

## CONCEPTUAL DELIMITATIONS REGARDING THE SALES FORECASTING METHODS. CASE STUDY FOR THE SEASONAL COEFFICIENT METHOD

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### Abstract

*One of the most important stages in the budget drafting process is the sales forecasting. As a matter of fact, the sales affect the whole activity of a company, their variation being considered the main risk factor for the performance and the financial position of the company. Sales forecasting starts with analyzing the turnover over a longer period of time. It includes all the studies and calculations made in order to determine the potential market to which the company can get access, as well as the part of it that the company is estimated to cover. There are several methods for planning the amount of sales, each company being able to choose one or more such methods. All the sales forecasting methods have advantages and disadvantages; however, in practice it was proved that most large companies use a combination of several methods. However, when there are seasonal variations each year, the seasonal coefficient method is used in order to forecast the sales. The exemplification of this method is done on the level of an production industrial company.*

### Keywords

sales budget; sales forecasting; sales forecasting methods; seasonal coefficient method

### JEL Classification

M41

### Sales forecasting – the starting point in drafting the budget

In the budget drafting process, the starting point is forecasting the sales activity. The sales budget is the forecast expressed in numbers for the company sales on types of products and services and/or groups, on quantities and prices, on destinations and periods of time. They will be regrouped on clients, regions, countries. The importance of drafting such a budget is given:

- on long term, by setting the investment plan and the financing plan;
- on medium term, by setting the expense budget pertaining to advertising and promotion;
- on short term, by determining the production level, the procurement plan, improving the workforce.

In this context, we consider the sales budget as a support budget allowing the coordination of the other budgets.

Considering the time span criterion, there can be long-term or short-term forecasting. Long-term forecasting is based on research done not only on the goods and services existing on the market, but also on the analysis of the existing or the virtual market needs in that particular field. On short term, the forecasting is limited to allowing for the external constraints imposed by the market, the competition or by the purchasing

power, as well as the internal constraints imposed by the company's trade policy, the trade methods and by the current production capacity. In order to ensure the long-term success of the company, it is vital to have an accurate sales forecast. In the context of the information society, the modern organization cannot survive without having real-time information, from both inside and outside its (Bucur, 2007). Under these conditions, marketing studies will be done on the external environment (the general economic situation, the company's position compared to the competition, the price level, the clients' behavior and so on), as well as on the internal environment (the normal production capacity, the trade policy, the pricing policy etc.).

### **Presentation of the sales forecasting methods, according to the specialized literature**

The estimation of sales requires setting the level of the future sales, from the point of view of quality and value, considering the trends and the restrictions imposed to the company, as well as the general policy of the company. In order to avoid the empiricism of the forecasts, it is necessary to carry out some rational research. Thus, the data processing and analysis must be done based on a logical, rational method. There are several methods for planning the sales volume, each company being able to choose one or more of them. As all the methods have both advantages and disadvantages, in practice it was ascertained that most great companies use a combination of these methods.

A series of methods are presented in the specialized literature, among which we mention:

- *the causal approach*, when several variables with causal effect on the prospective sales are identified;
- *the noncausal approach*, according to which the planning is done by analyzing the data of the previous periods of time, based on the idea that the future results will follow the trend of the previous results;
- *the direct method*, which requires certain simple projections, without taking into consideration the trends of the industry within which the company functions and competes;
- *the indirect method*, as the opposite of the direct method, starts from the trends of the industry in order to forecast the percentage rate that the company aims to reach within the industry;
- *the assessment methods* (the manager's opinion method or the information achieved from the sales staff or from the sales supervisors); the easiest forecasting methods, are based on the manager's opinions, who collects the information directly from the executive board members, or on the projections of the sales staff/sales department managers, the ones who get information concerning the demand directly from the consumers; some of the advantages of applying the assessment methods are that they are less time-consuming and less expensive; a great disadvantage is that they are based on opinions and not on facts;
- *the statistical methods*, as opposed to the assessment methods, are based on technical knowledge and on statistical applications; examples of such methods: the trend analysis, the analysis of the correlations, the preset goal method, the industry analysis method, the production line analysis, the analysis of the final user.

