

TIME SERIES ANALYSIS AS A MEANS OF MANAGERIAL DECISION MAKING IN MANUFACTURING INDUSTRY

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Abstract

This research Time Series Analysis on monthly sales of table Water as a means of decision making in manufacturing industry was aimed to identify the nature of the sales if there exist trend or seasonality, and. also to eliminate the trend and seasonality in the sales fitting an appropriate model for the sales pattern and predict the future sales . Minitab was use to analyse the data using multiplicative model and from the analysis we discover that the sales of Table water will be increasing every month. And attempt were been made to identify the nature of fluctuation in monthly sales of Ola table. A model was proposed for the sales patterns and the future sales were forecasted based on the fitted model.

Keywords: Industry, time, decision, sales series and analysis

INTRODUCTION

Analysis of sales has become a very important for producing or manufacturing company to see the growth or progress of the company. Sales can also be said to be strategic means by which products of a company are being moved to the channel of distribution[2],[4].

Generally, a sale is said to be the process of selling or rendering service. Furthermore, primary aim of any company is to minimize loses and maximize profits. Further values may be predicted or forecasted from past sales of previous years. Forecasting is projecting some possibilities in the future sales forecasting which an analysis of potential demand is an integral part of a company's policy to project what will or can be sold in future[1],[3]. Basically, the first step in sales forecasting is to apply statistics on sales records , Selling is a practical implementation of marketing, it often form a separate grouping in a corporate structure, employing separate specialists operatives known as sales person(s). The primary function of professional sales is to generate and close leads, educate prospects, fulfill needs and satisfy wants to customer appropriately and therefore turn prospective customers into actual ones.

From the marketing point of view, selling is one of the methods of promotion used by marketers. Other promotional technique includes advertising, sale promotion, publicity and public relations. Various sales strategies exist such as "tit for tat" which is the best if ongoing deals and interactions are expected. This insight is behind so called "consultative sales process" which is used by Saturn to sell cars, as well as for some direct business sales. Types of sales that we have included were direct, consultative and complex sales.

METHODOLOGY

Regression Analysis using Least Square method with minitab is used to analyse the data

The model of a linear regression is given by $Y_i = \beta_0 + \beta_1 x_i + e_i$ where

Y_i = dependent variable , X_i = The independent variable

β_1 = regression coefficient t and e_i = error term

DATA PRESENTATION

TABLE 1: MONTHLY SALES OF OLA TABLE WATER

MONTHS/YEAR	2006	2007	2008	2009	2010
January	316395	456217	488380	511017	512217
February	305030	456217	375296	351819	353019
March	177383	206019	206395	312320	320520
April	202705	269589	214216	256070	257270
May	194642	754559	173850	126319	127519
June	160925	169342	214015	214283	215483
July	188008	211112	321007	219317	220519
August	200989	293284	258923	378018	378218
September	214007	308917	405052	523317	524517
October	348802	506018	572317	595138	596338
November	507915	719313	71523	782212	783412
December	7154007	814018	877213	913918	915118

SOURCE:OLA TABLE WATER

TIME PLOT

In order to obtain the visual representation of the series, the observed values Y_t is plotted against time t as shown below

Y_t - number of bottles of Ola table water sold in millions at time t

$T = 1, 2, 3... 60$ i.e. monthly from January 2007 to December 2011 from the graph, the behaviour of the sales shown trend at the peak of the plot and seasonal variation which is also periodic.

INTERPRETATION OF THE TIME PLOT

From the time plot, we can see two components of time series which are: the trend and seasonal variation. At the peak of the plot, where we found the trend which shows high series and the variation in the sales which shows the seasonality.

Multiplicative Model

This scheme assumes that presence of interactions among the various component and that the original series, Y_t is the product of the various components. Algebraically,

$$Y_t = T_t \times S_t \times C_t \times I_t$$

Where

Y_t = the original series at time t

T_t = the effect of trend over time t

S_t = seasonal effect over time t

C_t = cyclical effect over time t

I_t = irregularity effect over time t

DATA ANALYSIS

Time Series Decomposition

Data Actual value
 Length 60.0000
 NMissing 0

Trend Line Equation

$$Y_t = 263251 + 3973.68 * t$$

Seasonal Indices

Period	Index
1	1.09215
2	0.879332
3	0.744885
4	0.794742
5	1.13236
6	1.21601
7	1.47805
8	1.50917
9	0.734335
10	1.03683
11	0.529739
12	0.916737
13	1.37334
14	1.08050
15	0.746134
16	0.735680

