Sales Forecast

Before examining the planning and analytical work involved in setting sales volume objectives, it is important to define three terms viz.

i) Market Potential

ii) Sales Potential

iii) Sales Forecast

i) Market Potential:

A market potential is an estimate of the maximum possible sales opportunities present in a particular market segment and open to all sellers of a good or service during a stated future period. Thus, an estimate of the maximum number of personal computers during the calendar year 2006 by all sellers competing for this market would represent the Indian PC market potential for the year 2006. A market potential indicates how much of a particular product can be sold to a particular market segment over some future period, assuming the application of appropriate marketing methods. There are 3 main steps in analysing market potential.

a) Market identification: The first step in analysing a product's market potential is to identify its market. Market identification requires finding out

1. Who buys the product?
2. Who uses it?
3. Who are the prospective buyers and/or users?

Some companies find answers to these questions in their internal records, but most companies, especially those that use long marketing channels, must use field research to obtain meaningful answers. In consumer goods marketing, buyers, users, and prospects are identified and classified according to such characteristics as age, sex, education, income, and social class. In industrial-

goods marketing, buyers, users, and prospects are identified and classified by size of firm, geographical location, type of industry, and the like.

Market identification studies reveal the characteristics that differentiate the market segments making up the product's market potential. Frequently they uncover unexploited market segments whose patronage might be obtained through redirecting personal-selling effort or changing promotional strategy. Sometimes, market identification studies provide, as a side result, customer data on such factors as purchase frequency, searching time expended, unit of purchase, and seasonal buying habits. When assembled and analysed, these data help in estimating market potential.

b) Market Motivation: The second step in analysing market potential is to detect the reasons why customers buy the product and the reasons why potential customers might buy it. Market motivation studies attempt to answer the twin questions like why do people buy and why they do not. The answers help not only in estimating market potential but assist the sales executive seeking to increase the effectiveness of promotional programmes.

Motivation research techniques vary, but the most widely used are the projective techniques, in which respondents project themselves, their attitudes, interests, and opinions into interpretations of special materials presented by the researcher. Analysis of results by trained specialists lays bare what goes on in buyer's minds, including, importantly, the real reasons for buying or not buying the product. Most motivation studies are directed towards explaining the buying behaviour of ultimate consumers rather than industrial users. Information from motivation studies helps not only in estimating a product's market potential but assists in deciding.

1. How best to present the product in sales talks.
2. The relative effectiveness of different selling appeals.
3. The relative appropriateness of various promotional methods.

c) Analysis of Market Potential: Having identified the potential buyers and their buying behaviour, the third step is to analyse the market potential. Generally, market potential cannot be

analysed directly, so analysis makes use of market factors (a market factor is a market feature or characteristic related to the product's demand). For instance, the number of males reaching shaving age each year is one market factor influencing the demand for men's electric shavers. But not every male reaching shaving age is a prospective buyer of an electric shaver, some will be late in starting to shave, others will adopt other shaving methods, some will not have the money to buy a shaver or will prefer to use that money for something else, and still others will use borrowed shavers or, perhaps, will grow beards. Thus, using market factors for analysing market potential is a two-step process:

1. Select the market factor(s) associated with the product's demand.
2. Eliminate those market segments that do not contain prospective buyers of the product.

Market indexes

A market index is a numerical expression indicating the degree to which one or more market factors associated with a given product's demand is present in a given market segment, usually a given geographical market segment. Market indexes are expressed in relative terms, such as in percentages, rather than in absolute numbers. For example, in analysing the market for washing machines furniture, a market index might contain three factors: population, effective buying income, and number of marriages. Many companies refine these indexes further by breaking them down into greater detail; for example, the population index is divided into sub-indexes covering different age groups and the income index into sub-indexes for different income groups.

Other marketers construct their own market indexes, including different market factors and using different weighting systems. One producer of lighting fixtures includes data on new housing starts, and a maker of auto seat covers includes motor vehicle registrations. Other market factors frequently used in constructing consumer-goods market indexes are registrations of new automobiles, home ownership, marriage licenses issued, births, and deaths. Marketers of industrial products construct market indexes using such market factors as value added by manufacture, number of employees engaged in certain kinds of manufacturing, number of manufacturing establishments, person-hours worked, total value of shipments of particular items, and capital expenditures for new plant and equipment.

ii) Sales Potential:

The sales potential is an estimate of the sales opportunities for a particular company selling a good or service during a stated future period. For example, the estimate of the number of PCs that might be sold in 2006 by Aamar PC would be their sales potential. Sales potentials are derived from market potentials after analyses of historical market share relationships and adjustments for changes in companies' and competitors' selling strategies and practices.

iii) Sales Forecast:

This is discussed in details in the next section.

Advantages of Personal Selling are:

- It's more flexible.
- Sales people can see the customer's reaction to a particular sales approach, and at times make the necessary corrections.
- It can be focused or pinpointed on prospective customers.
- The goal on personal selling is to actually make a sale.

Limitations of Personal Selling are:

- High cost
- The company may often be unable to attract the quality of people needed to the job.

Sales Forecast

A sales forecast is an estimate of sales, in monetary or physical units, in a future period under a particular marketing initiatives and an assumed set of economic and other factors outside the unit for which the forecast is made. A sales forecast may be for a single product or for an entire product line. It may be for a manufacturer's entire marketing area, or for any subdivision of it. Sales forecasts can be short-term, or operating and long-range. Long-range sales forecasts are used for long run financial and production capacity planning; but they are so tentative in nature that that salespeople more prefer the short-term or operating sales forecast, which is a prediction of how much of a company's particular product (or product line) can be sold during a future period under a given marketing programme and an assumed set of outside factors.

A firm's sales potential and its sales forecast are not usually identical. The sales potential is larger than the sales forecast. There are several reasons for this:

- Some companies do not have sufficient production capacity to capitalise on the full sales potential
- Other firms have not yet developed distributive networks capable of reaching every potential customer
- Others do not attempt to realise their total sales potentials because of limited financial resources
- Others, being more profit oriented than sales oriented, seek to maximise profitable sales and not possible sales.

The estimate for sales potential indicates how much a company could sell if it had all the necessary resources and desired to use them. The sales forecast is a related but different estimate, as it indicates how much a company with a given amount of resources can sell if it implements a particular marketing programme.

Forecasting is the key to success in sales since poor forecasting can lead to high inventories and associated costs, which eat into working capital, or under-production and unrealised market

potential. A major research exercise carried out in the USA by Ledbetter and Cox in 1977 showed that forecasting techniques were used by 88 per cent of the 500 largest industrial companies in the USA, and that forecasting was more widely used than any other planning technique. Most planning decisions make use of some form of forecasting information. Forecasting is important in almost all areas of the firm, but sales forecasting is especially salient, since this is the base upon which all company plans are structured. There are several methods available to the manager or researcher and these fall into two basic categories: subjective or objective methods or a combination of the two.

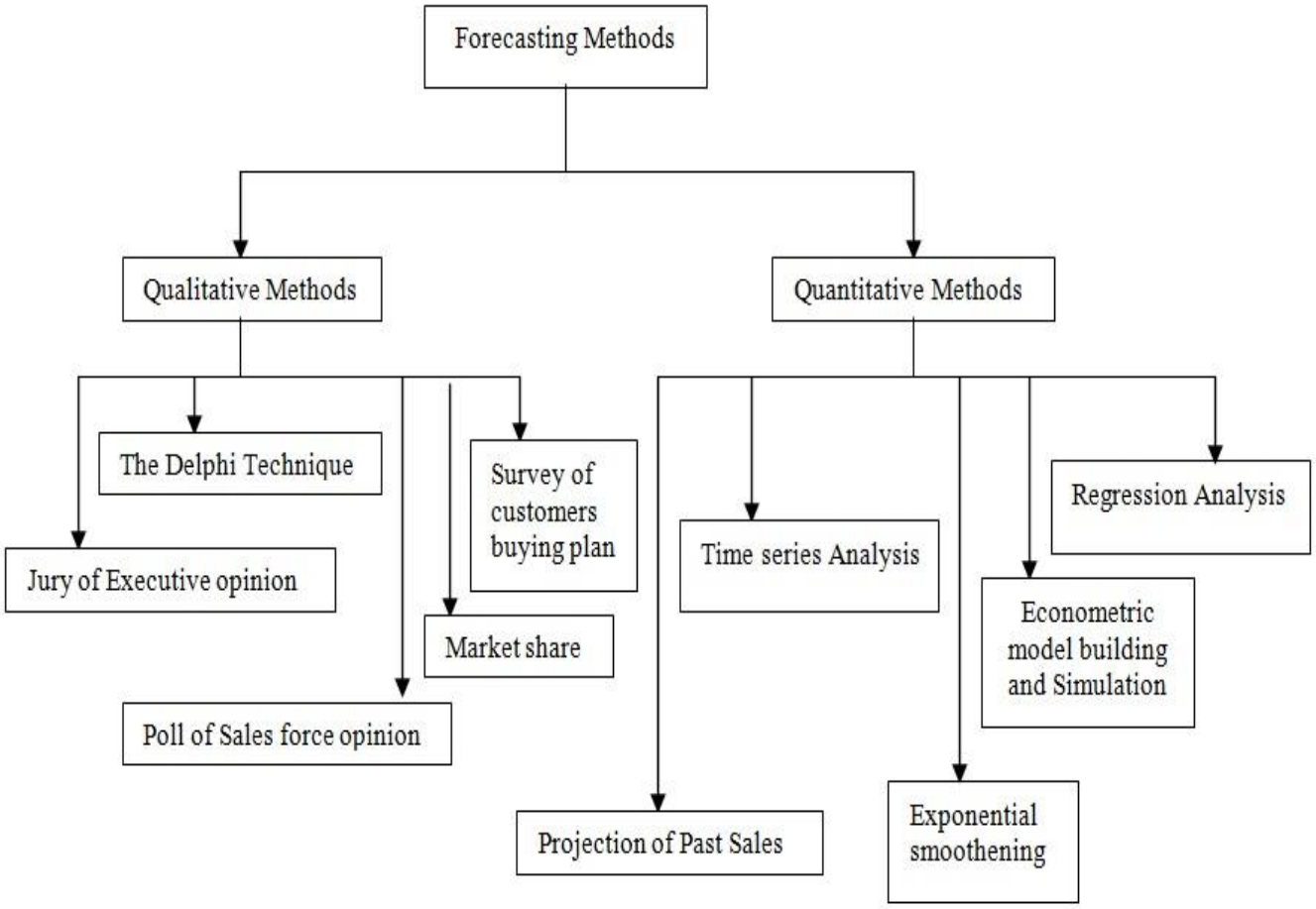
Sales forecasting is of three types:

