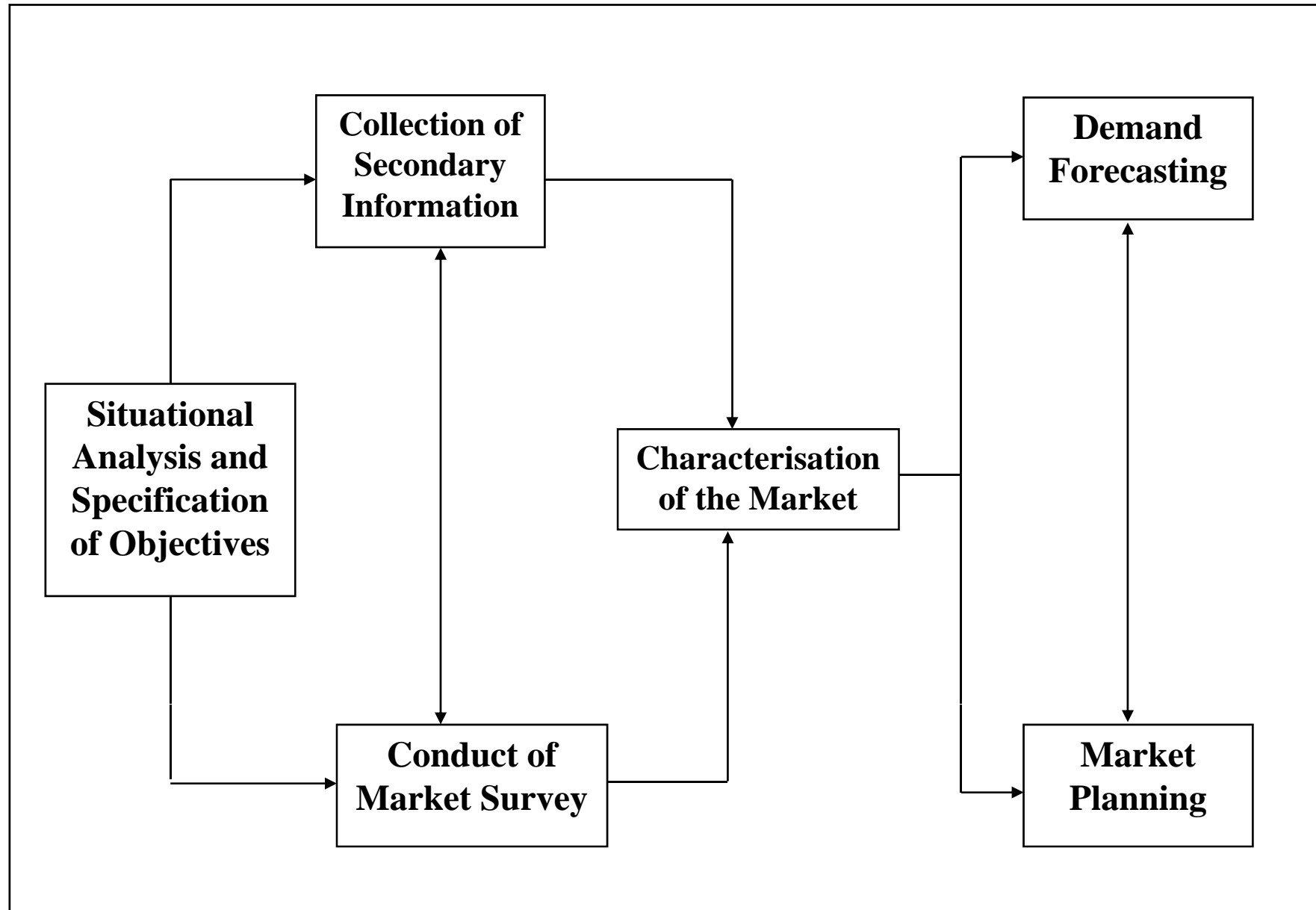


Market and Demand  
Analysis  
&  
Forecasting Techniques

# OUTLINE

- **Situational analysis**
- **Collection of secondary information**
- **Conduct of market survey (primary information)**
- **Characterization of the market**
- **Demand forecasting & techniques**
- **Uncertainties in demand forecasting**

## *Key Steps in Market and Demand Analysis and their Inter-relationships*



# **Situational Analysis**

- To study the relationship between the product and its market
- Project analyst study from customers, competitors, middlemen, and others in the industry.
- To learn about the preferences and purchasing power of customers, actions and strategies of competitors, and practices of the middlemen.

# Collection of Secondary Information

- Secondary information provides the base and the starting point for the market and demand analysis.
- It indicates what is known and often provides leads and cues for gathering primary information required for further analysis.

# **Evaluation of Secondary Information**

While secondary information is available economically and readily, its reliability, accuracy, and relevance for the purpose under consideration must be carefully examined.

