DEMAND FORECASTING OF SPARE PARTS STORE BY MOVING AVERAGE METHOD AND VERIFICATION BY EXPONENTIAL METHOD

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Abstract: A forecasting methodology will surely promote the efficiency of control actions by providing insight on the future. Today's every firm wants to maintain efficient inventory for avoiding losses, increase benefit and also make good relation with customer. To avoid this problem make a forecast for Commercial Engineers and Body Builders Co. Ltd. Jabalpur store. First compile all data (demand and supply) of stores in A B C Analysis on the basis of their prices. In this paper forecasting is done by two methods and compare on them which one is more close to supply. Moving average method and Exponential method is apply on the last 12 month supply data and verify to the last 9 month data.

Keyword –Demand, Forecasting, Moving average method, Supply.

Introduction

Forecasting is the process of making predictions of the future based on past and present data and most commonly by analysis of trends. A commonplace example might be estimation of some variable of interest at some specified future date. Prediction is a similar, but more general term. Both might refer to formal statistical methods employing time series, cross-sectional or longitudinal data, or alternatively to less formal judgmental methods. Usage can differ between areas of application: for example, in hydrology the terms "forecast" and "forecasting" are sometimes reserved for estimates of values at certain specific future times, while the term "prediction" is used for more general estimates, such as the number of times floods will occur over a long period. 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. Firms balance the costs of having inventories deviate from their desired level against the costs of adjusting production [1].The optimal trade off is based on current values and expected future paths of inventories, sales, and output investments. In the past, maintenance problems received little attention and research in this area did not have much impact [2, 3]. Today, this is changing because of the increasing importance of the role of maintenance in the new industrial environment. Maintenance, if optimized, can be used as a key factor in organizations efficiency and effectiveness. It also enhances the ability of the organization to be competitive and meets its stated objectives [4]. The research in the area of maintenance management and engineering is on the rise. Over the past few decades, there has been tremendous interest and a great deal of research in the area of maintenance modeling and optimization [5]. Models have been developed for a wide variety of maintenance problems. Although the subject of maintenance modeling is a late developer compared to other area like production systems, the interest in this area is growing at an unprecedented rate. In particular, the availability of spare parts

and material is critical for maintenance systems [6].

Moving Average Method:

In statistics, a moving average (rolling average or running average) is a calculation to analyze data points by creating a series of averages of different subsets of the full data set. It is also called a moving mean (MM)[1] or rolling mean and is a type of finite impulse response filter. Variations include: simple, and cumulative, or weighted forms (described below).

Given a series of numbers and a fixed subset size, the first element of the moving average is obtained by taking the average of the initial fixed subset of the number series. Then the subset is modified by "shifting forward"; that is, excluding the first number of the series and including the next value in the subset.

A moving average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles. The threshold between short-term and long-term depends on the application, and the parameters of the moving average will be set accordingly. For example, it is often used in technical analysis of financial data, like stock prices, returns or trading volumes. It is also used in economics to examine gross domestic product, employment or other macroeconomic time series. Mathematically, a moving average is a type of convolution and so it can be viewed as an example of a low-pass filter used in signal processing. When used with non-time series data, a moving average filters higher frequency components without any specific connection to time, although typically some kind of ordering is implied. Viewed simplistically it can be regarded as smoothing the data. In forecasting applications a simple moving average (SMA) is the unweighted mean of the previous n datum points. However, in science and engineering the mean is normally taken from an equal number of data on either side of a central value. This ensures that variations in the mean are aligned with the variations in the data rather than being shifted in time. An example of a simple unweighted running mean for n-month sample of closing price is the mean of the previous n month's closing prices. If those supplies are Sm, Sm-1, ……. Sm(n-1) then the formula is given below

$$\mathrm{SMA} = \frac{S_m + S_{m-1} + \cdots + S_{m-(n-1)}}{n}$$

Data analysis

In this thesis the data of 12 months are taken from Raju intersperse and is compiled by ABC analysis. After compilation the supply and demand data is sub divided into three categories A, B, & C. Forecasting methods (Average Moving Method and Exponential Smoothing Method) are applied on these supplies by taking three months reference make forecast of another nine months and verify to their actual supply. The spare parts of all data are shorted by ABC analysis as per their prices then evaluate their demand and supply of 12 month which is shown in Table 1

Table 1 Short list by ABC analysis

	A		B		C	
MONTH	D	S	D	S	D	S
JAN	24	25	100	97	600	689
FEB	25	22	100	96	750	653
MAR	20	18	100	104	700	701
APR	25	100	97	600	689	25
MAY	25	100	97	600	689	25
JUN	25	100	97	600	689	25

JUL	25	100	97	600	689	25
AUG	25	100	97	600	689	25
SEP	25	100	97	600	689	25
OCT	25	21	100	91	720	695
NOV	30	24	110	88	750	703
DEC	30	25	110	99	750	728

On the consideration of 3 month supply data (Jan. Feb & Mar) moving average method and Exponential method is applied so the result obtain for ABC Type spare parts as shown in Table 2

$$\text{SMA} = \frac{S_m + S_{m-1} + \cdots + S_{m-(n-1)}}{n}$$

$$\text{ES or } S_{n+1} = \alpha[D_n + (1-\alpha)D_{n-1} + (1-\alpha)^2 D_{n-2}] + (1-\alpha)^3 S_n$$

Table 2 Statistical result

	A		B		C	
MONTH	SMA	ES	SMA	ES	SMA	ES
APR	21	21.63	99.3	101.75	674	712.62
MAY	20	23.16	101	100.37	687	732.25
JUN	20	26.25	101.3	104.62	712.3	741
JUL	22	26.16	101.3	103	725	723.62
AUG	24.	25.75	99.6	101	710	734
SEP	25	25.16	98.6	94.25	724	714
OCT	24.6	24.75	93.6	91.25	710.6	706
NOV	23	25.5	91.3	95.12	701.6	709.37
DEC	22.6	27.38	89.3	102.2	698.6	730.37

D = Demand for inventory
S = Supply from inventory
SMA = Moving Average Method
ES = Exponential smoothing

Conclusions

The service period of the case company is 12 months and the final order decision is often made before the spare part has even reached one month age. From the above statistics Exponential method is very close to store supply as compare to Moving Average method. The error of Exponential method is mostly positive so it will reduce the losses and make a good relation between buyer and supplier. The future scope of the forecasting process development was to make better use of the data resources. Some convenient approaches were excluded, which includes forecast aggregation and disaggregation. Especially global forecasting (i.e., create a forecast based on global data and disaggregate to DC level) could be a respectable way to improve forecasting accuracy, though this approach has its problems as well.

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