- ***The short-range or operational forecast:*** These help in short range business planning. Such forecasts are usually made for a period of one year and reviewed monthly, quarterly or half-yearly. The forecasts are used for planning the various marketing activities.
- ***The long-range or strategic forecast:*** These facilitate investment decisions at the time of starting a new industry or while attempting an expansion or diversification.
- ***Perspective planning forecast:*** Still longer-term forecasts, say for 15 or 25 years are normally used for the purpose of perspective planning.

Sales Forecasting Methods

The sales forecasting method is a procedure for estimating how much of a given product (or product line) can be sold if a given marketing programme is implemented. No sales forecasting method is foolproof, each of them leads to some errors. Others involve the application of sophisticated statistical techniques, such as regression analysis or econometric model building and simulation. Well-managed companies do not rely upon only a single sales forecasting method but use several. The forecasting methods can be broadly classified as qualitative and quantitative as shown in the following figure.

Graphical Representation of Sales Forecasting Methods



Qualitative Methods

There are 5 Qualitative forecasting methods, which are discussed below.

1) Jury of Executive Opinion

The jury method is a commonly applied method of sales forecasting. Judgement is the crucial factor in this method. This is true for both the top jury method and the percolated jury method. The difference is that in the former, the participants are limited to the top executives and in the latter, a large number of marketing/sales executives participate. In both, the participants exercise

their judgement and give out their opinions. A rough averaging of these opinions arrives at the final forecast.

There are two steps in this method:

a. High-ranking executives estimate probable sales, and

b. An average estimate is calculated.

The assumption is that the executives are well informed about the industry outlook and the company's market position, capabilities, and marketing programme. All should support their estimates with factual material and explain their rationales.

Advantages

- This is a quick and easy way to turn out a forecast.
- This is a way to pool the experience and judgment of well-informed people.
- This may be the only feasible approach if the company is so young that it has not yet accumulated the experience to use other forecasting methods.
- This method may be used when adequate sales and market statistics are missing, or when these figures have not yet been put into the form required for more sophisticated forecasting methods.
- Because of the status of the contributing panel, the people who use the information see the figures as having a high level of source credibility.
- The final forecast is based on the collective experience of a group, rather than on the opinion of a single executive.
- The sales forecast is put together by people with many years' experience in a particular industry.
- Because the final forecast is based on a consensus of opinion, variations in individual subjective estimates are eliminated.

Disadvantages

- Its findings are based primarily on opinion or guesswork, and factual evidence to support the forecast is often less.
- This approach adds to the workload of key executives, requiring them to spend time that they would otherwise devote to their areas of main responsibility.
- A forecast made by this method is difficult to break down into estimates of probable sales by products, by time intervals, by markets, by customers, and so on.
- There is a possibility of pessimistic forecast by a salesperson whose sales quotas or targets are linked to payments of bonus or commission in order to boost earnings.

2) The Delphi technique

Several years ago researchers at the he Rand Corporation developed a technique for predicting the future that is called the Delphi technique. This is a version of the jury of executive opinion method in which those giving opinions are selected for their "expertise". The panel of experts responds to a sequence of questionnaires in which the responses to one questionnaire are used to produce the next questionnaire. Thus, information available to some and not to other experts is disseminated to all, enabling all to base their final forecasts on "all available" information. This technique eliminates the bandwagon effect of majority opinion. Their opinions and reactions are analysed and where is a sharp difference on an issue, interchanges are permitted and the final forecasts are presented issue by issue.

3) Poll of Sales Force Opinion or Sales Force Composite Method

In the poll of sales force opinion method, often tagged "the grass-roots approach," individual sales personnel forecast sales for their respective territories. These individual territory-wise forecasts are consolidated at branch/area/region level, and the aggregate of all these forecasts is taken as the corporate forecast.

Advantages

- Forecasting responsibility is assigned to those who produce the results.
- As the salespeople help to develop the forecast, they should have greater confidence in quotas based upon it.
- Forecasts developed by this method are easy to break down according to products, territories, customers, middlemen, and sales force.
- Those people closest to the actual customer produce forecasts
- Only individual sales personnel could have such an intimate knowledge of their own sales territory
- It does not involve mathematics or statistics in terms of composing the forecasts
- It can be produced at any level of disaggregation
- It can be produced on a regular basis
- It involves sales staffs actively in planning sales activities

Disadvantages

- Not generally trained to do forecasting, and influenced by current business conditions in their territories, salespersons tend to be overly optimistic or overly pessimistic about sales prospects.
- This method is often unaware of broad changes taking place in the economy and of trends in business conditions outside their own territories.
- Some sales personnel deliberately underestimate so that quotas are reached more easily.
- Many sales people are too busy in their routine selling activities that they may not get necessary time to execute this additional task
- If sales staffs think forecasts will be used to fix bonus payment levels they may be deliberately pessimistic.

- It involves a lot of staff time and hence the decrease in sales if carried out on a regular basis.

To some extent, the weakness of this method can be overcome through training the sales force in forecasting techniques, by orienting them to factors influencing company sales, and by adjusting for consistent biases in individual salespersons' forecasts.

For most companies, however, implementing corrective actions is an endless task, because sales personnel turnover is constantly going on, and new staff members (whose biases are unknown at the start) submit their forecasts along with those of veteran sales personnel with known biases. Hence the companies should not use it as the only forecasting method. The poll of sales force opinion serves best as a method of getting an alternative estimate for use as a check on a sales forecast obtained through some other approach.

4) Survey of Customers' Buying Plans

This method also known as User Expectation Method or End Use Method or Survey of Buyer Intentions Method, is based on customers' feedback on their future buying plans. According to this method, the various users of the product under forecasting are listed first, then their individual likely demand of the product is ascertained, and from that data, the demand forecast for those products is consolidated. The survey will give an idea of the total possible consumption of the product, the buying plans of the users and the possible market share for the company doing the survey. The user survey can be made either on a sampling basis or on a census basis depending on the size of the user group to be covered. Industrial marketers use this approach more than consumer-goods marketers, because:

- It is easiest to use where the potential market consists of small numbers of customers and prospects
- Substantial sales are made to individual accounts
- The manufacturer sells direct to users, and
- Customers are concentrated in a few geographical areas

Survey techniques such as market research surveys or simply conversations between the sales representative and existing and potential customers can make clear the purchase intentions of customers and/ or users. Test marketing, in a small representative area, is also used to produce forecasts and in many ways is similar to surveys.

Advantages

- Information is elicited with the use of proven marketing research methodology such as sample surveys, projective techniques and questionnaires.
- Prospective purchasers provide information on what and how much they are likely to buy in the future.
- Production of sales forecasts can be subcontracted to professional market research agencies, particularly useful when time is short.
- It is relatively inexpensive to survey a sample of customers and prospects to obtain their estimated requirements for the product, and to project the results to obtain sales forecast

Disadvantages

- There may be variance between what respondents say they are going to purchase and their actual purchases.
- There is a limit to how often the same people (i.e. a company's purchasing manager) can be approached.
- Sample surveys are expensive and very time-consuming, and not suited to producing forecasts on a regular basis.

5. Market Share Method

The planned market share of the firm is the key factor in this method. The firms first work out the industry forecast, apply the market share factor and then deduce the company's sales forecast. The

market share factor is developed based on the past trend, company's present competitive position, brand preference, etc. By a detailed marketing audit, the firm must correctly appraise its market standing, brand image, market share and strengths and weaknesses as compared with the competitors in the industry. It also correctly assesses through reliable marketing intelligence, its competitors' plans, policies, and activities. Only then, will the market share factor and therefore the sales forecast arrived at by this method have a good degree of reliability.

Quantitative forecasting methods

Objective methods of forecasting are statistical or mathematical in nature. Historical data are analysed to identify a pattern or relationship between variables and this pattern is then extended or extrapolated into the future to make a forecast. Objective methods of forecasting can be classified by considering the underlying models involved. They fall into two main categories:

i. Causal models
ii. Time series models

Causal Models

Causal models exploit the relationship between the time series of the variable being examined and one or more other time series. If other variables are found to correlate with the variable of interest, a causal model can be constructed incorporating coefficients that give the relative strengths of the various causal factors.

The sales of a product may be related to the price of the product, advertising expenditure and the price of competitors' products. If the forecaster can estimate the relationship between sales and the independent variables, then the forecast values of the independent variables can be used to predict future values of the dependent variable (in this case, sales).