# **Evaluation of Secondary Information**

The market analyst should seek to know:

- **Who gathered the information?**
- **What was the objective?**
- **When was the information gathered?**
- **When was it published?**
- **Have the terms in the study been carefully defined?**
- **What was the target population?**

# **Evaluation of Secondary Information**

The market analyst should seek to know:

- **How was the sample chosen?**
- **How representative was the sample?**
- **What was the process of information gathering?**
- **What was the degree of sampling bias in the information gathered?**

# Market Survey (primary information)

- Secondary information, though useful, often does not provide a comprehensive basis for market and demand analysis. It needs to be supplemented with primary information gathered through a market survey.
- The market survey may be a census survey or a sample survey

# **Information in a Market Survey**

- **Total demand and rate of growth of demand**
- **Demand in different segments of the market**
- **Income and price elasticities of demand**
- **Motives for buying**
- **Purchasing plans and intentions**
- **Satisfaction with existing products**
- **Unsatisfied needs**
- **Attitudes toward various products**
- **Trade Distribution practices and preferences**
- **Socio-economic characteristics of buyers**

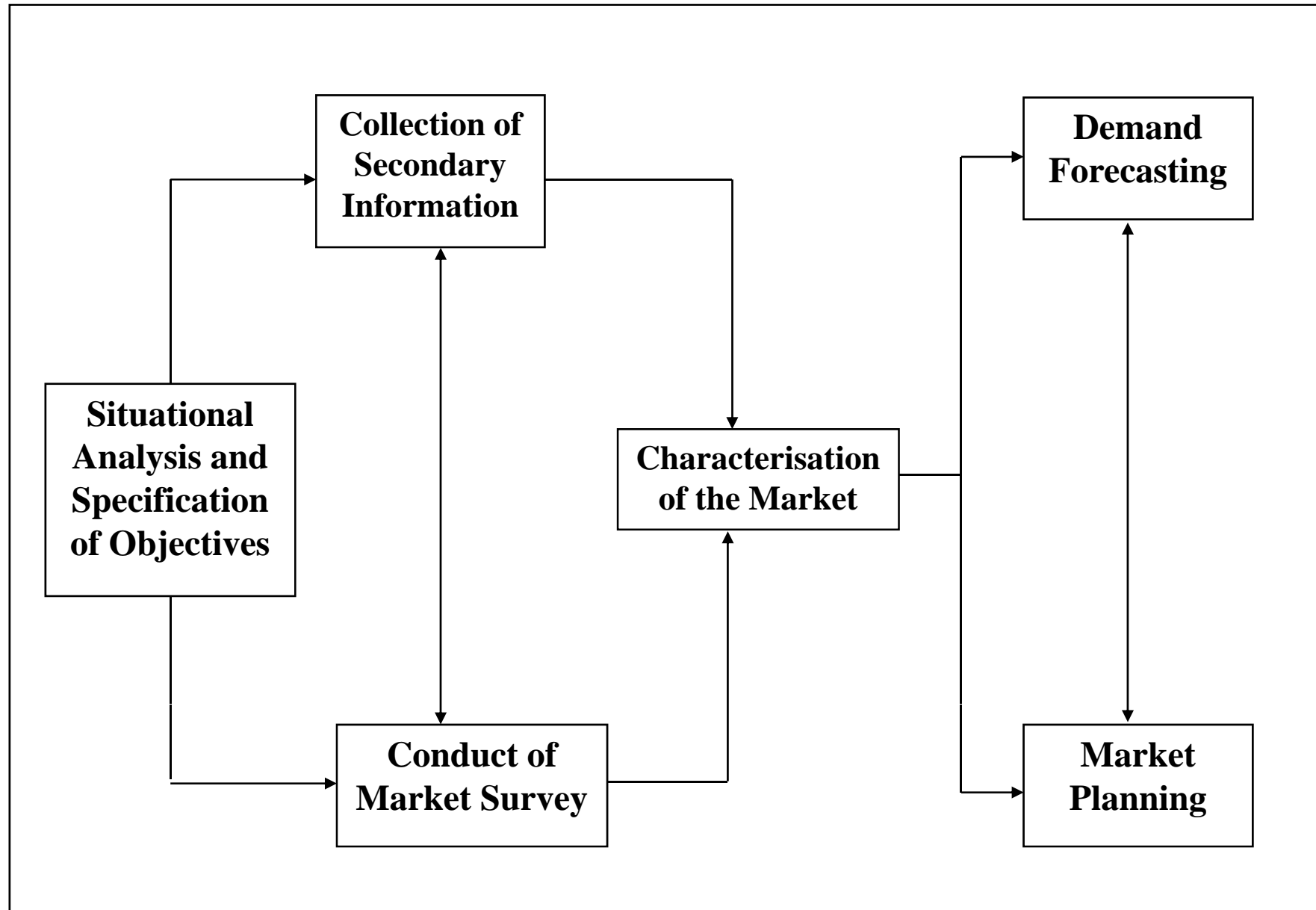
# Steps in a Sample Survey

1. Define the target population.
2. Select the sampling scheme and sample size.
3. Develop the questionnaire.
4. Recruit and train the field investigators.
5. Obtain information as per the questionnaire from the sample of respondents.
6. Scrutinise the information gathered.
7. Analyse and interpret the information.

