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Moving Average Method – A Tool for Demand Analysis in Supply Chain

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ABSTRACT- In this research work future demand of a product by using the time series method in a supply chain has been analysed. Demand is an economic principle that describes a consumers' desire and willingness to pay a price for a specific good or service. Time series analysis contains techniques for investigating information keeping in mind the end goal to remove meaningful statistics and different qualities. Time series forecasting is the utilization of a model to anticipate future qualities in view of already watched qualities. A contextual investigation has been done to check the work

Keywords: Supply chain management; Time-series method; Product life cycle; Moving average method, Demand analysis

I. INTRODUCTION AND LITERATURE REVIEW

Supply-Chain Management (SCM) has been characterized as the outline, arranging, execution, control, and checking of supply chain exercises with the target of making net esteem, assembling a focused framework, utilizing overall coordination, synchronizing supply with request and estimating execution universally [2]. In trade, Supply Chain Management (SCM), the management of the stream of products and ventures, includes the development and capacity of crude materials, work-in-process stock, and completed merchandise from purpose of beginning to purpose of utilization. Interconnected or interlinked systems, channels and hub organizations join in the arrangement of items and administrations required by end clients in a supply chain.

Supply chain also play vital role for determining demand in industries or organizations with the flow of information. In financial matters, request is the amount of a ware or an administration that individuals are ready or ready to purchase at a specific cost. Preferences and choices, which underlies demand, can be represented as functions of cost, benefit, odds and other variables [1, 3]. Demand can be classified as follows-

a. Competitive Demand

b. Joint or Complementary Demand

c. Derived Demand

d. Composite Demand

Demand amplification is the situation whereby small variations in demand from customers result in increasingly large variations as demand is transmitted upstream along a supply chain. The effect(Bullwhip) has been well described in the literature over many years and there have been various suggestions put forward as to how it might be identified and addressed through simulation and modelling techniques [7,9].

Demand forecasting is the movement of evaluating the amount of an item or administration that shoppers will buy. Demand forecasting includes procedures including both casual techniques, for example, taught surmises, and quantitative strategies, for example, the utilization of authentic deals information or current information from test markets [1].Qualitative methods, or judgmental methods, are based on subjective expertise of a person or group of persons. Judgmental methods can be applied individually or in committees [4, 6]. Demand forecasting may be used in making pricing decisions, in assessing future capacity requirements, or in making decisions on whether to enter a new market. There are some criteria which should be full fill for good demand forecasting by using accuracy, plausibility, simplicity and durability.

I. A The significance of Demand forecasting

Distribution of assets

Helps in maintaining a strategic distance from wastages of assets

Serves as a course to the creation

Pricing

Helps in formulating deals strategy

The decrease of business hazard

Inventory administration

I.B Levels of Demand forecasting

(i) Micro-level or firm level

This alludes to the demand forecasting by the firm for its item. The administration of a firm is extremely intrigued by such forecasting. As a rule, demand forecasting alludes to the forecasting of demand of a firm.

(ii) Industry level

Demand forecasting for the result of an industry, all in all, is, for the most part, attempted by the exchange affiliations and the outcomes are made accessible to the individuals. Apart firm by utilizing such information and data may decide its piece of the overall industry.

(iii) Macro-level

Evaluating industry demand for the economy, all in all, will be founded on macroeconomic factors like the national wage, national use, and utilization work, file of mechanical creation, total demand, total supply and so forth. By and large, it is embraced by national establishments, govt. Organizations and so forth. Such estimates are useful to the Government in deciding the volume of fares and imports, control of costs and so forth.

For demand forecasting, time arrangement technique assumes a crucial part. A grouping of numerical information focuses on the progressive request, as a rule happening in uniform interims. As a rule, a period arrangement is essentially a succession of numbers gathered at customary interims over some undefined time frame.

1. C Components of Time Series

The change which are being in time series, they are affected by Economic, Social, Natural, Industrial and Political Reasons. These reasons are called segments of Time Series.

Secular pattern

Seasonal variety

Cyclical variety

Irregular variety

Time series method will be applied in different phases of product life cycle for determining future demand of product. Product demand varies with product life cycle. There are mainly four stages in product life cycle as shown in Fig.1. These are Introduction, growth, maturity, and decline. Product demand will be maximum during maturity stage of product life cycle and then it will decrease in last stage of cycle.

