Strategic Planning Method Used in Enterprise Management

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Abstract

For pilotage organization's management system it is necessary to predict a wide range of future events that influence the success of a business.

Function of prediction, one of the most important functions of management, received wide development in recent years due to the behavior of organizations need allowing them to adapt rapidly to changes in the internal and external.

The forecast underpinning the planning, programming and control management systems, is an essential component of strategic planning.

Planning at company level is a formal process which creates the willful representation of the future state of the company, stating the means and methods necessary to materialize the desired state.

Key words: method, planning, time series, variation.
J.E.L. classification: C22, M19.

1. Introduction

Forecast of changes in economic processes on short, medium and long term can be a variety of methods, which enable a determination of how to address specific market phenomena as their specificity and the degree pursued precision forecasting.

Prediction methods can be grouped into two categories: qualitative methods and quantitative methods.

Quantitative forecasting models are based on statistical tools provided by statistics, mathematical science or econometrics and qualitative methods are supported by judgments and opinions of specialists, of functional services in the enterprise or the combination of these two levels.

In practice, opting frequently, for a combination of methods, especially if the forecast turns out to be a decisive factor for the enterprise.

The first group of methods is based on previous data group and on the use of specific methods for calculating the forecast, but it is not possible to include the qualitative, such as, for example, the influence of a new advertising campaign (Oprescu et. al., 2003, p. 57).

Quantitative methods based on time series are frequently used for the programming and the control of the production and inventory.

The second group of methods is based, in particular, a careful analysis of the opinions expressed.

Qualitative forecasting methods are less analytical, are commonly used in long-term strategic planning and decisions structural units of the company.

2. The method of time series decomposable

The method of time series decomposable involves determining separately of the four components that accompany a time series and their isolated forecast as follows (Raţiu-Suciu *et. al.*, 2009, p.68):

- trend;
- seasonal variation (S);
- cycling variation (C);
- random variation (R);

The conclusion reached in the study of the method was that these components can express both a forecast (P_t) for the next stage (t), and the fractions of the phases as a product of terms,

$$P_t = T_t \times C_t \times S_t \times R_t$$

The trend (T_t) expresses the general tendency of the phenomenon or indicator P_t , developed over a long period of time.

It may be revealed as the only series of which finite differences are constant or as a key component that can be isolated from other components for time series decomposable.

Identifying trends can be made by plotting scale at terms of the series or analytical by trying multiple functions among which we choose one with a minimum standard deviation (Collins *et. al.*, 2012, p. 117).

The cyclical component (C_t) in the time series is manifested by relatively large oscillations of the indicator or analyzed phenomenon, and the cycle time can be seen from the perspective of several years.

These oscillations are generated by alternating periods of growth to periods of stagnation and economic recession and other general causes (political activity) or regional (union action, currency market fluctuations, etc.).

The seasonal component (S_t) occurs as a result of seasonal influences of the year. In contrast to cyclical component this has an oscillation frequency (half, quarter, week, month).

Sometimes seasonal variation is caused by the seasons, the oscillating behavior of consumers on the market for a particular product or customs, traditions or social phenomena (religious holidays, school holidays).

The random component (R_t) occurs without special cause to determine causal and predictable manner or without the possibility of being awarded a pattern of systematic repetition.

3. Methodological example of forecast for decomposable series

Table no. 1 render annual or quarterly sales of a consumer electronics company relating to a period of five years.

Table no.1 Sales development of electronic products

The year	**Sales volume**			
	Quarter I	**Quarter II**	**Quarter III**	**Quarter IV**
2011	0,9	1,5	0,9	3
2012	1,2	1,2	0,9	1,8
2013	1,8	3,6	2,6	5,1
2014	1,8	1,5	2,2	4,8
2015	2,1	1,9	0,9	2,5

Source: (Raţiu – Suciu et. al., 2009, p.27)

Required to forecast sales in the 6th year division by quarters.

Solution:

After collecting and adjusting the data, and the dynamic graphical representation of the series following the steps:

E1: *Underlying trend*

Usually, the trend is set about graphics. From Figure 1 it is noted that a straight line upward trend plays suggestive sales development in this case.

The straight line formula used will be:

$T_t = a + bt$

Next calculate the parameters a and b of the straight line using normal equations system.

Examination of the structure of the normal equations system it is therefore necessary to assemble Table no. 2.