According to the nature of the factors considered to be the origin of the phenomenon, the sales forecasting methods are divided into:

- *qualitative methods*, which research the phenomena and try to explain them based mostly on intuition (investigations based on questionnaires, marketing studies or polls and so on);

- *quantitative methods*, which start for statistical data expressed in figures when setting the forecasts. In this category are included methods such as the linear adjustment, the correlation, the mobile average method, the seasonal coefficient method. The linear adjustment and the correlation can be applied in researching the general trends of the sales evolution, when the trend is linear. In those cases in which the linear adjustment is not suitable for setting the trend, the mobile average method can be applied, which is based on the idea that the forecast pertaining to a month or a year is an average of the sales for the previous months, any contingent fluctuations counterbalancing each other. When there are seasonal variations every year, in order to forecast the sales we resort to the seasonal coefficient method.

### Theoretical aspects concerning the seasonal coefficient method

In case there are seasonal variations every year, the estimation of the sales volume from the point of view of value and quantity is achieved using the seasonal coefficient method. The range of the seasonal variations is generally proportional to the trend.

The seasonal coefficients can be set as trend reports, chains of reports, simple methods. Thus:

- the trend report method requires setting some monthly average values of the real value reports and of the adjusted values calculated using method of least squares;
- the chain of reports method requires certain more complex stages, this method pertaining to the exponential trend cases;
- the simple methods require determining the monthly average values reported to the average of all the months.

No matter which method is used, the seasonal coefficients calculated will be used to influence the monthly adjustment equation.

### Case study concerning the sales forecasting in the case of a production industrial company, using the seasonal coefficient method

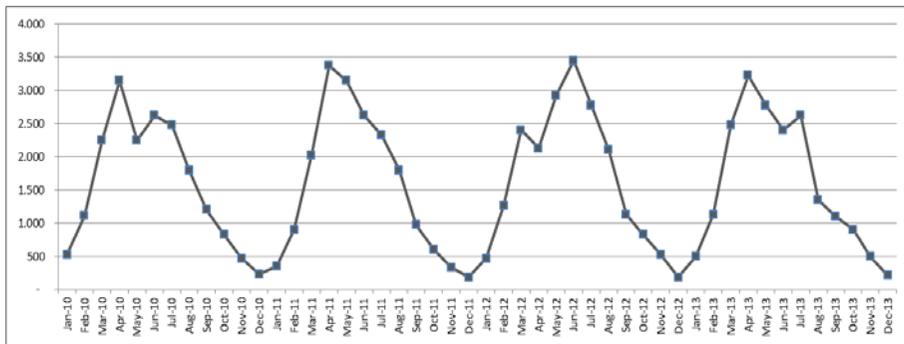
Within the "ALFA" industrial company, the sales evolution in the case of product "X", for the period of time 2010-2013 is as follows:

**Table 1 Historical data concerning the sales of product "X"**

Months \ Years	2010	2011	2012	2013
January	525	345	465	495
February	1.110	900	1.260	1.125
March	2.250	2.025	2.400	2.475
April	3.150	3.375	2.130	3.225
May	2.250	3.150	2.925	2.775
June	2.625	2.625	3.450	2.400
July	2.475	2.325	2.775	2.625
August	1.800	1.800	2.100	1.350
September	1.200	975	1.125	1.095
October	825	600	825	900
November	465	330	525	495
December	225	180	180	210

Source: data from „ALFA” production industrial company

Graphic, the diagram of the sales evolution is presented in the following figure:



**Figure 1 Diagram of the sales evolution**

Source: own calculations, based on the historical data concerning the sales of product “X”, for the period of time 2010-2013

The curve has a conical shape showing the seasonal evolution of the sales volume, the highest values being listed in the spring-summer months, and the lowest ones in the autumn-winter months.