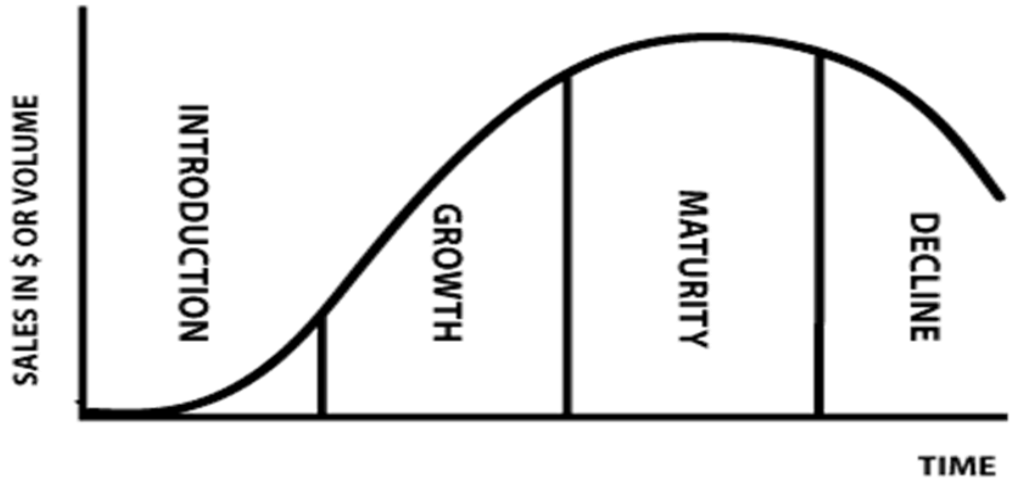

FIGURE 1-PRODUCT LIFE CYCLE

Speed of reaction to client request has for quite some time been natural as a key point to business accomplishment since client steadfastness can be won or lost on item accessibility. With everybody acknowledging fit assembling methods of insight, organizations additionally need to wind up shrewd chain directors and assurance ceaseless change to remain aggressive. It is also accurately used as an aid to the application of Decision Support Systems (DSS) [8].

II METHODOLOGY ADOPTED

In financial matters, request is the amount of an item or an administration that individuals are eager or ready to purchase at a specific cost. Future demand of any product can be analysed by using time series method.

Following method can be used for analyse future demand of Secular trend-

Free Hand Curve Method

Semi – Average Method

Moving Average Method

Least Square Method

a) Free Hand Curve Method

In this strategy the information is indicated on diagram paper. We take "Time" on 'x' pivot and "Information" on the 'y' hub. On diagram there will be a point for each purpose of time. We influence a smooth hand to bend with the assistance of these plotted focuses.

b) Semi – Average Method

In this strategy, the given information are separated in two sections, ideal with the equivalent number of years.

For instance, on the off chance that we are given information from 1999 to 2016, i.e., over a time of 18 years, the two equivalent amounts of will be initial nine years, i.e., 1999 to 2007 and from 2008 to 2016. If there should be an occurrence of odd number of years like, 9, 13, 17, and so forth.., two a balance of can be made just by disregarding the center year. For instance, if information are given for a long time from 1998 to 2016 the two a balance of would be from 1998 to 2006 and from 2008 to 2016 - the centre year 2007 will be overlooked.

c) Moving Average Method

It is a standout amongst the most famous techniques for computing Long Term Trend. This strategy is likewise utilized for 'Seasonal variance', 'cyclical change' and 'irregular vacillation'. In this technique we ascertain the 'Moving Average for specific years.

d) Least Square Method

This method is most widely in practice. When this method is applied, a trend line is fitted to data in such a manner that the following two conditions are satisfied:-

The sum of deviations of the actual values of y and computed values of y is zero.

$$\sum (Y - Yc) = 0$$

i.e., the sum of the squares of the deviation of the actual and computed values is least from this line. That is why method is called the method of least squares. The line obtained by this method is known as the line of `best fit`.

$$\sum (Y - Yc)\ 2 \text{ is least}$$

The Method of least square can be used either to fit a straight line trend or a parabolic trend.

With the help of these methods future demand can be analysed.

Therefore in this work moving average method has been adopted to calculate future demand. A moving average method may also be used for 'Seasonal fluctuation', 'cyclical fluctuation' & 'irregular fluctuation'. Demand can be calculated as:

$$D=(X1+X2+X3)/3$$

Where,

X1, X2, X3= Sales vol. of previous 3 months

N= Demand of next month

To authenticate the work, a case study on drug manufacturing industry in India has been done. Data has been collected for 19 months. Demand has been calculated for collected data by using moving average method and results are shown in section 3.