# Characterisation of the Market

- Effective demand in the past and present
- Breakdown of demand
- Price
- Methods of distribution and sales promotion
- Consumers
- Supply and competition
- Government policy

## *Key Steps in Market and Demand Analysis and their Inter-relationships*



# Demand Forecasting & technique

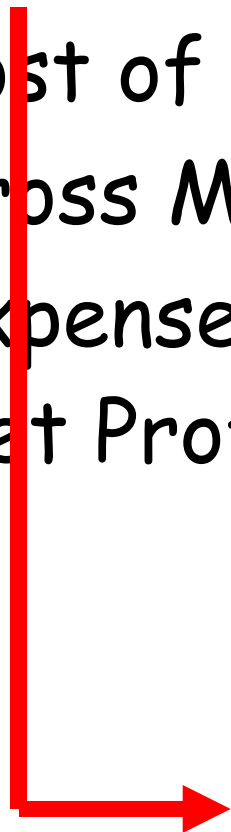
- Market Potential forecast
- Market Demand forecast
- Market Size forecast
- Market Share forecast
- Sales forecast

## Net cash Flow/Income statement

• Sales	xxx	-
• Cost of goods sold	xxx	
	<hr/>	
• Gross Margin	xxx	
• Expenses	xxx	-
	<hr/>	
• Net Profit	xxx	
	<hr/> <hr/>	

# Net cash Flow/Income statement

• <u>Sales</u>	xxx
• Cost of goods sold	xxx -
• Gross Margin	xxx
• Expenses	xxx -
• Net Profit	xxx



Market Forecast/Sales Forecast

## Net cash Flow/Income statement

• Sales	xxx	-
• <u>Cost of goods sold</u>	xxx	
• Gross Margin	xxx	-
• Expenses	xxx	
• Net Profit	xxx	

→ Operations decisions (Make or Buy)

# Net cash Flow/Income statement

• Sales	xxx	-
• Cost of goods sold	xxx	
• Gross Margin	xxx	-
• <u>Expenses</u>	xxx	
• Net Profit	xxx	

Marketing Expenses (sales promotion, advertisement, etc)

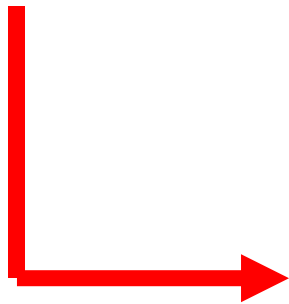
Operations Expenses (transportation, inventory, etc)

Organization Expenses (salary, admin cost, etc)

Financial Expenses (interest, etc)