Table no.2 Preparing numerical data necessary to solve system

t_i	x_i	t_i^2	$x_i t_i$
1	0,9	1	0,9
2	1,5	4	3
3	0,9	9	2,7
4	3,0	16	12
5	1,2	25	6
6	1,2	36	7,2
7	0,9	49	6,3
8	1,8	64	14,4
9	1,8	81	16,2
10	3,6	100	36
11	2,6	121	28,6
12	5,1	144	61,2
13	1,8	169	23,4
14	1,5	196	21
15	2,2	225	33
16	4,8	256	76,8
17	2,1	289	35,7
18	1,9	324	34,2
19	0,9	361	17,1
20	2,5	400	50
$\sum t_i = 210$	$\sum X_i = 42{,}2$	$\sum t_i^2 = 2870$	$\sum X_i t_i = 485{,}7$

Source: (Adapted by Raţiu – Suciu et. al., 2009, p.22)

Replace the data located on the last line of the table no. 2 in the following system:

$20a + 210b = 42{,}2$

$210a + 2870b = 485{,}7$

This system is solved with respect to a and b, yielding a = 1.45; b = 0.063.

Trend function will be:

$T_t = 1{,}45 + 0{,}063\ t$

Next will replace t with values in the first column of Table 2, leading the trend for each month separately.

$T_1 = 1{,}45 + 0{,}063 * 1 = 1{,}513$

$T_2 = 1{,}45 + 0{,}063 * 2 = 1{,}576$

$T_3 = 1{,}45 + 0{,}063 * 3 = 1{,}639$

$T_4 = 1{,}45 + 0{,}063 * 4 = 1{,}702$

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$T_{20} = 1{,}45 + 0{,}063 * 20 = 2{,}71$

E2: *Calculation cycling variation*

The graph in Figure 1 it is seen that in the case of the numerical example there is a cyclic variation around the trend.

The index with which to be taken into consideration the cyclic variation will be expressed as a proportion relative to the trend.

Therefore will use the moving average of 4th order designed to eliminate seasonal influences, such as suggested the sales curve in the figure are present and in this case (Ciobănică, 2011, p. 44).

Index measurements of cyclical variation involves the following steps:

P_1: Calculate simple moving average (MM_{ti} , where i = 1,......,17)

$$MM_1 = \frac{x_1 + x_2 + x_3 + x_4}{4} = \frac{0,9 + 1,5 + 0,9 + 3}{4} = 1,575$$

$$MM_2 = \frac{x_2 + x_3 + x_4 + x_5}{4} = \frac{1,5 + 0,9 + 3 + 1,2}{4} = 1,650$$

$$MM_3 = \frac{x_3 + x_4 + x_5 + x_6}{4} = \frac{0,9 + 3 + 1,2 + 1,2}{4} = 1,575$$

....

$$MM_{17} = \frac{x_{17} + x_{18} + x_{19} + x_{20}}{4} = \frac{2,1 + 1,9 + 0,9 + 2,5}{4} = 1,85$$

In Table no. 3 shows simple moving averages MM_{ti} calculated for the entire analyzed period.

P_2: Calculate moving averages centered (MMC_{ti} , i = 1,.....,16)

$$MMC_t = \frac{MM_t + MM_{t+1}}{2}, \text{ where:}$$

MM_t = moving average in the first quarter t;
MM_{t+1} = moving average in the next quarter.

$$MMC_1 = \frac{MM_1 + MM_2}{2} = \frac{1,575 + 1,650}{2} = 1,6125$$

$$MMC_2 = \frac{MM_2 + MM_3}{2} = \frac{1,650 + 1,575}{2} = 1,6125$$

$$MMC_3 = \frac{MM_3 + MM_4}{2} = \frac{1,575 + 1,575}{2} = 1,575$$

....

$$MMC_{16} = \frac{MM_{16} + MM_{17}}{2} = \frac{2,425 + 1,85}{2} = 2,1375$$

In Table no. 3 shows centered moving averages values MMC_{ti} calculated for the entire analyzed period.

P_3: Cyclic variation index is calculated using the formula:

$$C_{ti} = \frac{MMC_i}{T_i}, \quad i = 1,.....,16$$

$$C_1 = \frac{MMC_1}{T_1} = \frac{1,6125}{1,513} = 1,065$$

$$C_2 = \frac{MMC_2}{T_2} = \frac{1,6125}{1,576} = 1,023$$

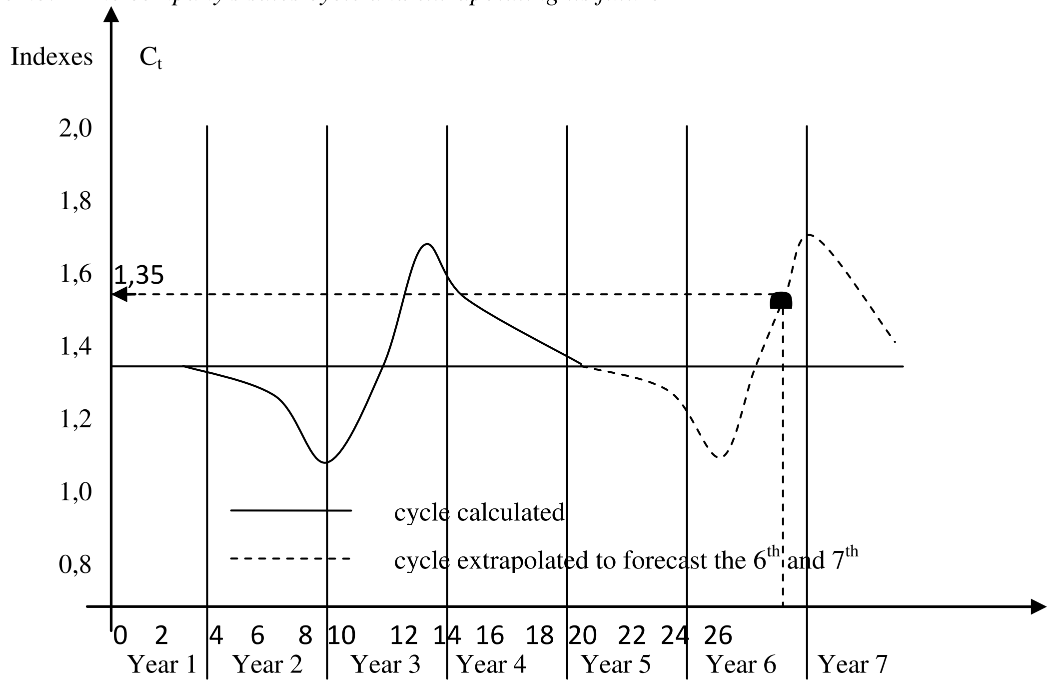
$$C_3 = \frac{MMC_3}{T_3} = \frac{1,575}{1,639} = 0,96$$

....

$$C_{16} = \frac{MMC_{16}}{T_{16}} = \frac{1,6125}{1,621} = 1,002$$

Figure 1 shows the indexes cycloidal curve (C_t) from Table 3.

Figure no. 1 The company's sales cycle and extrapolating its future



In Table 3 shows the variation of the values index cyclicaliy calculated for the entire analysed period.

Table no. 3 Table of cyclically variation

Years	*Quarter*	*Sales x_i*	*MM_{ti}*	*MMC_{ti}*	*T_{ti}*	*C_{ti}*
1	1	0,9				
	2	1,5	1,575			
	3	0,9	1,650	1,6125	1,639	0,98
	4	3,0	1,575	1,6125	1,702	0,95
2	5	1,2	1,575	1,575	1,765	0,89
	6	1,2	1,275	1,425	1,828	0,78
	7	0,9	1,425	1,350	1,891	0,71
	8	1,8	2,025	1,7250	1,954	0,88
3	9	1,8	2,450	1,2375	2,017	0,61
	10	3,6	3,275	2,8625	2,08	1,38
	11	2,6	3,275	3,2750	2,143	1,53
	12	5,1	2,750	3,0125	2,206	1,37
	13	1,8	2,650	2,7	2,269	1,19

4	14	1,5	2,575	2,6125	2,332	1,12
	15	2,2	2,650	2,5875	2,395	1,08
	16	4,8	2,750	2,7	2,458	1,09
5	17	2,1	2,425	2,5875	2,521	1,02
	18	1,9	1,85	2,1375	2,584	0,83
	19	0,9				
	20	2,5				

Source: (Adapted by Raţiu – Suciu et. al., 2009, p.24)

E$_3$: *Seasonal component index calculatuin S_t*

The formula which allows to determine this index is:

$$S_t = \frac{X_i}{MMC_{ti}} = \frac{T \times C \times S \times R}{T \times C} = S \times R$$

Index measurements of cyclical variation involves the following steps:

P$_1$: Calculate values $(S \times R)$ for the analysed period:

The evolution of seasonal component can be seen in Table 4.