III. RESULTS AND DISCUSSION

Moving average method has been adopted for calculating future demand. A case study has been done on a drug manufacturing industry. With the help of given historical data (From Oct.2015 to Mar2017), next month demand of product can be analysed by using three year's moving avg. method. In table 1, second column represent estimated demand and third column represent sales volume of a drug manufacturing industry. With the help of sales volume of the industry the next month demand using three year's moving average method has been calculated. Graphical results are shown by figure 2.

TABLE 1 – DEMAND ANALYSIS USING THREE YEAR'S MOVING AVG. METHOD

Months (1)	Company Forecast/Estimated Demand (2)	Actual Demand of Company/Sales Volume (3)	Research Forecast/Calculate Demand using three year's moving average method (4)
Oct. (2015)	131	125	-
Nov. (2015)	140	132	-
Dec. (2015)	120	115	-
Jan. (2016)	122	137	124
Feb. (2016)	126	122	128
March (2016)	137	130	125
April (2016)	127	141	130
May (2016)	133	128	131
June (2016)	129	118	133
July (2016)	133	123	129
Aug. (2016)	121	139	123
Sep. (2016)	144	133	127
Oct. (2016)	121	128	132
Nov. (2016)	133	121	133
Dec. (2016)	131	135	127
Jan. (2017)	130	116	128
Feb. (2017)	122	129	124
March (2017)	147	138	127
April (2017)	141	-	128

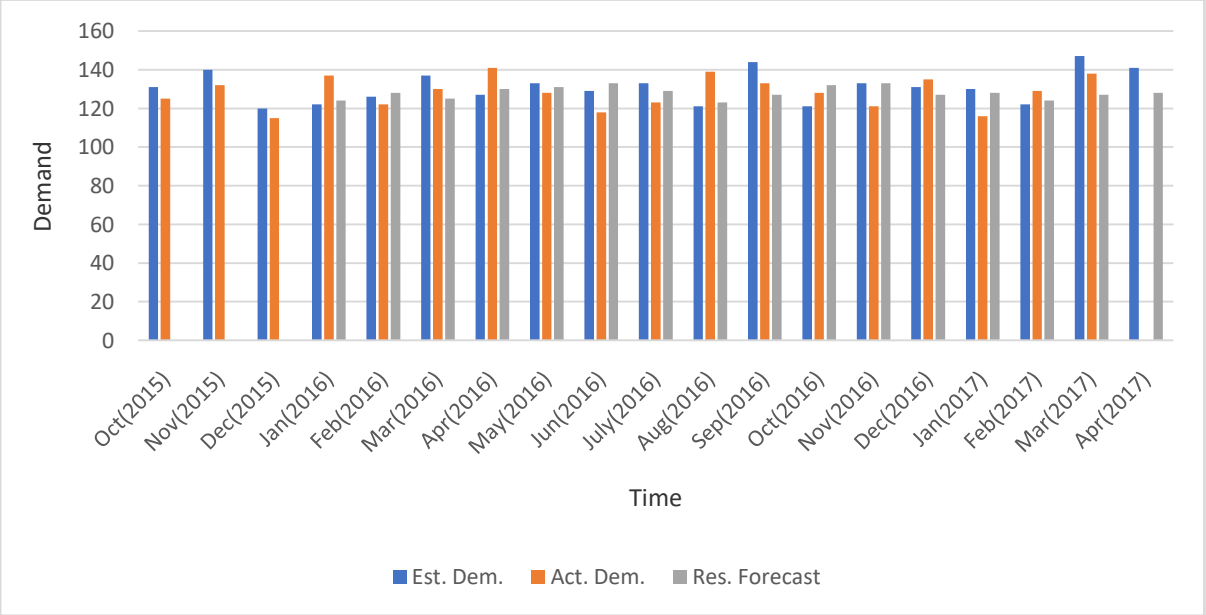

FIGURE 2- DEMAND V/S TIME PATTERN

Fig. 2 represents the variation of monthly demand of industry. It also represents the comparison between demand calculated by industry and demand calculated using three year's moving average method. X axis represent the time and Y axis represent the variation of demand with time.

IV. CONCLUSION

Demand is an economic principle that describes a consumer's desire and willingness to pay a price for a specific good or service.In this research work time series method is using for analyse future demand in all phases of product life cycle. Time series examination involves techniques for breaking down time series information keeping in mind the end goal to extricate significant insights and different qualities of the information. Time series guaging is the utilization of a model to anticipate future qualities in view of beforehand watched qualities.

From the research it has been concluded that by opting time series method most of the times difference between calculated demand and sales volume is less than the difference between estimated demand (at company's end) and sales volume.Therefore by using this model there is reduction in inventory and associated costs and profit may be maximised.

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