- Sales
- Cost of goods sold
- Gross Margin
- Expenses
- Net Profit

xxx	
xxx	-
<hr/>	
xxx	
xxx	-
<hr/>	
xxx	
<hr/> <hr/>	



**Compare with the amount of investment (PB, IRR, NPV, etc)**

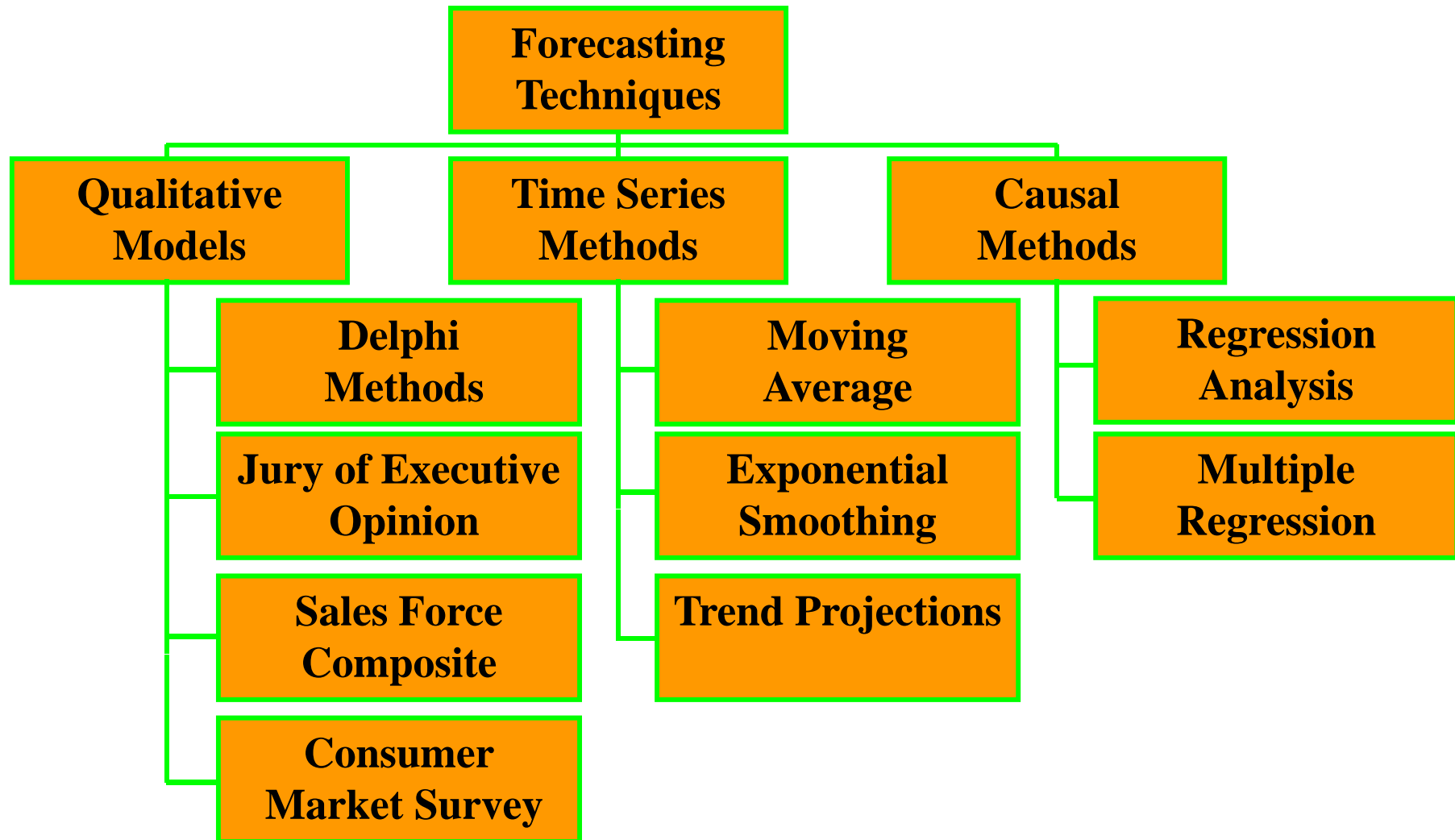
# Eight Steps to Forecasting

1. Determine the use of the forecast
2. Select the items or quantities that are to forecast
3. Determine the time horizon of the forecast
4. Select the forecasting model(s)
5. Gather data needed
6. Validate the forecasting model
7. Make the forecast
8. Implement the results

# Types of Forecasts

- **Qualitative methods**
  - based on subjective methods
- **Quantitative methods**
  - based on mathematical model

# Forecasting Models



# Methods of Demand Forecasting

I Qualitative Methods : These methods rely essentially on the judgment of experts to Translate qualitative information into quantitative estimates.

- Jury of executive method
- Delphi method

# **Jury of Executive Opinion Method**

This method involves soliciting the opinion of a group of managers on expected future sales and combining them into a sales estimate

## **Pros**

- **It permits a wide range of factors to be considered**
- **It appeals to managers**

## **Cons**

- **The biases cannot be unearthed easily**
- **Its reliability is questionable**

# Executive opinion

- In a meeting of 6 top executives
- 3 see strong growth (12 %)
- 3 see limited growth (3 %)
- Executives compromise on 6% growth
- This year sales = \$ 11 million
- Sales forecast = \$ 11,660,000

# Expert opinion

- Group of dealers, distributors, wholesalers, retailers, suppliers and consultants meeting
- Each group confers and reaches a consensus
- Top management formulate final expert opinion forecast

## **Delphi Method**

To extract the opinions of a group of experts with the help of a mail survey. The steps involved :

1. A group of experts is sent a questionnaire by mail and asked to express their views.
2. The responses received from the experts are summarized without disclosing the identity of the experts, and sent back to the experts, along with a questionnaire meant to probe further the reasons for extreme views expressed in the first round.
3. The process may be continued for one or more rounds till a reasonable agreement emerges in the view of the experts.

## **Pros**

- It is intelligible to users
- It seems to be more accurate and less expensive than the traditional face-to-face group meetings

## **Cons**

There are some question marks:

What is the value of the expert opinion?

What is the contribution of additional rounds and feedback to accuracy?

# Sales force survey

- Sales personnel report that competitor's price drop of 10 %
- Company's sales will decline 3 %
- This year sales = \$ 7 million
- Sales forecast = \$ 6,790,000

# Consumer survey

- 85% of current customers (1 million) say they will repurchase next year
- 3 % of non customers (10 million) say they will purchase next year
- Sales forecast = 1,150,000 customers
- Increase of 15 %

# Methods of Demand Forecasting

II Time Series Projection Methods : These methods generate forecasts on the basis of an analysis of the historical time series

- Moving Average Method
- Exponential Smoothing Method
- Trend projection Method

# Moving Average Method

The moving average method :

the forecast for the next period is equal to the average of the sales for several preceding periods.

# Moving Average

- Average several periods of data

$$\begin{array}{l} \text{Moving Average} \\ \text{forecast} \end{array} = \frac{\text{Sum of demand in previous } n \text{ periods}}{n}$$

# Simple Moving Average Example

<u>Month</u>	<u>Actual</u>	<u>3-mo</u>	<u>5-mo</u>
Jan	120	-	-
Feb	90	-	-
Mar	100	-	-
Apr	75	-	-
May	110	-	-
June	50	-	-
July	75	-	-
Aug	130	-	-
Sept	110	-	-
Oct	90	-	-
Nov	-	-	-

# Simple Moving Average Example

<u>Month</u>	<u>Actual</u>	<u>3-mo</u>
Jan	120	-
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Mar	100	-
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July	75	-
Aug	130	-
Sept	110	-
Oct	90	-
Nov	-	-