In order to do the forecast for 2014, we must go through the following *stages*:

- ✓ Calculating the total annual sales and the monthly average based on the real data:

**Table 2 Total annual sales and the monthly averages**

Years	2010	2011	2012	2013
Total annual sales	18.900	18.630	20.160	19.170
Monthly sales average	1.575	1.553	1.680	1.598

Source: data from „ALFA” production industrial company

- ✓ Setting the monthly total values for the whole year 2013:

**Table 3 Monthly total values**

Months	Monthly total values cumulated for the year 2013
January	495
February	1.620
March	4.095
April	7.320
May	10.095
June	12.495
July	15.120
August	16.470
September	17.565
October	18.465
November	18.960
Decembers	19.170

Source: own calculations, based on data from “ALFA” production industrial company

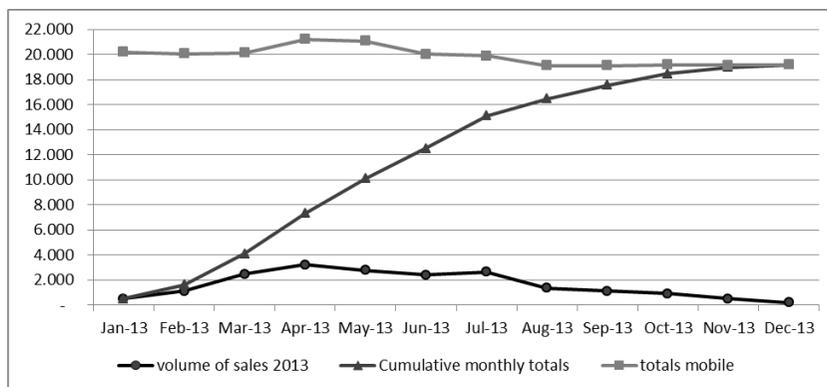
✓ Drawing up the Table of the moving totals for the year 2013:

**Table 4 Table of the moving totals**

Months	Moving totals for the year 2013
January	20.190
February	20.055
March	20.130
April	21.225
May	21.075
June	20.025
July	19.875
August	19.125
September	19.095
October	19.170
November	19.140
December	19.170

Source: own calculations, based on data from “ALFA” production industrial company

✓ The sales evolution is graphically presented based on the historical data (Table 1), as well as on the data concerning the Cumulated monthly totals (Table 3) and the table of the moving averages (Table 4).



**Figure 2 Graphical representation of the sales evolution**

Source: own calculations, based on data from “ALFA” production industrial company

✓ In order to determine the linear adjustment, we mark “xi” – the rank of the months of the four years and “yi” – the monthly sales (Table 1). Applying the method of least squares and determining the values of  $\bar{x}$  and  $\bar{y}$ , we calculate the coefficient for the line “a” according to the formula:

$$a = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^n x_i^2}$$

**Table 5 Calculations necessary for setting the coefficient of the linear adjustment according to the first calculation formula**