$$S_1 \times R_1 = \frac{X_1}{MMC_1} = \frac{0{,}9}{1{,}6125} = 0{,}5581$$

$$S_2 \times R_2 = \frac{X_2}{MMC_2} = \frac{3}{1{,}6125} = 1{,}8604$$

Table no. 4 Values $(S \times R)$ associated to the company sales

Year	*Quarter t_i*	*Sales x_i*	*MMC_{ti}*	*$(S\times R)_i$*	*Year*	*Quarter t_i*	*Sales x_i*	*MMC_{ti}*	*$(S\times R)_i$*
1	1	0,9				11	2,6	2,143	1,2132
	2	1,5				12	5,1	2,206	2,3118
	3	0,9	1,6125	0,5581	4	13	1,8	2,269	0,7933
	4	3,0	1,6125	1,8604		14	1,5	2,332	0,6432
2	5	1,2	1,575	0,7619		15	2,2	2,395	0,9185
	6	1,2	1,425	0,8421		16	4,8	2,458	1,9528
	7	0,9	1,350	0,6666	5	17	2,1	2,521	0,833
	8	1,8	1,7250	1,0434		18	1,9	2,584	0,7352
3	9	1,8	1,2375	1,4545		19	0,9		

Source: (Adapted by Raţiu – Suciu et. al., 2009, p.32)

P2: Determine indications of seasonal variation own professed values (S) as arithmetic averages $(S \times R)$, grouped by quarters for the five years analyzed (raţiu-Suciu et. al., 2009, p.
Seasonal indexes (S) for dynamic sales series is shown in Table 5

E4: *Calculation of the random component index R*

The formula which allows to determine this index is:

$$\frac{S \times R}{S} = R$$

The values of the random component obtained by applying this formula are shown in Table 5.

Table no. 5 Table of random variation

Year	*Quarter*	*(S×R)ᵢ*	*Sᵢ*	*Rᵢ*	*Year*	*Quarter*	*(S×R)ᵢ*	*Sᵢ*	*Rᵢ*
1	1					11	1,2132	0,8391	1,4458
	2					12	2,3118	1,7921	1,2899
	3	0,5581	0,8391	0,6651	4	13	0,7933	0,9606	0,8258
	4	1,8604	1,7921	1,0381		14	0,6432	0,8695	0,7397
2	5	0,7619	0,9606	0,7931		15	0,9185	0,8391	1,0946
	6	0,8421	0,8695	0,9684		16	1,9528	1,7921	1,0896
	7	0,6666	0,8391	0,7944	5	17	0,833	0,9606	0,8671
	8	1,0434	1,7921	0,5822		18	0,7352	0,8695	0,8455
3	9	1,4545	0,9606	1,5141		19			
	10	1,2576	0,8695	1,4463		20			

(Adapted by Raţiu – Suciu et. al., 2009, p.32)

At the moment it has all the data needed to calculate forecast sales of electronic products in the 6th year, global and quarterly.

This step is performed in two stages:

I. First shall be made calculation of quarterly forecast because they are independent variable function trend.

Serial number of the 6th year will be:

Such, the trend Q_t will be:

- for quarter 21nd, first quarter, 6th year: $Q_{21} = 1,45 + 0,063 \times 21 = 2,773$
- for quarter 22nd, 2th quarter, 6th year: $Q_{22} = 1,45 + 0,063 \times 22 = 2,836$
- for quarter 23nd, 3th quarter, 6th year: $Q_{23} = 1,45 + 0,063 \times 23 = 2,899$
- for quarter 24nd, 4th quarter, 6th year: $Q_{24} = 1,45 + 0,063 \times 24 = 2,962$

The sum of the quarterly values calculated above is trend for the 6th year, as follows:

$Q_6 = Q_{21} + Q_{22} + Q_{23} + Q_{24}$

$Q_6 = 2,773 + 2,836 + 2,899 + 2,962 = 11,47$ thousands electronics

II. Trend values for quarters Q_{21} - Q_{24} multiplied by the corresponding indices cyclically C_t, seasonal variation (S_t) and random variation (R_t), according to formula:

$$P_t = T_t \times C_t \times S_t \times R_t$$

Following these explanations, using the formula above results:

- $P_{21} = 2,773 \times 0,68 \times 0,9607 \times 0,7944 = 1,4390$
- $P_{22} = 2,836 \times 0,86 \times 0,8695 \times 0,5822 = 1,2346$
- $P_{23} = 2,899 \times 1,09 \times 0,8391 \times 1,5141 = 4,0146$
- $P_{24} = 2,962 \times 1,35 \times 1,7921 \times 1,4463 = 10,3642$

It is noted that the production of electronic products is in great demand in the 4th quarter of the 6th year which has been predicted.

4. References

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