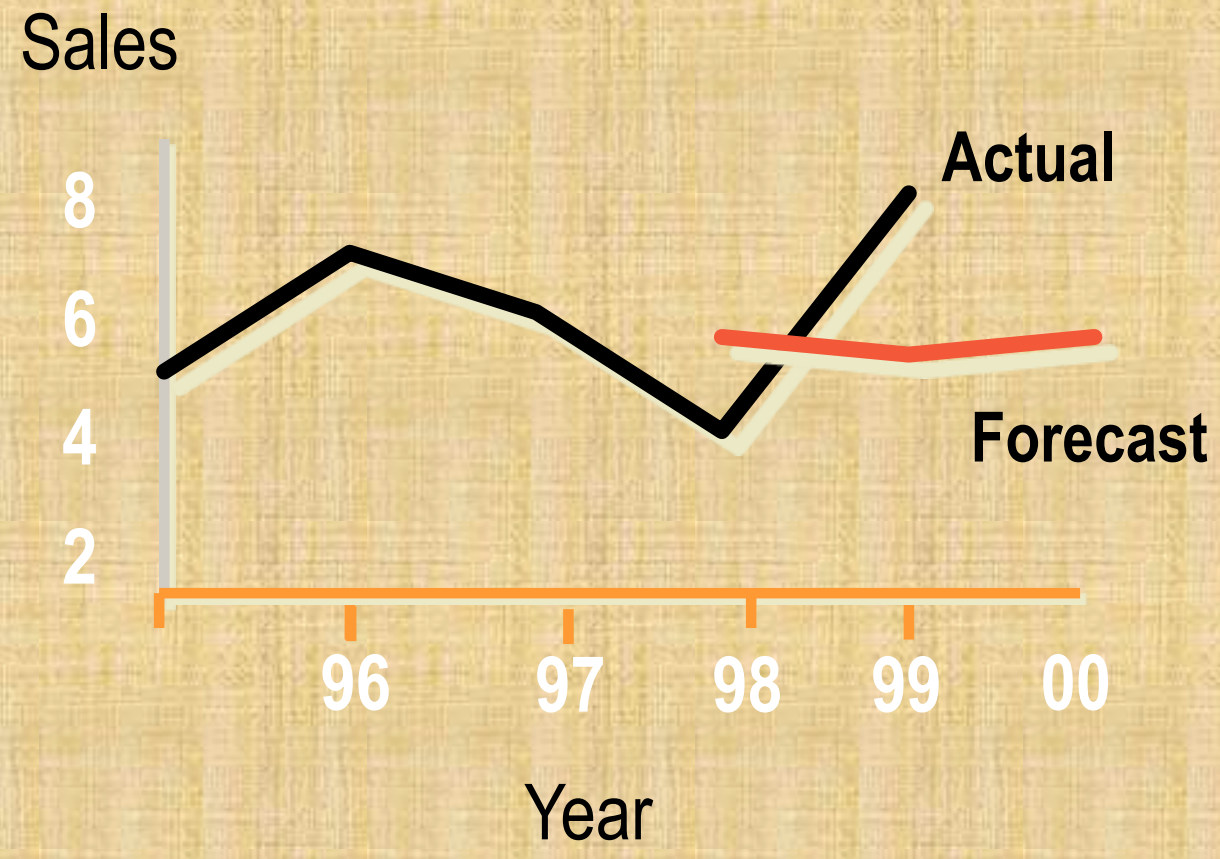
Equation,

$$MA = \frac{\sum \text{Demand in Previous } n \text{ Periods}}{n}$$

- A manager of a museum store that sells historical replicas. He want to forecast sales of item (123) for *2000* using a 3-period moving average.

1995	4
1996	6
1997	5
1998	3
1999	7

Time	Response Y_i	Moving Total (n=3)	Moving Average (n=3)
1995	4	NA	NA
1996	6	NA	NA
1997	5	NA	NA
1998	3	4+6+5=15	15/3=5.0
1999	7	6+5+3=14	14/3=4.7
2000	NA	5+3+7=15	15/3=5.0


Sales
8
6
4
2
Actual
Forecast
96
97
98
99
00
Year

Weighted moving average method

- Used when trend is present
  Older data usually less important
- Weights based on intuition
  Often lay between 0 & 1, & sum to 1.0
- Equation

$$WMA = \frac{\Sigma(\text{Weight for period n})(\text{Demand in period n})}{\Sigma \text{Weights}}$$

Disadvantages of Moving Average Methods

- Increasing *n* makes forecast less sensitive to changes
- Do not forecast trend well due to the delay between actual outcome and forecast.
- Difficult to trace seasonal and cyclical patterns.
- Require much historical data.
- Weighted MA may perform better.

Exponential Smoothing Method

- Form of weighted moving average
  - Weights decline exponentially
  - Most recent data weighted most
- This method requires only the current demand and forecast demand.
- This method assigns weight to all the previous data.
- The reason this is called exponential smoothing is that each increment in the past is decreased by (1-α).