xi	yi	xi - $\bar{x}$	yi - $\bar{y}$	(xi - $\bar{x}$ ) (yi - $\bar{y}$ )	(xi - $\bar{x}$ ) <sup>2</sup>
1	525	-23,50	-1.076,25	25.291,88	552,25
2	1.110	-22,50	-491,25	11.053,13	506,25
3	2.250	-21,50	648,75	-13.948,13	462,25
4	3.150	-20,50	1.548,75	-31.749,38	420,25
5	2.250	-19,50	648,75	-12.650,63	380,25
6	2.625	-18,50	1.023,75	-18.939,38	342,25
7	2.475	-17,50	873,75	-15.290,63	306,25
8	1.800	-16,50	198,75	-3.279,38	272,25
9	1.200	-15,50	-401,25	6.219,38	240,25
10	825	-14,50	-776,25	11.255,63	210,25
11	465	-13,50	-1.136,25	15.339,38	182,25
12	225	-12,50	-1.376,25	17.203,13	156,25
13	345	-11,50	-1.256,25	14.446,88	132,25
14	900	-10,50	-701,25	7.363,13	110,25
15	2.025	-9,50	423,75	-4.025,63	90,25
16	3.375	-8,50	1.773,75	-15.076,88	72,25
17	3.150	-7,50	1.548,75	-11.615,63	56,25
18	2.625	-6,50	1.023,75	-6.654,38	42,25
19	2.325	-5,50	723,75	-3.980,63	30,25
20	1.800	-4,50	198,75	-894,38	20,25
21	975	-3,50	-626,25	2.191,88	12,25
22	600	-2,50	-1.001,25	2.503,13	6,25
23	330	-1,50	-1.271,25	1.906,88	2,25
24	180	-0,50	-1.421,25	710,63	0,25
25	465	0,50	-1.136,25	-568,13	0,25
26	1.260	1,50	-341,25	-511,88	2,25
27	2.400	2,50	798,75	1.996,88	6,25
28	2.130	3,50	528,75	1.850,63	12,25
29	2.925	4,50	1.323,75	5.956,88	20,25
30	3.450	5,50	1.848,75	10.168,13	30,25
31	2.775	6,50	1.173,75	7.629,38	42,25
32	2.100	7,50	498,75	3.740,63	56,25
33	1.125	8,50	-476,25	-4.048,13	72,25
34	825	9,50	-776,25	-7.374,38	90,25
35	525	10,50	-1.076,25	-11.300,63	110,25
36	180	11,50	-1.421,25	-16.344,38	132,25
37	495	12,50	-1.106,25	-13.828,13	156,25
38	1.125	13,50	-476,25	-6.429,38	182,25
39	2.475	14,50	873,75	12.669,38	210,25
40	3.225	15,50	1.623,75	25.168,13	240,25
41	2.775	16,50	1.173,75	19.366,88	272,25
42	2.400	17,50	798,75	13.978,13	306,25
43	2.625	18,50	1.023,75	18.939,38	342,25
44	1.350	19,50	-251,25	-4.899,38	380,25
45	1.095	20,50	-506,25	-10.378,13	420,25
46	900	21,50	-701,25	-15.076,88	462,25
47	495	22,50	-1.106,25	-24.890,63	506,25
48	210	23,50	-1.391,25	-32.694,38	552,25
1.176	76.860	-	-	-49.500,00	9.212,00

Source: own calculations, based on data from „ALFA” production industrial company

According to another formula, the coefficient for the line “a” can be determined as follows:

$$a = \frac{\sum_{i=1}^n x_i \cdot y_i - n \cdot \bar{x} \cdot \bar{y}}{\sum_{i=1}^n x_i^2 - n \cdot \bar{x}^2}$$

**Table 6 Calculations necessary for setting the coefficient of the linear adjustment according to the second calculation formula**

xi	yi	xi <sup>2</sup>	xi • yi	xi	yi	xi <sup>2</sup>	xi • yi
1	525,00	1,00	525,00	26	1.260,00	676,00	32.760,00
2	1.110,00	4,00	2.220,00	27	2.400,00	729,00	64.800,00
3	2.250,00	9,00	6.750,00	28	2.130,00	784,00	59.640,00
4	3.150,00	16,00	12.600,00	29	2.925,00	841,00	84.825,00
5	2.250,00	25,00	11.250,00	30	3.450,00	900,00	103.500,00
6	2.625,00	36,00	15.750,00	31	2.775,00	961,00	86.025,00
7	2.475,00	49,00	17.325,00	32	2.100,00	1.024,00	67.200,00
8	1.800,00	64,00	14.400,00	33	1.125,00	1.089,00	37.125,00
9	1.200,00	81,00	10.800,00	34	825,00	1.156,00	28.050,00
10	825,00	100,00	8.250,00	35	525,00	1.225,00	18.375,00
11	465,00	121,00	5.115,00	36	180,00	1.296,00	6.480,00
12	225,00	144,00	2.700,00	37	495,00	1.369,00	18.315,00
13	345,00	169,00	4.485,00	38	1.125,00	1.444,00	42.750,00
14	900,00	196,00	12.600,00	39	2.475,00	1.521,00	96.525,00
15	2.025,00	225,00	30.375,00	40	3.225,00	1.600,00	129.000,00
16	3.375,00	256,00	54.000,00	41	2.775,00	1.681,00	113.775,00
17	3.150,00	289,00	53.550,00	42	2.400,00	1.764,00	100.800,00
18	2.625,00	324,00	47.250,00	43	2.625,00	1.849,00	112.875,00
19	2.325,00	361,00	44.175,00	44	1.350,00	1.936,00	59.400,00
20	1.800,00	400,00	36.000,00	45	1.095,00	2.025,00	49.275,00
21	975,00	441,00	20.475,00	46	900,00	2.116,00	41.400,00
22	600,00	484,00	13.200,00	47	495,00	2.209,00	23.265,00
23	330,00	529,00	7.590,00	48	210,00	2.304,00	10.080,00
24	180,00	576,00	4.320,00	<i>1.176</i>	<i>76.860,00</i>	<i>8.024,00</i>	<i>1.833.570,00</i>
25	465,00	625,00	11.625,00				