Accuracy of Model

MAPE: 56
 MAD: 178415
 MSD: 5.94E+10

Row Actual value (Yt) Trend Seasonal Detrend Deseason Model

1	316395	267224	1.09215	1.18401	289699	291849
2	305030	271198	0.87933	1.12475	346888	238473
3	177383	275172	0.74489	0.64463	238135	204971
4	202705	279145	0.79474	0.72616	255058	221848
5	194642	283119	1.13236	0.68749	171890	320594
6	160975	287093	1.21601	0.56071	132379	349108
7	188008	291066	1.47805	0.64593	127200	430210
8	200989	295040	1.50917	0.68123	133178	445266
9	214007	299014	0.73434	0.71571	291429	219576
10	348802	302987	1.03683	1.15121	336412	314147
11	507915	306961	0.52974	1.65466	958803	162609
12	754007	310935	0.91674	2.42497	822490	285046
13	456217	314908	1.37334	1.44873	332194	432477
14	369319	318882	1.08050	1.15817	341804	344551
15	206019	322856	0.74613	0.63811	276115	240894
16	269589	326829	0.73568	0.82486	366449	240442
17	154559	330803	1.09215	0.46722	141518	361286
18	169342	334777	0.87933	0.50584	192580	294380
19	211112	338751	0.74489	0.62321	283415	252330
20	293284	342724	0.79474	0.85574	369030	272377
21	308917	346698	1.13236	0.89103	272807	392588
22	506018	350672	1.21601	1.44300	416129	426421
23	719313	354645	1.47805	2.02826	486664	524183
24	814018	358619	1.50917	2.26987	539381	541217
25	488380	362593	0.73434	1.34691	665064	266265
26	375296	366566	1.03683	1.02381	361964	380067
27	206395	370540	0.52974	0.55701	389617	196289
28	214216	374514	0.91674	0.57198	233672	343331
29	173850	378487	1.37334	0.45933	126589	519793
30	214015	382461	1.08050	0.55957	198071	413248
31	321007	386435	0.74613	0.83069	430227	288332
32	258974	390408	0.73568	0.66334	352020	287216
33	405052	394382	1.09215	1.02705	370876	430724
34	572317	398356	0.87933	1.43670	650854	350287
35	717523	402329	0.74489	1.78342	963266	299689
36	877317	406303	0.79474	2.15927	1103902	322906
37	511017	410277	1.13236	1.24554	451283	464583
38	351819	414251	1.21601	0.84929	289322	503733
39	317320	418224	1.47805	0.75873	214689	618156
40	256070	422198	1.50917	0.60652	169676	637169
41	126317	426172	0.73434	0.29640	172015	312953
42	214283	430145	1.03683	0.49816	206671	445988
43	219317	434119	0.52974	0.50520	414010	229970
44	378018	438093	0.91674	0.86287	412351	401616
45	523317	442066	1.37334	1.18380	381053	607109
46	395138	446040	1.08050	0.88588	365700	481945
47	782212	450014	0.74613	1.73820	1048353	335771
48	913918	453987	0.73568	2.01309	1242276	333989
49	512217	457961	1.09215	1.11847	468999	500162
50	353019	461935	0.87933	0.76422	401463	406194
51	320520	465908	0.74489	0.68795	430294	347048
52	257270	469882	0.79474	0.54752	323715	373435
53	127519	473856	1.13236	0.26911	112613	536577

54	215483	477830	1.21601	0.45096	177205	581046
55	220517	481803	1.47805	0.45769	149195	712128
56	379218	485777	1.50917	0.78064	251276	733120
57	524517	489751	0.73434	1.07099	714274	359641
58	596412	493724	1.03683	1.20799	575226	511909
59	783412	497698	0.52974	1.57407	1478865	263650
60	915118	501672	0.91674	1.82414	998234	459901

Forecasts

Row	Period	Index
1	3	204971
2	4	221848
3	5	320594
4	6	349108
5	7	430210
6	8	445266
7	9	219576
8	10	314147
9	11	162609
10	12	285046
11	13	432477
12	14	344551
13	15	240894
14	16	240442
15	17	361286
16	18	294380

SUMMARY OF FINDINGS

.In conclusion, there are variations in sales of table water from one year to another, there is higher sales in the following month: January, February, October, November and December.

The original data trend value show the upward movement. The seasonal index and the prediction values show that there is higher sales of Table water during the months of January, February, October, November and December because we are in the dry season when people always look for cold water to refresh themselves. Also, the sales is low during the raining season..Finally, we can observe that time also goes with sale of Table water because it has seasonal. That is, dry season and raining season.



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