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Analysis of Forecasting Sales By Using Quantitative And Qualitative Methods

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ABSTRACT
This paper focuses on analysis of forecasting sales using quantitative and qualitative methods. This forecast should be able to help create a model for measuring a successes and setting goals from financial and operational view points. The resulting model should tell if we have met our goals with respect to measures, targets, initiatives.
Keywords: Goals, Qualitative, Quantitative, Success.

I. INTRODUCTION

A Forecast is an estimate of an event which will happen in feature. The event may be demand of a product, rainfall at a particular place, population of country or growth of a technology. In business, forecast may be classified into technology forecast, economic forecast and demand forecast. Combination of hardware and software is called as "Technology forecast". Its deals with certain characteristics such as level of technological performance, rate of technological advances. Government agencies and other organizations involve in collecting data and prediction of estimate on the general business environment is "Economic forecast". Expected level of demand for goods or services is given by "Demand forecast".

Two general approaches of forecasting are Quantitative and Qualitative. Quantitative involves either projections of historical data or development of association models which attempt to use casual variables to arrive at the forecasts. Qualitative consists mainly of subjective inputs, often of non-numerical description. Overviews of both methods are moving average, weighted moving average method, exponential smoothing method, trend projection, linear regression analysis.

II. MOVING AVERAGE AND WEIGHTED MOVING AVERAGE:

In moving average method the raw data is converted into a moving average that reflects the trend in change of demand. The moving average is an arithmetic average of data over a period of time.

$F_{t+1} = (A_1 + A_{t-1} + A_{t-2} + A_{t-3} + - - - - - - - - A_{(t-n+1)})/n$ ---------- 1

In waited moving average

$F_{t+1} = (W_t A_t + W_{t-1} A_{t-1} + W_{t-2} A_{t-2} + W_{t-3} A_{t-3} + - - - - - - - - - - - W_{t-n+1} A_{t-n+1})$/n ----------2

Where

F_{t+1} $weighted\ moving\ average\ for\ the\ period\ of\ t+1$, $W_t = weighted\ factor\ \sum_{t=1}^{n} W_t = 1$

III. LINEAR REGRESSION ANALYSIS

Regression analysis is a method of predicting the value of one variable based on the value of other variables used to forecast both time series and cross sectional data. Two types of Regression analyses are simple regression and multiple regressions where there are two or more predictors, multiple regression analysis is employed. These models are based on functional relationships between variables that define the environment. The value of one variable is based on the value of other variable to make estimates, must identify the effective predictors of the variable of interest. Need to identify variables that are important indicators and can be measured at the least cost to use for the forecast. Simple forecasting model, reflecting an independent and dependent variable having a relationship

Y=f(X) ----------3

The two types of variables are dependent variable and independent variable. The functional relationship between the two can be system of coordinates where the dependent variable is shown on the Y and independent variable on X-axis.

Y=f(X) or Y= a + bX.

Where Y=dependent variable, 'a' is Y intercept, 'b' is slope of the line, X the time period. Multiple regression is always better to use as few variables as predictors as necessary to get a reasonably

accurate forecast, in many cases this may not give accurate results.

The forecast takes the form:

$$Y=b_0 + b_1X_1 + b_2X_2 + - - - - - + b_nX_n \quad \text{---------- 4}$$

Where b_0 is intercept and $b_1, b_2 - - - - - b_n$ are coefficiants representing the contribution of the independent variables $X_1, X_2 - - - - - - - - - X_n$

Multiple regressions are used when two are more independent factors are involved, and it is widely used short to intermediate term forecast. They are used to assess the factors which have to be included (or) excluded. They can be used to develop alternate models with different factors. Developing a model with environmental forces that are important to one organization may not be important for another. A small scale or medium scale manufacturer may be interested in demand in the local market, government plans in infrastructure development, cost and availability of power etc. Three goals of analysis of the environmental forces are forecasting, modeling, characterization.