Source: own calculations, based on data from “ALFA” production industrial company

Based on the data in the tables above, we calculate:

$$\bar{x} = \frac{\sum_{i=1}^n xi}{n} = \frac{1.176}{48} = 24,50 \quad \text{and} \quad \bar{y} = \frac{\sum_{i=1}^n yi}{n} = \frac{76.860,00}{48} = 1.601,25$$

Replacing with the calculated values, we can set  $a = - 5,37$ .

The equation of the line is determined by the formula:  $y - \bar{y} = a (x - \bar{x})$ .

So, we obtain  $y - 1.601,25 = -5,37 (x - 24,50)$  and hence  $y = -5,37 \cdot x + 1.732,82$ .

✓ We calculate the adjusted values for the period of time considered (2010-2013) based on the equation of the line determined previously.

**Table 7 Table of the adjusted values**

Months	Adjusted values for the years			
	2010	2011	2012	2013
January	1.727,45	1.663,01	1.598,57	1.534,13
February	1.722,08	1.657,64	1.593,20	1.528,76

March	1.716,71	1.652,27	1.587,83	1.523,39
April	1.711,34	1.646,90	1.582,46	1.518,02
May	1.705,97	1.641,53	1.577,09	1.512,65
June	1.700,60	1.636,16	1.571,72	1.507,28
July	1.695,23	1.630,79	1.566,35	1.501,91
August	1.689,86	1.625,42	1.560,98	1.496,54
September	1.684,49	1.620,05	1.555,61	1.491,17
October	1.679,12	1.614,68	1.550,24	1.485,80
November	1.673,75	1.609,31	1.544,87	1.480,43
December	1.668,38	1.603,94	1.539,50	1.475,06

Source: own calculations, based on data from "ALFA" production industrial company

- ✓ We determine the *seasonal coefficients*, reporting the real sales values (Table 1) with the calculated adjusted values (Table 7):

**Table 8 Seasonal coefficients**

Months \ Years	2010	2011	2012	2013
January	0,303916	0,207455	0,290885	0,322658
February	0,644569	0,542941	0,790861	0,735891
March	1,310647	1,225587	1,511497	1,624666
April	1,840663	2,049305	1,346006	2,124478
May	1,318898	1,918941	1,854682	1,834529
June	1,543573	1,604366	2,195047	1,592272
July	1,459979	1,425689	1,771635	1,747775
August	1,065177	1,107406	1,345309	0,902081
September	0,712382	0,601833	0,723189	0,734323
October	0,491329	0,371591	0,532176	0,605734
November	0,277819	0,205057	0,339834	0,334362
December	0,134861	0,112224	0,116921	0,142367

Source: own calculations, based on data from "ALFA" production industrial company

- ✓ Setting the *correction coefficients*, by reporting the total seasonal coefficients calculated for each month to the number of years considered, resulting the monthly average values for the four years:

**Table 9 Correction coefficients**

Months	Total seasonal coefficients for the four years	Correction coefficients
January	1,124915	0,281229
February	2,714262	0,678565
March	5,672396	1,418099
April	7,360451	1,840113
May	6,927050	1,731762
June	6,935259	1,733815
July	6,405077	1,601269
August	4,419973	1,104993
September	2,771727	0,692932
October	2,000829	0,500207

November	1,157073	0,289268
December	0,506373	0,126593

Source: own calculations, based on data from "ALFA" production industrial company

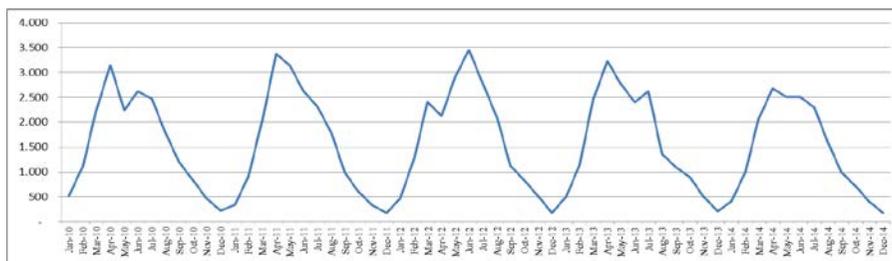
- ✓ Analyzing the evolution of sales during the four years, based on the calculations presented above, we can extrapolate the trend of the sales evolution. In order to forecast the sales volume for 2014, we mark the rank of the months from 49 to 60 and we calculate the adjusted values, which will be corrected afterwards using the correction coefficients, thus resulting the following values:

**Table 10 Forecast values of the sales volume for 2014**

Months of 2014	xi	Adjusted values for 2014	Correction coefficients	Values for the sales volume forecast for 2014
January	49	1.469,69	0,281229	413
February	50	1.464,32	0,678565	994
March	51	1.458,95	1,418099	2.069
April	52	1.453,58	1,840113	2.675
May	53	1.448,21	1,731762	2.508
June	54	1.442,84	1,733815	2.502
July	55	1.437,47	1,601269	2.302
August	56	1.432,10	1,104993	1.582
September	57	1.426,73	0,692932	989
October	58	1.421,36	0,500207	711
November	59	1.415,99	0,289268	410
December	60	1.410,62	0,126593	179

Source: own calculations, based on data from "ALFA" production industrial company

Graphic, the diagram of the sales evolution, based on the historical data for the period of time 2010-2013 plus the sales volume forecast for 2014, is presented in the following figure:



**Figure 3 Diagram of the sales evolution**

Source: own calculations, based on data from "ALFA" production industrial company

**Conclusions**

Business managers always had to pay attention to the efficient resource management, to that purpose using the planning and the budgets; it has become even more important in the current economic context. This period of crisis is regarded by some specialists as a recession stage of the economic cycle, thus a normal stage in the market economy. Consequently, it is natural that all the performance indicators should have losses. Under these conditions, we recommend drawing up a budget system, as it

helps managers in achieving the strategic objectives they have set. While on decision-making level we use a scoreboard including the main budget indicators, on operational level we use the detailed budget.

The budget that influences all the other budgets is the sales budget. In order to sell, it is necessary to have a supply of goods which, in order to be produced, require raw materials, workforce, equipment, etc. Building the sales budget requires forecasting the sales volume (the sales programme) as well as the selling prices per unit. The specialized literature describes many sales forecasting methods. As to the preference of applying a certain method within a company, each method has advantages and disadvantages; however, in practice it was proved that a combination of several methods should be used. After setting the forecasted sales volume and associating it to the selling price per unit, the annual and the global forecasts for the sales budget on the level of the whole company, we can allocate the monthly and quarterly values, on groups of products or on groups of purchasers, also taking into consideration the seasonal variation.

The importance of building the sales budget lies in the fact that it later allows the exercise of control, the managers being subsequently able to decide on: the achievement of the forecasts in the next periods of time, changing the pricing policy, organizing promotional campaigns, training the employees, and so on.

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