Average of  
Jan, Feb, Mar  
will be April  
forecast

# Simple Moving Average Example

<u>Month</u>	<u>Actual</u>	<u>3-mo</u>
Jan	120	-
Feb	90	-
Mar	100	-
Apr	75	-
May	110	-
June	50	-
July	75	-
Aug	130	-
Sept	110	-
Oct	90	-
Nov	-	-



Average of  
Feb, Mar, Apr  
will be May  
forecast

# Simple Moving Average Example

<u>Month</u>	<u>Actual</u>	<u>3-mo</u>
Jan	120	-
Feb	90	-
Mar	100	-
Apr	75	-
May	110	-
June	50	-
July	75	-
Aug	130	-
Sept	110	-
Oct	90	-
Nov	-	-



Average of  
Mar, Apr, May  
will be Jun  
forecast

# Simple Moving Average Example

Month	Actual	3-mo	5-mo
Jan	120	-	-
Feb	90	-	-
Mar	100	-	-
Apr	75	103.3	-
May	110	88.3	-
June	50	95.0	99.0
July	75	78.3	85.0
Aug	130	78.3	82.0
Sept	110	85.0	88.0
Oct	90	105.0	95.0
Nov	-	<b>110</b>	<b>91</b>

**November forecast**

$$MA_3 = \frac{130+110+90}{3} = 110$$

$$MA_5 = \frac{50+75+130+110+90}{5} = 91$$

# Weighted Moving Average

- Adjusts moving average method to more closely reflect data fluctuations (weights can be used to place more emphasis on recent values)

$$\text{Weighted moving average} = \frac{\sum (\text{Weight for period } n)(\text{Demand in period } n)}{\sum \text{Weights}}$$

# Weighted Moving Average Example

<u>Month</u>	<u>Weight</u>	<u>Actual</u>
August	17%	130
September	33%	110
October	50%	90

November forecast

$$\text{WMA 3} = \frac{(0.17)(130) + (0.33)(110) + (0.50)(90)}{1} = 103.40$$

# Exponential Smoothing Method

In exponential smoothing, forecasts are modified in the light of observed errors.

# Exponential Smoothing

$$F_{t+1} = aD_t + (1 - a)F_t$$

where,

$F_{t+1}$  = forecast for next period

$D_t$  = actual demand for present period

$F_t$  = forecast for present period

$a$  = exponential smoothing constant

# Exponential Smoothing

$$F_{t+1} = aD_t + (1 - a)F_t$$

where,

$F_{t+1}$  = forecast for 2010

$D_t$  = actual demand for 2009 = 50,000

$F_t$  = forecast for 2009 = 40,000

$a = 0.4$

$$\begin{aligned} F_{2010} &= 0.4(50,000) + 0.6(40,000) \\ &= 44,000 \end{aligned}$$

# Trend Projection Method

The trend projection method involves

- (a) determining the trend of consumption by analyzing past consumption statistics
- (b) projecting future consumption by extrapolating the trend.