For example, the demand for building bricks is based on the demand for houses and other commercial buildings built from brick. This is called derived demand, that is, in this case the demand for bricks is derived from the demand for houses. There are many factors influencing the demand for houses and other brick-built buildings. These include the following:

- Number of newly married couples
- Interest rate levels
- Income lending ratios used by banks and building societies; fashion
- Levels of unemployment
- Inclement weather (stops building)
- Local authority housing policies

All of the above factors have a 'causal' effect on the demand for brick. These variables would have to be included in a forecasting equation and their relevant strengths and effects assessed before the demand for brick could be estimated for future periods. This is an example of what is meant by 'causal techniques'.

Time Series Models

As their name suggests, time series methods operate on the assumption that the past is a good indicator of the future and that future demand is simply a function of time. This time dependence includes such factors as seasonality and cyclicality. For example, shops tend to sell more ice cream in the summer and more warm clothes in the winter. Their whole purpose is to identify patterns in historical data, model these, and extrapolate them into the future.

Such methods are unlikely to be successful in forecasting future demand when the historical time series is very erratic. In addition, because it is assumed that future demand is a function of time only, causal factors cannot be taken into consideration. For example, such models would not be able to incorporate the impact of changes in management policy. Such techniques are epitomised by two of the simpler models, moving averages and exponential smoothing, which will be looked at here. Other, more sophisticated, time series models include decomposition models and auto-regressive moving averages (Box-Jenkins) techniques.

Time series analysis uses the historical series of only one variable to develop a model for predicting future values. The forecasting situation is treated rather like a 'black box', with no attempt made to discover the other factors that might affect its behaviour. Because time series models treat the variable to be forecast as a function of time only, they are most useful when other conditions are

expected to remain relatively constant, most likely true of the short term rather than the long-term future. Hence such methods are particularly suited to short term, operational, routine forecasting - usually up to six months or one year ahead of current time. Time series methods are not very useful when there is no discernible pattern of demand.

In total, there are 6 quantitative forecasting methods, which are discussed below.

1) Projection of Past Sales
2) Time-series analysis
3) Moving Average method
4) Exponential smoothing
5) Regression Analysis
6) Econometric Model Building and Simulation

1) Projection of Past Sales

Lines of various shapes can be described by mathematics. A particular line or curve has a 'mathematical function' as shown as $y = a + bx$, where y represents the vertical axis of a graph, a being the intercept of the y axis, b the gradient of the curve and x the units of time plotted on the horizontal axis. So a five period ahead forecast can be calculated from the intercept *(a)* plus the gradient component *(b)* multiplied by five $(x = 5)$ or $y = a + b*5$. Basically if the forecaster has some data and has some idea of the likely mathematical function of the plot of the data he or she can use the appropriate mathematical equation to extrapolate the plot of the curve into future time periods and use this extrapolation as a basis of a forecast, in the context of our discussion, a sales forecast.

Trend projections are perhaps more suitable to long term forecasting rather than to short term. They provide the forecaster with evidence of the shape and extent of the underlying trend exhibited in the data. For example a 10-year plot of the BSE index shows an underlying upward trend imbedded in quite erratic random fluctuations from the trend line. Many stock analysts, often known as

'chartists' use this approach, because they plot share price movements on charts to assist them in their investment decisions.

The projection of past sales method of sales forecasting takes a variety to forms. The simplest is to set the sales forecast for the coming year at the same figure as the current year's actual sales, or the forecast may be made by adding a set percentage to last year's sales, or to a moving average of the sales figure for several past years. For instance, if it is assumed that there will be the same percentage sales increase next year as this year, the forecaster might utilize a naïve model projection such as:

Next year's sales = this year's sales x this year's sales / last year's sales

This year's sales are inevitably related to last year's. Similarly, next year's sales are related to this year's and to those of all preceding years.

Projecting present sales levels is a simple and inexpensive forecasting method appropriate for companies in more or less stable or "mature" industries.

2) Time-series analysis:

Time-series analysis is a statistical procedure for studying historical sales data, not greatly different in principle from the simple projection of past sales in. This procedure involves isolating and measuring four chief types of sales variations: long-term trends, cyclical changes, seasonal variations, and irregular fluctuations. Then a mathematical model describing the past behaviour of the series is selected, assumed values for each type of sales variation are inserted, and the sales forecast is 'cranked out."

The utilities of time series analysis are:

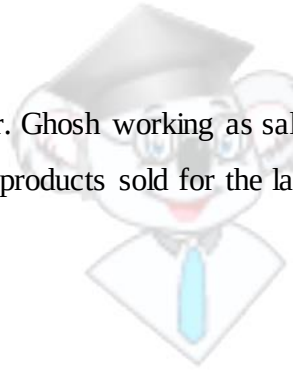
- It helps in understanding the changes that takes place in past behaviour by observing the data over a period of time.
- It helps to predict future behaviour
- It helps in planning the future operations.
- It helps in evaluating current accomplishment by comparing the actual performance with the predetermined performance, then analysing the cause of variations

- It facilitates comparison of data over a period of time and helps in drawing the conclusions.

For most companies, time-series analysis finds practical application mainly in making long-range forecasts. Predictions on a year-to-year basis, such as are necessary for an operating sales forecast, generally are little more than approximations. Only where sales patterns are clearly defined and relatively stable from year to year is time-series analysis appropriately used for short-term operating sales forecasts.

One drawback of time-series analysis is that it is difficult to "call the turns". Trend and cycle analysis helps in explaining why a trend, once under way, continues, but predicting the turns often is more important. When turns for the better are called correctly, management can capitalise upon sales opportunities; when turns for the worst are called correctly, management can cut losses.

To understand this analysis, let us consider the following example.



Mr. Ghosh working as sales manager of ***Joy Gifts Ltd.***, found out the following data on number of products sold for the last 7 years:

Year	Sales (in'000)
1998	37
1999	41
2000	45
2001	52
2002	58
2003	63
2004	78

In order tit a trend line for this data, following workings are needed.

X	Y	x = X-2001	x*Y	x^2
1998	37	-3	-111	9
1999	41	-2	-82	4
2000	45	-1	-45	1
2001	52	0	0	0
2002	58	1	58	1
2003	63	2	126	4
2004	78	3	234	9
	∑Y=374		∑x*Y=180	∑x2=28

Let the trend line equation be Y = a + b*X

Now, b = ∑**x*Y** / ∑**x2** =180 / 28 **= 6.43** and a = ∑Y / N=374/7= **53.43**

Hence, the regression equation describing the secular trend is given by:

Y = 53.43 + 6.43X

3) Moving Average method:

This method is extensively used to allow for market place factor changing at different rates and at different times. In this method, both distant past and distant future have little value in forecasting. The moving average is a technique that attempts to "smooth out" the different rates of change for the immediate past, usually past three to five years. The forecast is the mean of these past periods and is only valid for one period in future. The forecast is updated by eliminating the data for the earliest period and adding the most recent data.

Let us consider following example.

Period	Sales volume	Sales for 3- Year period	3- Year moving average
1	200		
2	250		
3	300	750	250
4	350	900	300
5	450	1100	366.6
6	?		

Period-6 forecast = 366.6

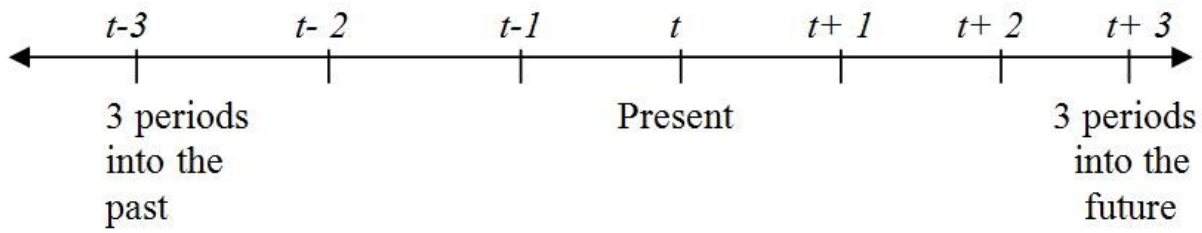
The sales volumes for periods 3, 4, 5 are totaled and divided by 3 to derive the mean of 366.6, which is the Period-6 forecast. If the company operates in the stable environment a short 2 or 3 years average will be most useful. For a firm in an industry with cyclical variation, the moving average should use data equal to length of cycle.

There are mainly two types of moving averages.

Simple moving average

The simple moving or rolling average is a useful and uncomplicated method of forecasting the average expected value of a time series. The process uses the average individual forecasts (F) and demand values (X) over the past *n* time periods. A suffix notation is used, which may seem complicated at first, but it is really quite simple: the present is referred to as time *t* and one period into the future by *t* + 1, one period into the past by *t* -1, two periods by *t* + 2, and so on. This is perhaps best appreciated with reference to a time diagram:

Time diagram showing notation for present, past and future



The simple moving average process is defined by the equation:

$$F_{t+1} = F_t + 1/n\ (X_t X_{t-n})$$

Where

F_{t+1} = Forecast for 1 period ahead

F_t = Forecast made last time period for present period

n = number of time periods

X_t = Actual demand in present time

X_{t-n} = Actual demand in period t-n

Weighted average

The simple moving average has the disadvantage that all data in the average are given equal weighting, i.e.: 1/n

More recent data may be more important than older data, particularly if the underlying pattern of the data has been changing, and, therefore, should be given a greater weight. To overcome this problem and increase the sensitivity of the moving average, it is possible to use weighted averages, with the sum of the weights equal to unity, in order to produce a true average. In decimal form, a weighted moving average can be expressed as:

$$F_{t+1} = 0.4\,X_t + 0.3\,X_{t-1} + 0.2\,X_{t-2} + 0.1\,X_{t-1}$$

(Notation as defined for the simple moving average).