- $F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$

  $= \alpha A_{t-1} + (1 - \alpha) F_{t-1}$

F_t = Forecast value

A_t = Actual value

α = Smoothing constant

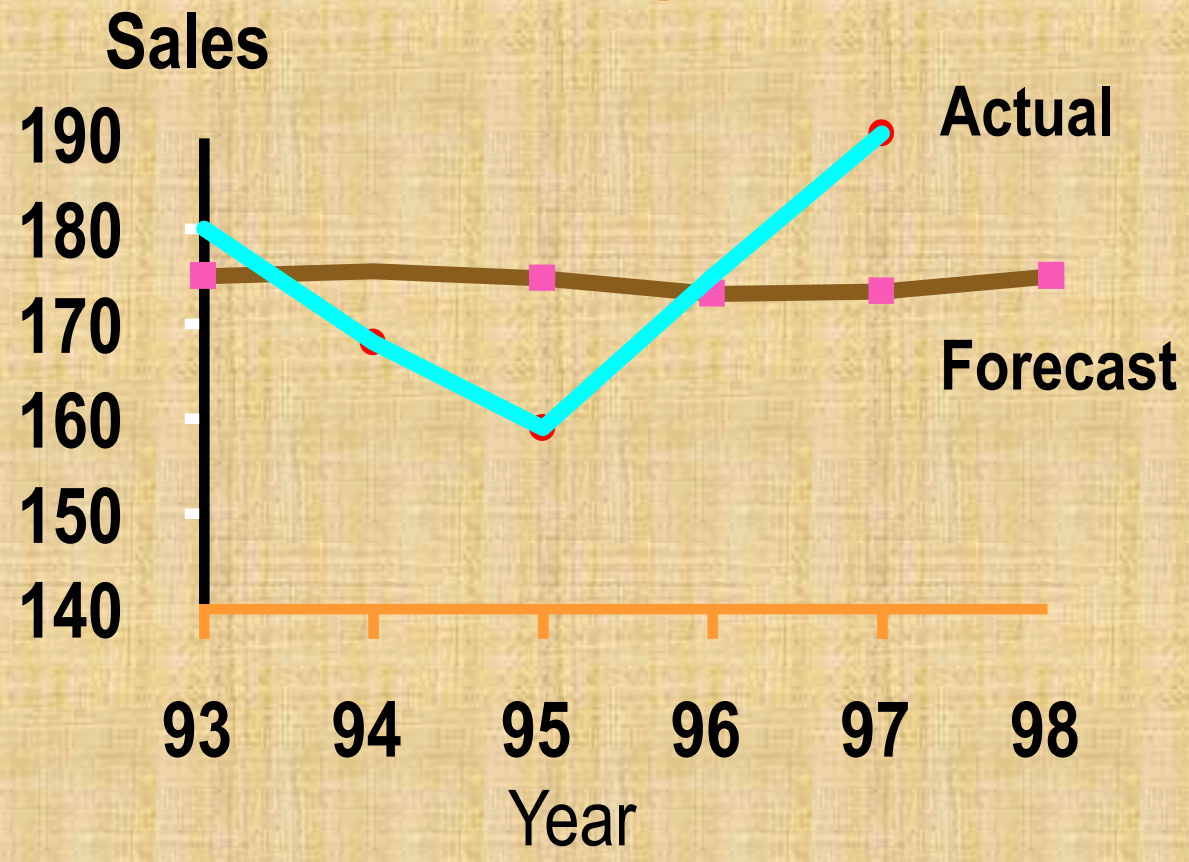
Suppose you are organizing a Kwanza meeting. You want to forecast attendance for 2000 using exponential smoothing ($\alpha = .10$). The 1995 (made in 1994) forecast was 175.

Actual data:

1995	180
1996	168
1997	159
1998	175
1999	190

$$F_t = F_{t-1} + \alpha \cdot (A_{t-1} - F_{t-1})$$

Time	Actual	Forecast, (α = .10)
1995	180	175(Given)
1996	168	175.00 + .10(180 - 175.00) = 175.50
1997	159	175.50 + .10(168 - 175.50) = 174.75
1998	175	174.75 + .10(159 - 174.75) = 173.18
1999	190	173.18 + .10(175 - 173.18) = 173.36
2000	NA	173.36 + .10(190 - 173.36) = 175.02


Sales
190
180
170
160
150
140
Actual
Forecast
93
94
95
96
97
98
Year

Casual method

- Why Causal Forecasting ?
  - There is no logical link between the demand in the future and what has happened in the past
  - There are other factors which can be logically linked to the demand
- **Example 1**: There is a strong cause and effect relationship between future demand for doors and windows and the number of construction permits issued at present.
- **Example 2**: The demand for new house or automobile is very much affected by the interest rates changed by banks.

THANK YOU