# Linear Trend line (Trend Projection)

**Year Actual**

**1 37**

**2 40**

**3 41**

**4 37**

**5 45**

**6 50**

**7 43**

**8 47**

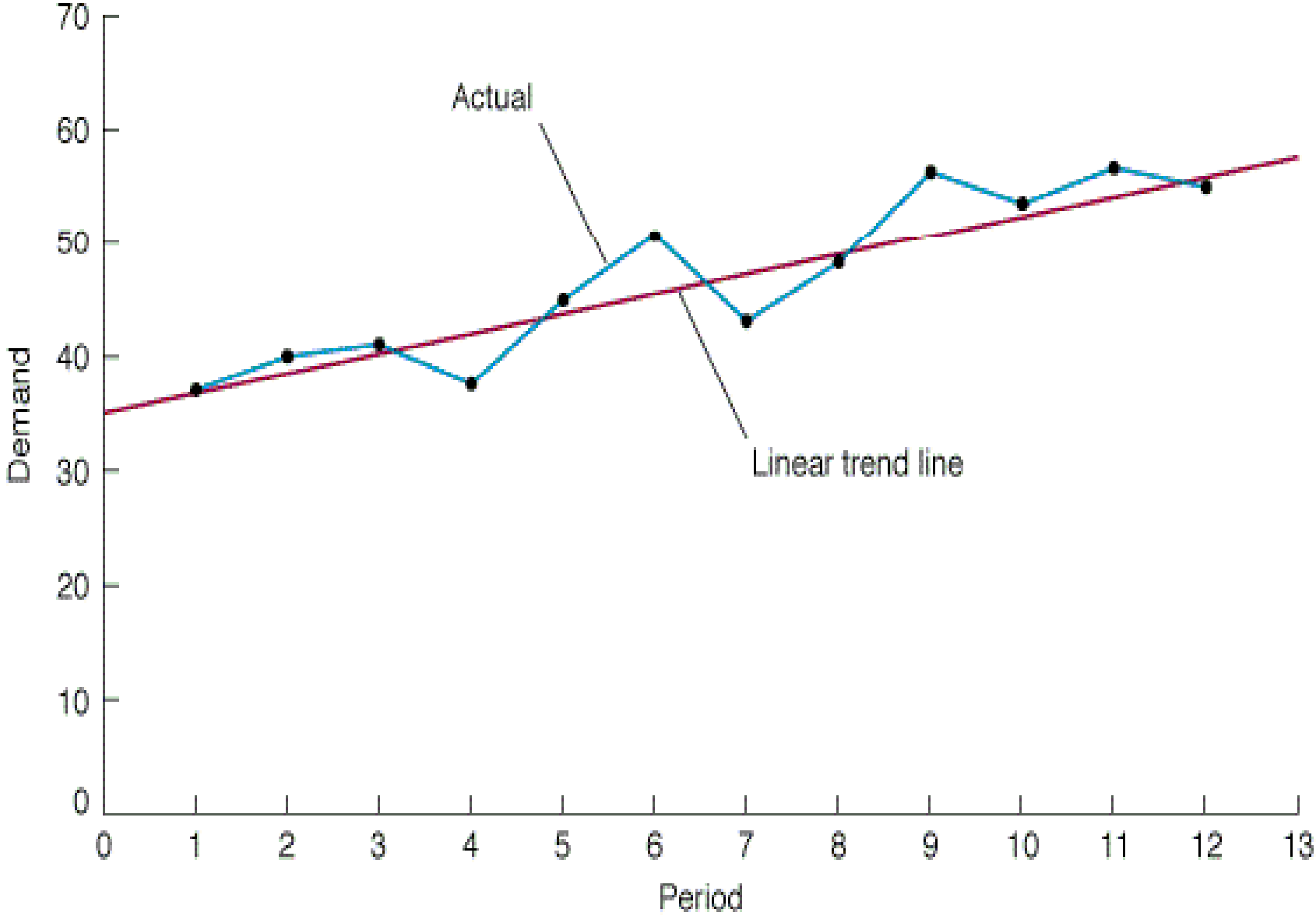
**9 56**

**10 52**

**11 55**

**12 54**

# Linear Trend Line(Trend Projection)



# Linear Regression Formulas

$$y = a + bx$$

where,

**a** = intercept (at period 0)

**b** = slope of the line

**x** = the independent variable

**y** = forecast for demand given x

$$b = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2}$$

$$a = \bar{y} - b\bar{x}$$

where,

**n** = number of periods

$$\bar{x} = \frac{\sum x}{n}, \text{ average of } x \text{ values}$$

$$\bar{y} = \frac{\sum y}{n}, \text{ average of } y \text{ values}$$

# Least Squares Example

<b>x</b>	<b>y</b>	<b>xy</b>	<b>x<sup>2</sup></b>
1	37	37	1
2	40	80	4
3	41	123	9
4	37	148	16
5	45	225	25
6	50	300	36
7	43	301	49
8	47	376	64
9	56	504	81
10	52	520	100
11	55	605	121
12	54	648	144
<b>78</b>	<b>557</b>	<b>3867</b>	<b>650</b>

$$\bar{x} = \frac{78}{12} = 6.5$$

$$\bar{y} = \frac{557}{12} = 46.42$$

$$b = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2} = \frac{3,867 - (12)(6.5)(46.42)}{650 - 12(6.5)^2} = 1.72$$

$$a = \bar{y} - b\bar{x} = 46.42 - (1.72)(6.5) = 35.2$$

$$y = 35.2 + 1.72x$$

$$y_{13} = 35.2 + 1.72(13) = 57.56$$

# Seasonal Adjustments

- Repetitive increase/decrease in demand
- Use seasonal factor to adjust forecast

# Seasonal Adjustments

- Repetitive increase/decrease in demand
- Use seasonal factor to adjust forecast

$$\text{Seasonal factor} = S_i = \frac{D_i}{\sum D}$$

# Seasonal Factor ( Index)

<u>Year</u>	<u>Demand (1000's per quarter)</u>				
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>Total</u>
2006	12.6	8.6	6.3	17.5	45.0
2007	14.1	10.3	7.5	18.2	50.1
2008	15.3	10.6	8.1	19.6	53.6
<u>Total</u>	<u>42.0</u>	<u>29.5</u>	<u>21.9</u>	<u>55.3</u>	<u>148.7</u>
$S_i$	0.28	0.20	0.15	0.37	

$$S_1 = \frac{D_1}{\sum D} = \frac{42.0}{148.7} = 0.28$$

# Methods of Demand Forecasting

III Causal Methods : More analytical than the preceding methods,

Causal methods seek to develop forecasts on the basis of cause-effect relationships specified in an quantitative manner.