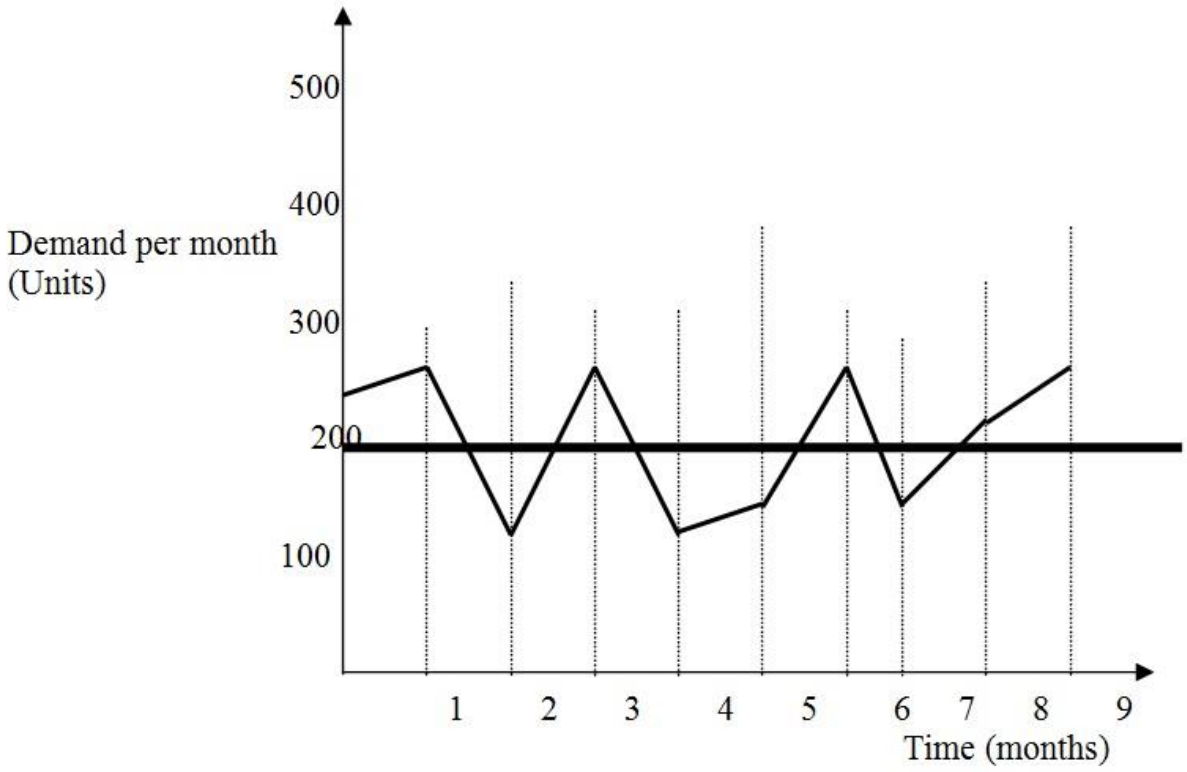
Problems common to all moving average procedures still remain, the major ones being

1. No forecast can be made until n time periods have passed, because it is necessary to have values available for the previous (n – 1) periods.

2. The sensitivity or speed of response of moving average procedures is inversely proportional to the number of periods *n* included in the average. To change the sensitivity, it is necessary to change the value of *n*. That creates problems of continuity and much additional work.

The methods of simple and weighted moving averages discussed so far are only suitable for reasonably constant (stationary) data and are unable to deal with a significant trend. An example of a stationary time series is shown in the following figure.

Example of a stationary time series

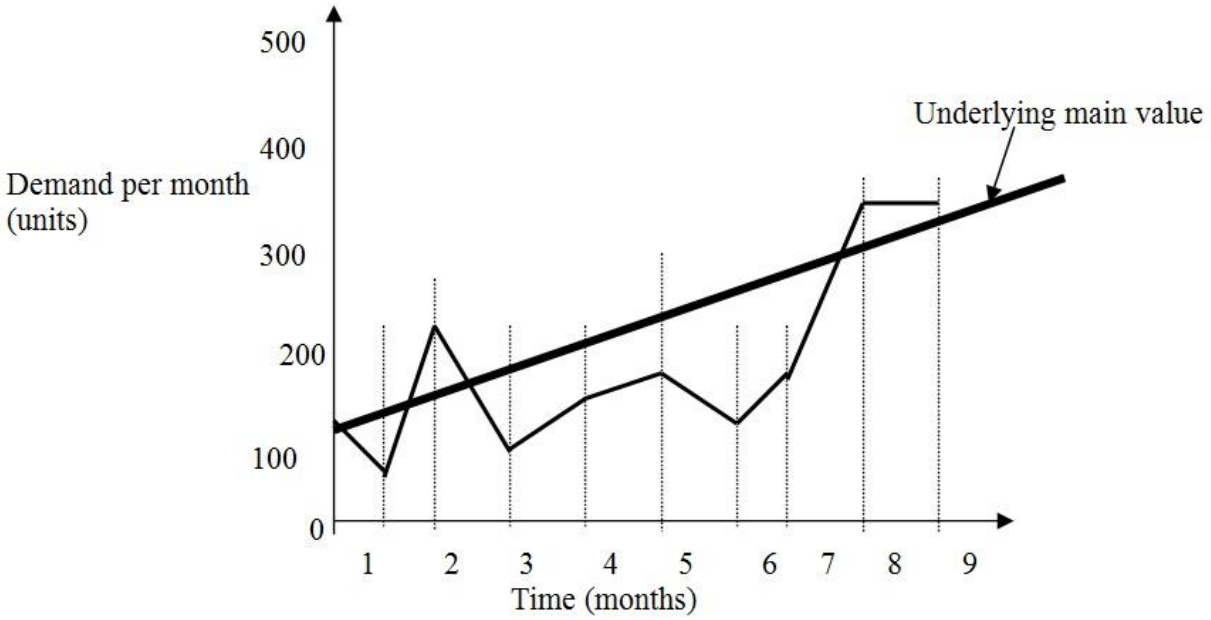


It can be seen from the graph that over a period of nine months the time series fluctuates randomly about a mean value of 200 units, which is not increasing or decreasing significantly over time.

4) Exponential smoothing

Unlike the above case, time series may have a linear underlying trend as shown below:

Example of a time series with a linear underlying trend



In the time series shown in the above figure, the underlying mean value of the series is not stationary. If a line of best fit is drawn through all the points, you can see that while the actual values are fluctuating randomly, the underlying mean value is following a rising linear trend. A method of moving averages designed for a reasonably stationary time series cannot accommodate a series with a linear trend. In such situations, the forecasts tend to lag behind the actual time series, resulting in systematic errors.

To counter such error factors, the method of double (sometimes called linear) moving averages has been developed. This method calculates a second (or double) moving average, which is a moving average of the first one. The basic principle is very similar to linear exponential smoothing methods, which are themselves a kind of double moving average but which utilise a more sophisticated weighting system.

Exponential smoothing (time series)

The use of exponentially weighted moving averages was first developed from a number of unpublished reports by C Holt of the Carnegie Institute of Technology. Such techniques overcome

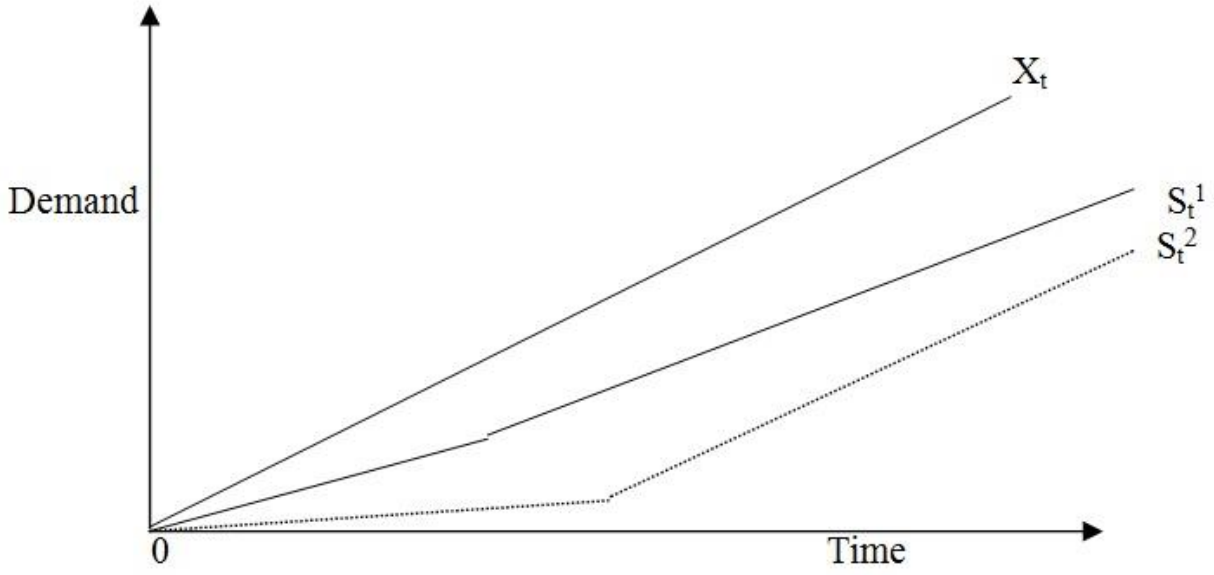
many of the shortcomings and limitations of the moving average method. Exponential smoothing is very simple and is really just a more elaborate form of the moving average. The updating equations for exponential smoothing can easily be stored in a computer in the form of a programme. Exponential smoothing is useful in the production of a large number of routine short-term sales forecasts, which are required on a regular basis. Apart from the need to input the most recent information in order to update the present values, much of the calculations can be carried out by computer making the system as a whole a semi-automatic system.