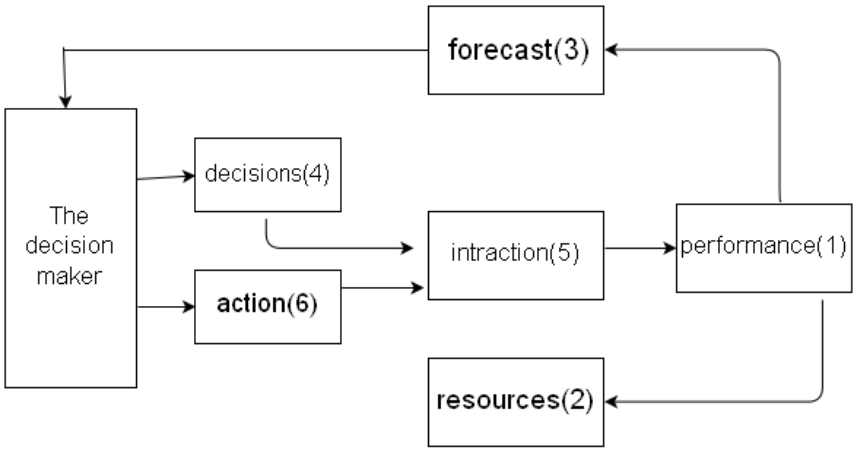

Fig1: forecasting and decision-making

IV. NUMERICAL EXAMPLES

4.1 Case study 1

Company ABC wants to forecast the sale for the next 12 months based upon a simple moving average and weighted moving average, using 5 previous periods as the data base, will prove accurate forecast method. To found out which method will provide it with mare accurate forecasts. Where the different periods of time in the past for instant.

Time in past	weight age
5 years ago	0.01
4 years ago	0.05
3years ago	0.25
2 years ago	0.3
Last year	0.4

Table 1: Best Accurate Forecast Analysis

Month	Sales	Total Off 5 Periods	Moving Average(MA)	Weighted Moving Average(WMA)
1	1104.0			
2	1500.0			
3	1460.0			
4	1880.0			
5	1724.0	7668	1533.6	1687.76
6	2034.0	8598	1719.6	1870.09
7	2404.0	9502	1900.4	2090.49
8	2698.0	10740	2148	2390.33
9	2972.0	11832	2366.4	2102.12
10	2852.0	12960	2592	2819.24
11	3248.0	14174	2834.8	3026.47
12	3172.0	14942	2988.4	3100.77

1. Flowchart for Forecast Analysis

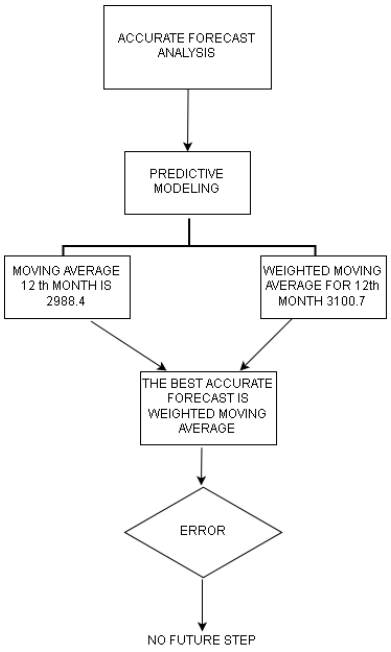

Fig1: Flow Chart for Accurate Forecast Analysis

4.2 Case study2

Company of sales in millions of dollars using the principal of least squares fit a straight line trend equation form the data also determining the sum of squares of deviation forecast the sales for the month of 13 & 14

Table2: Analysis of Linear Regression

Month(X)	Sales(Y)	XY	X^2	Y^2	Y'	Deviation (Y-Y')
1	1104.0	1104	1	1218816	346.770	757.23
2	1500.0	3000	4	2250000	693.539	806.461
3	1460.0	4380	9	2131600	1040.308	419.692
4	1880.0	7520	16	3534400	1387.077	492.923
5	1724.0	8620	25	2972176	1733.846	-9.846
6	2034.0	12204	36	4137156	2080.615	-46.615
7	2404.0	16828	49	5779216	2427.382	-23.382
8	2698.0	21584	64	7279204	2774.153	-76.153
9	2972.0	26748	81	8832784	3120.922	-148.922
10	2852.0	28520	100	8133904	3467.691	-615.691
11	3248.0	35728	121	10549504	3814.460	-566.46
12	3172.0	38064	144	10061584	4161.229	-989.229
78	27048					
$\bar{X}$=78/12=6.5						
$\bar{Y}$= 27048/12=2254						
a= 2254-346.769(6.5)=0.0015 , b=346.769				b= $(\sum XY\text{-n}\bar{X}\bar{Y})/(\sum_X 2\text{-n}\bar{X}^2)$		
Therefore Y=0.0015+346.769(X)						

For 13^{th}month forecast=4507.9985
For 14^{th} month forecast is= 4854.7675

V. CONCLUSION

Forecast has a high level of accuracy. These are simple, commonsense rules made up and then tested to see whether they should be kept. Example of simple forecasting rules could include exponential smoothing, moving averages, predictive theories, subjective information etc…The data collected for making forecasts can also be used to measure performance characteristics. At the end of the day, it is not the sophistication of the forecasting technique but the ability to recognize the pattern of data accurately and to put it to use effectively. This determines the best forecasting method.

The best method is weighted moving average method.

The results obtained from average methods are

month	Moving average	Weighted moving average
11	2834.8	3026.47
12	2988.4	3100.77

Results of sales by using linear regression method are

Month	Sales
13	4507.9985
14	4854.7675

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