# Causal Method (Regression)

- Study relationship between two or more variables
- **Dependent** variable( $Y$ ) depends on **independent** variable( $x$ )

# Using Regression Analysis to Forecast - continued

<b>Y</b>	<b>X</b>
<b>Sales</b>	<b>Advertise Expenses</b>
<b>(\$100,000)</b>	<b>(\$10)</b>
<b>2.0</b>	<b>1</b>
<b>3.0</b>	<b>3</b>
<b>2.5</b>	<b>4</b>
<b>2.0</b>	<b>2</b>
<b>2.0</b>	<b>1</b>
<b>3.5</b>	<b>7</b>

# Using Regression Analysis to Forecast - continued

<b>Sales, Y</b>	<b>Adv Ex, X</b>	<b>X<sup>2</sup></b>	<b>XY</b>
2.0	1	1	2.0
3.0	3	9	9.0
2.5	4	16	10.0
2.0	2	4	4.0
2.0	1	1	2.0
<u>3.5</u>	<u>7</u>	<u>49</u>	<u>24.5</u>
<b><math>\Sigma Y - 15.0</math></b>	<b><math>\Sigma X - 18</math></b>	<b><math>\Sigma X^2 - 80</math></b>	<b><math>\Sigma XY - 51.5</math></b>

# Using Regression Analysis to Forecast - continued

Calculating the required parameters:

$$\bar{x} = \frac{18}{6} = 3$$

$$\bar{y} = \frac{15}{6} = 2.5$$

$$b = \frac{\sum xy - n\bar{x}\bar{y}}{\sum x^2 - n\bar{x}^2} = \frac{51.5 - (6)(3)(2.5)}{80 - 6(3)^2} = 0.25$$

$$a = \bar{y} - b\bar{x} = 2.5 - (0.25)(3) = 1.75$$

$$y = 1.75 + 0.25x$$

$$\text{Sales} = 1.75 + 0.25 (\text{Adv Exp})$$

# Correlation And Coefficient Of Determination

- *Correlation,  $r$* 
  - measure of strength of relationship
  - varies between -1.00 and +1.00
- *Coefficient of determination,  $r^2$* 
  - percentage of variation in dependent variable
  - resulting from independent variable

# Computing Correlation

$$r = \frac{n E x y - E x E y}{\sqrt{[n E x^2 - (E x)^2][n E y^2 - (E y)^2]}}$$

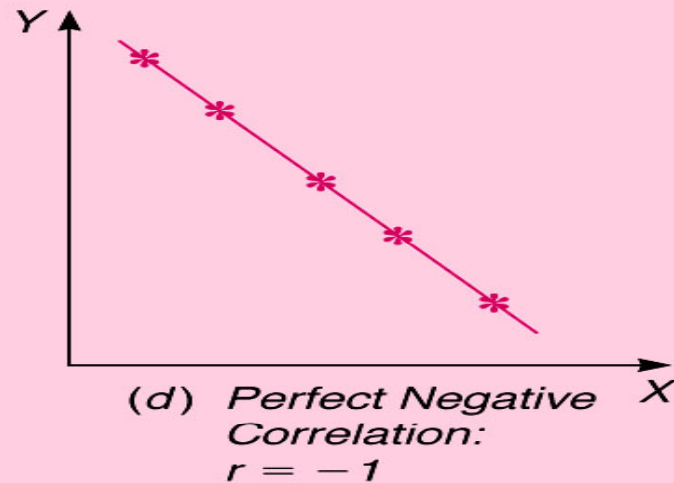
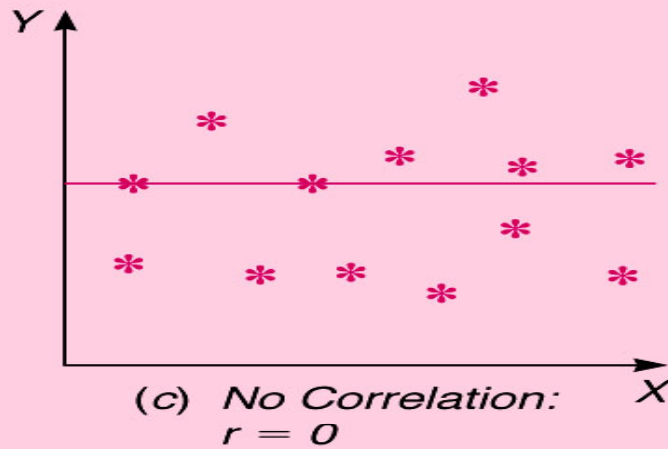
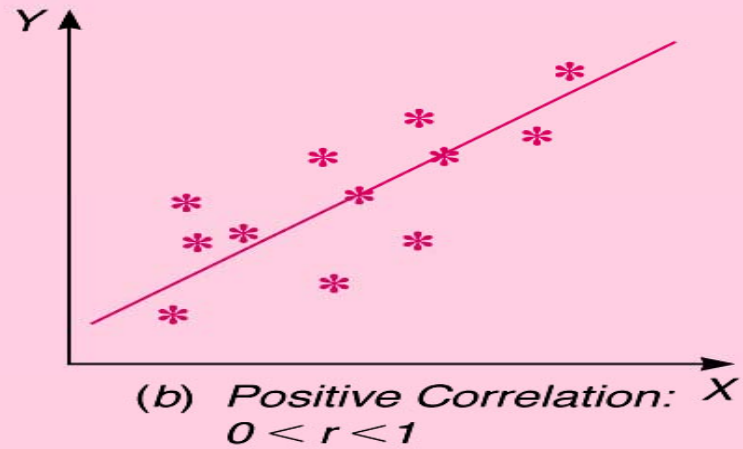
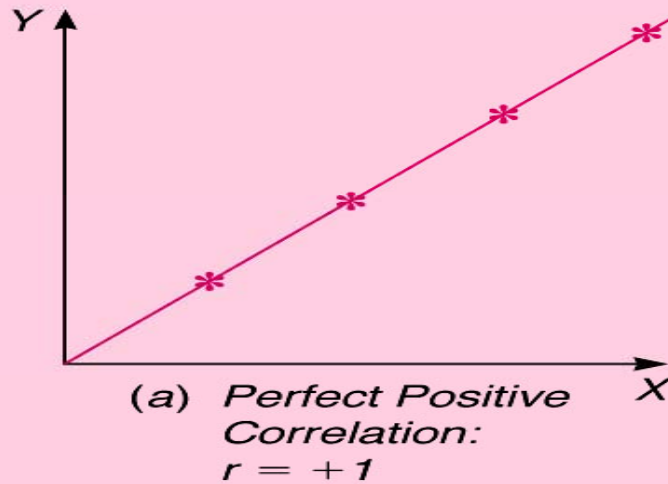
$$r = \frac{(6)(51.5) - (18)(15)}{\sqrt{[(6)(80) - (18)(18)][(6)(39.5) - (15)(15)]}}$$