Double exponential smoothing

Simple exponential smoothing is only really appropriate for a relatively stationary time series. In particular, the method will do rather badly if the series contains a long-term trend. Like the simple moving average, if simple exponential smoothing is applied inappropriately to a time series with a trend, the forecast will continually lag behind the actual value of series X_t.

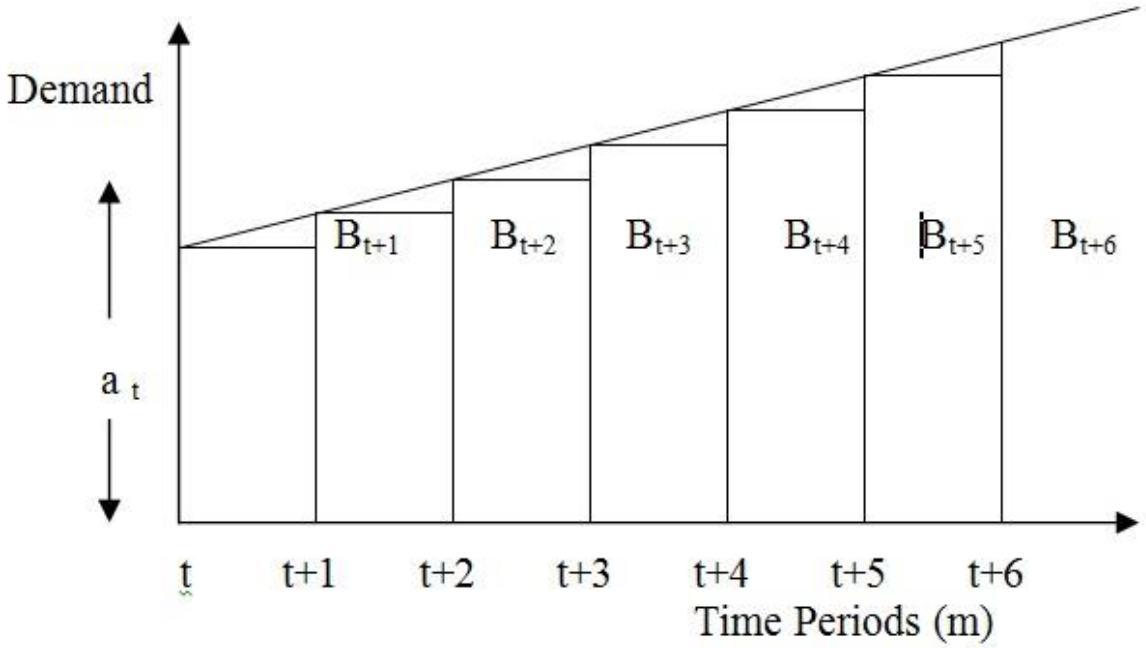
The method of double exponential smoothing is technically known as Brown's one parameter linear exponential smoothing. This method introduces additional equations to those of the simple exponential smoothing to estimate a trend. The method uses the same principle as the double or linear moving average discussed earlier, that is, if simple exponential smoothing is applied to a time series with a significant trend it will lag behind. If single exponential smoothing is applied again to the first smoothed series, the second smoothed series S_t^2 will lag behind the first S_t^1 by approximately the same amount as the first smoothed series S_t^1 lagged behind the original time series X_t. This is illustrated in the following figure.

The lagged response of a sample exponential smoothing model



Brown's method accepts that after initial transients have died down, S_t^1 will lag behind X_t by amount *A*. A second single exponentially weighted average S_t^2 will lag behind the first S_t^1 by the same amount, *A*. At time *t*, the difference between S_t^1 and S_t^2 is added to the S_t^1 to give the level component a_t. A proportion of the difference between S_t^1 and S_t^2 is then used to provide a trend component, b_t, which is multiplied by the number of periods ahead to be forecast, *m*, and the product added to the level at to produce a forecast for *m* steps ahead. Brown's model of double exponential smoothing is made up of two components: a level component (or intercept) *(a)* and a trend component *(b)*. These components are combined to provide a forecast, as illustrated in the following figure.

The components of Brown's Double Exponential Smoothing



The updating equations for Brown's model are as follows:

Single smoothing $S'_t = \alpha X_t + (1-\alpha) S'_{t-1}$

Double smoothing $S''_t = \alpha S'_t + (1-\alpha) S''_{t-1}$

Level component $a_t = S'_t + (S'_t - S''_t) = 2S'_t - S''_t$

Trend component $B_t = \alpha / 1-\alpha (S'_t - S''_t)$

Forecast $F_{t+m} = a_t + B_t m$, where m is a multiplier of the trend component.

Winter's trend and seasonal model

The exponential smoothing models discussed so far cannot deal with seasonal data. When seasonality does exist, these methods may perform poorly, because the seasonality will produce a systematic error pattern. Such a data series requires the use of a seasonal method to eliminate the systematic pattern in the errors.

Winter's trend and seasonal model is based on three smoothing equations; one for stationary series, one for trends and one for seasonality. The updating equations for this model are as follows:

Overall smoothing $S_t = \lambda * X_t + (1- \lambda) * I_{t-L}$

Trend $Z_t = \gamma * (S_t - S_{t-l}) + (1- \gamma) * Z_{t-1}$

Seasonality $I_t = \beta * (X_t / S_t) + (1- \beta) * I_{t-L}$

Forecast $F_{t+m} = (S_t + mZ_t) I_{(t-L+m)}$

Where:

L is the length of seasonality (e.g. the number of months or quarters in a year)

Z_t is the trend component

I_t is the seasonal adjustment factor is the forecast for m periods ahead

X, Y and β are the smoothing coefficients for overall smoothing, trend and seasonal components, respectively

This statistical technique used for short-range sales forecasting is a type of moving average that represents a weighted sum of all past numbers in a time series, with the heaviest weight placed on the most recent data. To illustrate, consider this simple but widely used form of exponential smoothing, a weighted average of this year's sales is combined with the forecast of this year's sales to arrive at the forecast for next year's sales. The forecasting equation, in other words, is:

Next year's sales = a * (this year's sales) + (1-a)* (this year's forecast)

The "a" in the equation is called the "smoothing constant" and is set between 0.0 and 1.0. If, for example, actual sales for this year came to 320 units of product, the sales forecast for this year was 350 units, and the smoothing constant was 0.3, the forecast for next year's sales is (0.30)(320) + (0.7)(350) = 341 units of products

Determining the value of "a" is the main problem. If the series of sales data changes slowly, "a" should be small to retain the effect of earlier observations. If the series changes rapidly, "a" should be large so that the forecasts respond to these changes. In practice, "a" is estimated by trying several values and making retrospective tests of the associated forecast error is then chosen for future smoothing.

The key limitation of all past sales projection methods lies in the assumption that past sales history is the sole factor influencing future sales. No allowance is made for significant changes made by the company in its marketing program or by its competitors in theirs. Nor is allowance made for sharp and rapid upswings or downturns in business activity, nor is it usual to correct for poor sales performance extending over previous periods.

The accuracy of the forecast arrived at through projecting past sales depends largely upon how close the company is to the market saturation point. If the market is nearly fully saturated, it is rational to predict sales by applying certain percentage figure to "cumulative past sales of the product still in the hands of users" to determine annual replacement demand. However, most often the company whose product has achieved nearly full market saturation finds that its prospective customers can postpone or accelerate their purchases to a considerable degree.

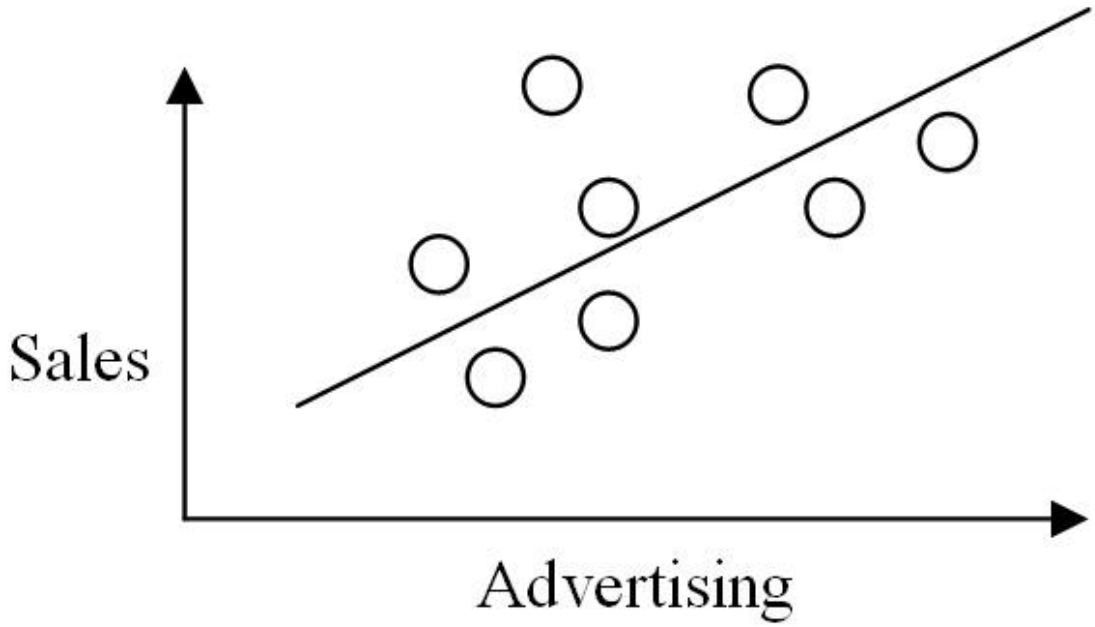
Past sales projection methods are most appropriately used for obtaining "check" forecasts against which forecasts secured through other means are compared. Most companies make some use of past sales projections in their sales forecasting procedures. The availability of numerous computer programs for time-series analysis and exponential smoothing has accelerated this practice.