$$r = 0.901$$

**Coefficient of determination**

$$r^2 = (0.901)^2 = 0.812$$

# Coefficient - Four Values



# Multiple Regression Analysis

$$Y = a + b_1X_1 + b_2X_2$$

$$\text{Output} = -3.20 + 0.25 * \text{test} + 0.40 * \text{experience}$$

If  $X_1 = \text{test score } 60$ ,  $X_2 = \text{experience } 2 \text{ years}$

$$Y = -3.20 + (0.25 * 60) + (0.40 * 2)$$

$$= 11$$

# Econometric Method

An econometric model is a mathematical representation of economic relationship (s) derived from economic theory. The primary objective of econometric analysis is to forecast the future behavior of the economic variables incorporated in the model.

# Multiple Regression (Econometric Model)

- $\text{Sales} = a + bP + c\text{Adv} + d\text{GNP} + e\text{RD} + F\text{Pc} + r$

Where

- $P$  = price
- $\text{Adv}$  = Advertising expenditure
- $\text{GNP}$  = Gross national Product
- $\text{RD}$  = Research and development expenses
- $\text{Pc}$  = price of the firm leading competitor
- $r$  = random error term

# Simple trend analysis

- This year sales = \$ 2 million
- 5 percent grow per year
- Sales forecast = \$ 2.1 million

# Market share analysis

- **Current market share = 18 %**
- **Market forecast = \$ 10,000,000**
- **Sales forecast = \$ 1,800,000**

# Chain Ratio Method

The potential sales of a product may be estimated by applying a series of factors to a measure of aggregate demand

# Chain ratio method

- Sales forecast for Introductory Marketing text book = number of college students x percent annually enrolled in Introductory Marketing course x percent purchasing new book x expected market share
- Sales forecast =  $10,000,000 \times .07 \times .87 \times .11$   
= 66,990 text books

Total amount of coffee sales	174.5 mil units
Proportion of coffee used at home	0.835
Coffee used at home	145.7 mil units
Proportion of non-caffeinated coffee used at home	0.937
Non-caffeinated coffee used at home	136.5 mil units
Proportion of instant coffee	0.40
Instant non-caffeinated coffee used at home	54.6 mil units
Estimated market share for Maxim	0.08
Potential sales of Maxim	4.37 mil units

Male population in country	150 mil
Proportion of adult male using shaving blades	0.60
Male population using shaving blades	90 mil
Number of times using per years	100
Total shaving done per year	9000 mil
Proportion of shaving done with stainless steel	0.4
Average number of shaving per stainless steel blade	6
Number of stainless steel blades used per year (9000mil x0.40) / 6	600 mil
Proportion of market the firm can capture	0.20
Potential sales	120 mil

# Market build up method

- Total sales forecast = region 1 forecast  
+ region 2 forecast + region 3 forecast  
= \$ 2 m +  
\$ 7 m + \$ 13 m  
= \$ 22 m

# Test marketing

Total sales forecast = ( sales in test market A)+ (sales in test market B ) x 25

Sales forecast = ( \$ 1 m + \$ 1.2 m ) x 25  
= \$ 55 m

# Improving Forecasts

Some simple guidelines:

- Check assumptions
- Stress fundamentals
- Beware of history
- Beware of technology
- Stay flexible

# Uncertainties in Demand Forecasting

Demand forecasts are subject to error and uncertainty which arise from three principal sources:

- Data about past and present market
- Methods of forecasting
- Environmental change

# Coping with Uncertainties

The following guidelines

- Conduct analysis with data based on uniform and standard definitions.
- In identifying trends, coefficients, and relationships, ignore the abnormal or out-of- the- ordinary observations.
- Critically evaluate the assumptions of the forecasting methods and choose a method which is appropriate to the situation.
- Adjust the projections derived from quantitative analysis in the light of unquantifiable, but significant, influences.

# Coping with Uncertainties

- Monitor the environment imaginatively to identify important changes.
- Consider likely alternative scenarios and their impact on market and competition.
- Conduct sensitivity analysis to assess the impact on the size of demand for unfavorable and favorable variations of the determining factors from their most likely levels.