5) Regression Analysis

One of the most widely used causal techniques is what is known as regression analysis. This technique tries to calculate the statistical relationship between at least two variables. These variables take the form of one or more independent variables and one dependent variable. For example advertising and merchandising expenditure may constitute the two independent variables whereas the resulting level of sales of a certain product in a certain store may constitute the dependent variable. This method starts from the assumption that a basic relationship exists between two variables e.g. diet and health. The method most commonly used is the method known as

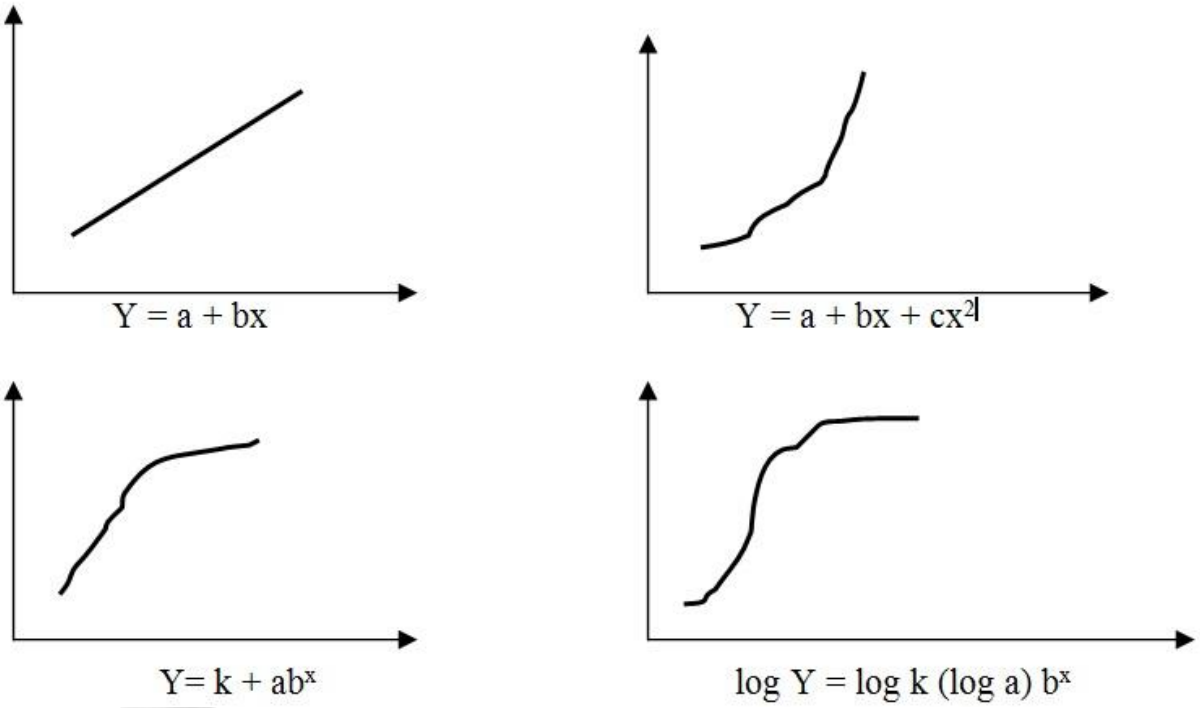
'ordinary least square linear regression'. This method produces a line of best fit in a scatter diagram using mathematical equations called 'normal equations'. The concepts of a scatter diagram and a line of best fit produced mathematically using the ordinary least squared method are shown below in following figure.

Scatter diagram and Regression plot



In the above figure, you can see that the values of independent variable X (advertising) are plotted on the horizontal axis for any given value of the dependent variable Y (sales). This produces a number of points scattered on the graph. To estimate the relationship, if any, and the type of relationship we can plot a line of best fit through the scatter points by eye. Ordinary least square linear regression takes a more scientific approach and plots the line mathematically by using equations to minimise the cumulative value of the squared differences from the line.

Now let us consider the following figures.



If we consider the individual points on the above graphs, some of the differences from the line are negative and some positive. We square the differences and minimise their total to calculate the line of best fit or 'regression line'. Various forms of regressions are available. Ordinary least square linear regression assumes a linear relationship between variables, which basically means that the line of best fit will be a straight line. Multiple regression analysis can handle non-linear relationships and is used extensively in economic calculations or 'econometrics'.

Regression analysis is a statistical process and, as used in sales forecasting, determines and measures the association between company sales and other variables. It involves fitting an equation to explain sales fluctuations in terms of related and presumably causal variables, substituting for these variables values considered likely during the period to be forecasted, and solving for sales. In other words, there are three major steps in forecasting sales through regression analysis:

1. Identify variables causally related to company sales.
2. Determine or estimate the values of these variables related to sales.
3. Derive the sales forecast from these estimates.

Computers make it easy to use regression analysis for sales forecasting. For instance, the manufacturers of consumer durables and FMCGs may use simple regression analysis to determine the association between economic variables and the sales.

To understand this method, let us consider following example.

The sales manager of ***Happy Toyz Ltd***. has collected following data on the company's sales and advertising expenditures for last 7 years.

Sales (No. of units in '000)	253	328	334	331	302	292	324
Ad budget (Rs. in lakhs)	56	75	87	91	102	115	127

Now, for the financial year 2005-06, he has been instructed to achieve sales target of 5 lakh units. For taking decision regarding the advertising budget of the company, he has to take help of regression analysis, which is explained below.

Regression equation of dependent variable Y (in this case, the ad budget) on independent variable X (in this case, the sales) is:

$$Y - \bar{Y} = b_{yx} * (X - \bar{X}), \text{ where } b_{yx} = (\sum XY - n*\bar{X}*\bar{Y}) / (\sum X^2 - n*\bar{X}^2)$$

X	253	328	334	331	302	292	324	**$\sum X=2164$**
Y	56	75	87	91	102	115	127	**$\sum Y=653$**
XY	14168	24600	29058	30121	30804	33580	41148	**$\sum XY=203479$**
X^2	64009	107584	111556	109561	91204	85264	104976	**$\sum X^2=674154$**

Mean of X 309.14

Mean of Y 93.29

byx = (203479 – 7*309.14*93.29) / (674154- 7* 95569.3) = 1608.7 / 5168.9 = 0.311

So, the regression equation is:

Y-93.29 = 0.311*(X-309.14)

Or, **Y= 0.311*X -2.93**

Now for X = 500, Y = 0.311*500-2.93 = 155.5-2.93 =152.57

So the required advertising budget is **Rs. 1, 52, 57,000**

6) Econometric Model Building and Simulation

Econometric model building and simulation approach use an equation or system of equations to represent a set of relationships among sales and different demand-determining independent variables. Then, by "plugging in" values (or estimates) for each independent variable (that is, by "simulating" the total situation), sales are forecast. An econometric model (unlike a regression model) is based upon an *underlying theory* about relationships among a set of variables, and parameters are estimated by statistical analysis of past data. An econometric sales forecasting model is an abstraction of a real-world situation, expressed in equation form and used to predict sales. For example, the sales equation for a durable good can be written as,

S = R + N

Where

S = total sales

R = replacement demand (purchases made to replace product units going out of use, as measured by the disposal of old units)

N = new-owner demand (purchases made not to replace existing product units, but to add to the total stock of the product in users' possession)

Total sales of a durable good, in other words, consist of purchases made to replace units that have been scrapped and purchases by new owners. Thus, a family that has a five-year-old machine trades it to a dealer as part payment for a new machine and becomes part of the replacement demand (although only effectively so when the five-year-old machine, perhaps passing through several families' hands in the process, finally comes to be owned by a family that goes ahead and consigns its even-older machine to the scrap heap).

Replacement demand is measured by the disposal of old units of products, that it, by the percentage of the total stock of the product in users' hands that is taken out of service through consignment to the trash pile, by sale to a junk dealer, or merely by being stowed away and never used again. Replacement demand in any one year does not include demand originating from the family that had a five-year-old machine that it traded to a dealer for a new machine, with the dealer reselling the old machine to another family who buys it second-hand. Only when a particular machine goes completely out of service is it regarded as scrapped, and, at that time (through a chain of purchases and trade-ins), some family becomes a part of replacement demand. Econometricians estimate replacement demand by using life expectancy of survival tables, which are similar to the life (or mortality) tables used by life insurance actuaries.

Econometric model building is almost an ideal way to forecast sales, since it considers the interaction of independent variables that bear logical and measurable relationships to sales and also uses regression analysis techniques to quantify these relationships. Econometric models, however, are best used to forecast industry sales not the sales of individual companies. This is because the independent variables affecting an individual company's sales are more numerous and more difficult to measure than are those determining the sales of an entire industry. Many companies use an econometric model to forecast industry sales, and then apply an estimate of the company's share-of the-market percentage to the industry forecast to arrive at a first approximation for the company's forecasted sales.

Converting industry forecast to company sales forecast

Many companies forecast both their own sales and sales of the industry. The general practice is to forecast industry sales early in the procedure and from it derive a company sales forecast for use as a check against forecasts arrived at through other methods.

Deriving a company sales forecast from an industry sales forecast requires an appraisal of company strengths and weaknesses (as well as marketing programmes) against those of competitors. The result is an estimate of expected market share that (when applied to the industry sales forecast) results in a forecast of company sales.

Forecasting a company's market share varies in complexity from one industry to another. In the steel industry, the number of competitors is small, products are homogeneous and market share is relatively stable, so determining a given company's market share is a simple task, just a matter of projection past trends and adjusting for anticipated changes in the company's relative strengths and weaknesses. But in the clothing industry, the number of competitors is large and market shares fluctuate widely, so determination of market share is difficult. The ability to evaluate a clothing style's saleability is a key element in forecasting, and this requires both thorough knowledge of market trends and keen judgment. Most companies operate in industries that lie somewhere between these two extremes, with market shares neither as stable as in steel nor as volatile as in apparel. Forecasters in most companies need information on competitors' plans to launch new and improved products, advertising and selling plans, pricing strategies, and so on. When forecasters evaluate this information in relation to their own company's proposed marketing and selling plans, they are in a position to exercise informed judgment in predicting the company's probable market share. If, for example, a forecaster knows that a major competitor plans a substantial price cut on a product that many buyers buy mainly on the basis of price, it will be necessary to lower the estimate of the company's market share unless management is willing to match the price cut. Forecasting a company's market share is a matter both of examining past trends and of appraising impending changes in competitive relationships.

Bayesian Decision Theory

Bayesian forecasting is based on a statistical technique known as decision theory. The Bayesian approach to producing forecasts is really a mixture of qualitative and quantitative techniques. The method is named after the Reverend Thomas Bayes (1702-61), a statistician and generally an all-round polymath, so common amongst the intellectuals of the period. Despite the fact that the technique was developed in the 18th century, it has only recently begun to be widely used especially in the business and operational research fields. The method incorporates expert management 'guesses', or subjective probabilistic evaluations, at data inputs for the statistical calculation of sales forecasts.

Up until the time of Bayes probability was thought of as something that had to be objectively calculable. For example, the chance of obtaining a head or tail when tossing a fair coin or the probability of winning the National Lottery are examples of events which lend themselves to objective calculation based on the scientific laws of probability. Unless a person had an objective prior probability of an event occurring, such as the result of tossing a coin, you could not start the 'ball rolling' in terms of using probability to calculate the likelihood of future conditions.

Bayes said that it was quite acceptable to arrive at the initial or 'prior' probability subjectively using experience or human judgement to put a numerical figure to the subjective estimation. The researcher or, in our case, forecaster, could then use this subjective estimate in statistical processes. Bayes found an acceptable way of arriving at the initial probability for a whole range of situations for which the calculation of initial prior probabilities was virtually impossible. This then opened up the use of Bayesian techniques, including the use of decision tree analysis, to a much wider range of problems including the kind of ill-structured problems commonly found in business scenarios.

Bayesian decision tree analysis makes use of network diagrams exhibiting the probable outcome of each decision alternative considered in the model. These are shown together with expected values and associated probabilities, initially derived on a subjective basis, the revolutionary mark of the Bayesian approach as discussed in the last paragraph. As explained, one of the problems of using probabilities in any statistical model is in ascertaining initial probabilities to commence the forecasting process. Bayesian statisticians differ from 'purist' statisticians in one respect: purists view the concept of probability as the relative frequency with which an event might occur, whereas

the Bayesian view is that probability is a subjective measure of our belief and that we can always express our degree of belief in terms of probability i.e. we can express it numerically in terms of a percentage or proportion, such as the probability of this event occurring is 0.3 with total certainty being equal to 1 (unity). Although the initial probabilities are derived subjectively (i.e. the figures are based on judgmental opinion, rather than on objective calculation), proponents of Bayesian theory believe that such probabilities are perfectly valid and hence perfectly acceptable as initial starting points in an extensive quantitative forecasting process.

It is the subjective nature of arriving at the initial probabilities that makes the Bayesian approach so useful in solving business problems for which initial probabilities are often unknown and are either very difficult or impossible to calculate using objective methods. Many marketing problems are of this type and lend themselves well to the Bayesian approach.

To use the Bayesian approach, the decision maker must be able to assign a probability to each specific event. The sum of the probabilities of all the events considered must be unity (one). These probabilities represent the magnitude of the decision maker's belief that a particular event will take place. In practical business situations, such decisions should be delegated to staff who have the expertise and experience to assign valid initial subjective probabilities to the occurrences of various business events. These initial probabilities are all based on previous experience of information (such as published secondary data for example) obtained prior to the decision making process. For this reason, the initial subjective probabilities are called prior probabilities.

When making business decisions, the financial implications of actions must be considered. For example, when a manager is thinking about investing a firm's surplus cash in a new product acquisition, he or she must consider the probability of making an acceptable return on the investment greater than the profit that could be achieved in a safe investment such as bank interest. Applying Bayesian decision theory involves selecting a specific option and having an idea of the economic impact of selecting a given course of action. Once the future events have been specified, the decision maker gives prior subjective probabilities to them in numeric form, usually in the form of a percentage or proportion. The expected pay-off for each act is then calculated and the act with the most attractive pay-off is selected. If pay-offs represent income or profit, the decision maker would normally select the act with the best, normally the highest, expected financial pay-off.

Collecting input data for forecasting

Following the decision about how much time, expense and effort is to be expended on the data collection stage of the forecasting process, it has to be located. All forecasting techniques, no matter how simple or sophisticated, are in themselves, only procedures. They all need input data to use as raw material if they are to be of any functional use. The old adage 'rubbish in-rubbish out' certainly applies here. A forecasting technique if based on mathematical or statistical procedures will process any form of data whether good or bad. You can feed data into a computer program and a forecast may result but the forecast will be worthless if the input data is itself faulty. A forecast is only as good as the data used to produce it.

There are two main categories of existing data:

1. Internal data sources
2. External secondary data sources

Internal data sources

These are sources of data generated within the company, e.g. previous company plans, sales statistics and other internal records. Many firms fail to capitalise on the wealth of data available to them, which has been generated internally as part of the ordinary day-to-day administrative procedure of doing business. Many firms keep business records going back many years; in fact publicly limited companies are compelled to do so by law. This information provides very valuable forecasting input data as long as management knows how to make use of it effectively. Also small and medium sized enterprises rarely make full use of this treasure of information available to them without further cost. Internal documentation and records are a valuable source of potentially useful information, especially in the case of immediate and short-term forecasting.

There are questions that can only be answered by a detailed examination of the company's own data, which should be collected, recorded and stored as a routine administrative procedure. The most valuable and cost effective source of internal data is desk research, which should form the

beginning for information collection in any forecasting programme. The accuracy of such data can easily be established by the departmental manager concerned, but on the other hand it may be problematic. This may be due to inflexibility of the system or lack of co-operation from departments who seem to regard the information that they produce as their own, rather than it being part of the data generation process of the firm as a whole. To succeed in getting the right kind of internal information the forecaster must be familiar with the firm and its procedures and must have authority from senior management.

External secondary data sources

Examples of these are government and trade statistics and published marketing research surveys. You only have to enter the library of a major business school or a big commercial public library to see the vast amount of secondary commercial data generated every year, particularly the wealth of government-sponsored research.

Much of this is available at little or even no cost to the potential forecaster, who only needs to know where to look what to ask for and how to make effective use of what is available. Data can also be generated expressly for the forecasting task using marketing research, e.g. a sample survey. As this is an expensive way of collecting data, existing data should be examined first as it can give sufficient information.

Information Sources

The forecaster would be advised to take a 'systems analysis' approach to securing the right kind of internal data for forecasting purposes, examining what records are stored and how data is obtained, altered, processed and circulated within the organisation. This means recording every document in detail, as well as listing the type of document, its purpose, origin and destination. Most company systems start with an inquiry from a customer and end with a customer's invoice, but much paperwork is generated in between these two extremes.

The forecaster builds up a picture of the overall system, from individual members of departmental staff and ultimately the company as a whole. This is a 'systems analysis' approach. Unless you are

familiar with how the administrative documentary procedure of the firm works you cannot hope to be able to make full use of the information that it generates 'unofficial' records kept by members of staff for their own purposes are often very valuable to the forecaster, but they may only come to light after a careful search. They are not part of the 'official' administrative system and the person who keeps such unofficial records may have to be persuaded to contribute them.

A. Plans from Functional Departments

Changes in company plans or methods of operation already planned could have an impact on a forecast. For example, plans to expand the sales department or increase advertising activity will affect a sales forecast because of the likely impact on sales. In addition to this source of information, other departments such as personnel and research and development also provide useful information and the choice of sources will depend on the type of forecast required. Most functional departments make plans at the beginning of the calendar or financial year, but invariably these alter as outside influences change. Obviously if forecasts were produced based on a particular set of commercial assumptions any changes will also have to be 'factored' into the forecast to bring it into line with the new reality.

B. Sales Department Information

It stands to reason that a great deal of historical and present sales related information is likely to be situated within the sales department itself. This is where the marketing firm and its customers interact and therefore it should be able to provide a great deal of highly valuable information, including the following:

Enquiries received and quotations supplied

Written and verbal enquiries from customers may lead to a detailed quotation being submitted. This will provide information that is useful to the forecaster, especially if patterns can be established in the percentage of enquiries that are followed by orders and the time that elapses between quotation and order. The number of quotations converted into orders indicates the firm's market share.

Sales volume by product and by product group

These combine to give total sales volume, but also show each product or product group in the overall mix in terms of the contribution to total volume.

Sales volume by area

The salesperson's territories or other geographical areas could be chosen.

Sales volume by type of channel of distribution

In a firm that has a multi-channel distribution policy, the effectiveness and profitability of each channel can be calculated. It also allows for trends in the pattern of distribution to be identified and used when forecasting future channel requirements. Channel information by geographical area may show a difference in the profitability between various types of channel in different parts of the country, allowing for profitable geographical channel differentiations. A more realistic forecast can be developed from information gathered by type of retail outlet, agents, wholesalers, distributors and factors, revealing promising channel opportunities and resulting in more effective channel management.

Sales volume over time

This reveals actual sales and units sold and allows for seasonal variations, inflation and price adjustments to be taken into consideration.

Pricing information

The effects of price increases and decreases can be established through historical information, giving an opportunity to forecast the effects of future changes.

Sales representatives' records and reports

The customer file kept by professional sales representatives contains detailed information on live customers such as company information, likely future requirements etc. and the reports that they make to the sales office contain much information that is useful to the forecaster.

Communication mix information

The effects of previous advertising campaigns, sponsorship, direct mail programmes or exhibitions can be evaluated, as can the effects of various levels of expenditure in marketing communications, giving a guide to future effectiveness.

Sales promotional data

This allows assessment of past promotional campaigns in terms of their individual effects on sales.

Sales volumes by market segment

Segmentation may be regional or, in industrial markets, by type of industry. It will show which segments are likely to remain static, which are declining and which show growth possibilities. Where the company deals with a small number of large companies, segmentation may be by customer, and any change in demand from any of these may be highly important when forecasting sales and material requirements.

C. Information from elsewhere in the firm

Dispatch department

Here the forecaster will find chronological information on what goods were dispatched and how, including copies of advice notes and other delivery documents.

Production department

Works orders, material lists, design information, order completion dates and much other useful information can be easily obtained from this source.

Purchasing department

Useful information includes old purchase orders, material lists, requisitions, material status schedule reports, information on suppliers and stock control data relating to reorder levels, buffer and safety stock levels, economic order quantities and stock turn by inventory item.

Accounts department

Accurate cost data is available from the management accountant and previous management reports are also a useful source of information on such matters as:

- Number of new customers in a given period
- Number of withdrawals
- Number of items sold by product in volume terms
- Total sales by salesperson, area, division, etc.

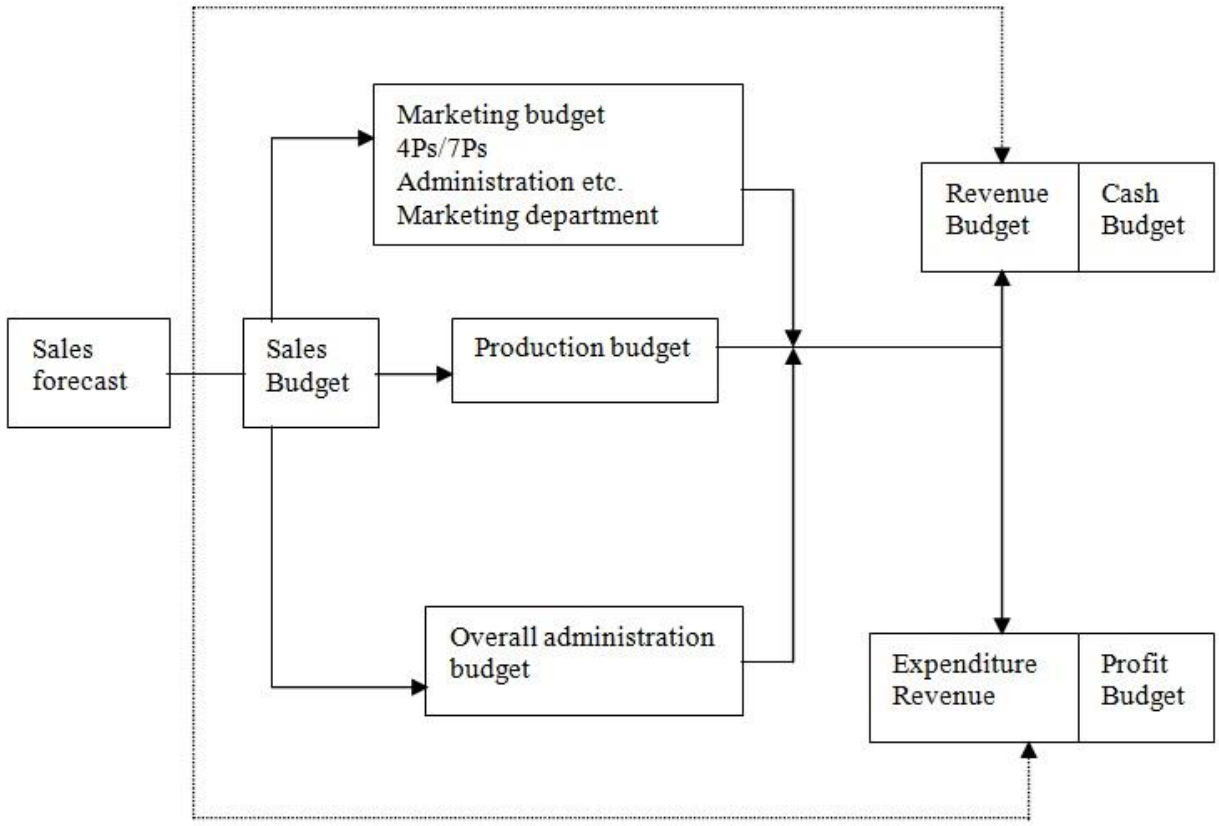
Production capacity can be forecast using the information on staff that is given in management accounting reports, including absenteeism. Historical information can be obtained from past budgets with variance analysis showing budgeted figures against actual figures. Information such as orders received, dispatched and on hand will be most accessible in the accounts department.

Sales Budgets

Many different departmental budgets such as the sales budget, marketing budget, production budget and administrative budget are derived from the master sales forecast. A budget is different from a forecast in the sense that it is a representation or 'model' of what the firm expects or plans to happen. The sales forecast on the other hand is far more uncertain. It is affected by factors, many of % them extraneous to the organisation and beyond the control of the individual firm.

The budget is under the control of management, who use the master sales forecast as a guide to what the appropriate budgetary figures and expectations should in fact be. The relationship between the sales forecast and the creation of budgets for managerial planning and control purposes is shown below in the form of a schematic diagram.

: The relationship of the sales forecast to the firm's budgetary procedure



The reader can see from the above figure that budgets are derived from the sales forecast and the business budgetary procedure cannot begin until the forecasting has taken place and the figures agreed by management. These figures are then passed on to the people responsible for formulating budget, usually cost and management accountants as well as marketing and sales planning staff. They interpret the figures and factor them into the necessary budgets, e.g. sales budget, advertising budget and so forth.

Budgeting requires very precise planning of all the activities that are to be undertaken during the period that the budget refers to, usually one year ahead of current time. The total sales budget is split amongst all the products and services in the firm's portfolio, in terms of apportioning expenditure on advertising, personal selling, merchandising, packaging, Internet, trade exhibitions, sales promotions, etc. The precise manner in which this budgetary 'split' is decided is a management decision and differs from firm to firm. It is important to make sure that the sales budget is linked and co-ordinated with other budgets within the organisation. For example the sales budget should not set plans to sell more product than the production capacity of the firm can cope with, unless there is a contingency plan to contract out some of the additional production work. Budgets must also allow for some flexibility and many firms use a flexible budgetary system, where figures are fed into the budgetary process each month and budget figures are adjusted to take into account any new unforeseen factors that would render the original budget figures obsolete.

Quality of forecasts

Although advanced mathematics and enormous computational power have improved significantly, forecasting is not an exact science since it is still mostly a human dynamic where accuracy is dependent on:

- Asking the right people the right questions
- Their willingness to answer truthfully and completely
- The ability to separate the meaningful elements from the noise
- The openness of the forecaster to suggestions of process improvement

There are 5 Ways to improve the quality of sales forecasts.

1. Be Specific

Knowing exactly what to forecast is the most important step to success. Sales forecast may try to address the issues like unit sales, gross margin, market share, and customer value.

2. Be Structured

A structured, methodical approach to forecasting takes all the key information into consideration that might affect the forecast and maintains quality in execution by multiple checking of all the assumptions and formulae. The other obvious benefits of structure are:

- The removal of personal biases that might unknowingly be causing participants to filter their inputs or interpretations
- The continuity of consistently improving on the process over time, regardless of turnover among key input or executional resources
- The auditability of the approach to determine where things might have gone awry at various steps in the process

3. Be Quantitative

In case of abundance of historical data at hand, quantitative forecasting methods create a much greater likelihood of developing a strong forecast. Even if the data are only a series of "finger-in-the-air" estimates, people can still take a more disciplined quantitative approach by building simulations that explore the "what if" scenarios often hidden in best guesses at average outcomes.

4. Be More Than Quantitative

Straight statistical extrapolation is fine for simple situations with short time horizons. But more variables can affect the forecast over a longer horizon. The factors most likely to influence the forecast need to be identified and their possible impacts assessed as closely as they can be.

5. K.I.S.S.

As with most things in life, simplicity is a virtue in forecasting. Einstein said "things should be made as simple as possible, but no simpler." Accurate and reliable forecasting process should be comprehensive enough to identify the truly causal factors but simple enough to explain to those who will need to make decisions based on it. There is no power in a forecast if those who need to trust it cannot understand or explain the logic and process behind it.