

# **Automation of Making Marketing Decisions**

Giorgi Kuchava<sup>a</sup>, Maia Mantskava<sup>b\*</sup>

<sup>a</sup>*Business and Technology University, Tbilisi, Georgia*

<sup>a,b</sup>*Ivane Beritashvili Center of Experimental Biomedicine, Tbilisi, Georgia*

<sup>b</sup>*European University, Tbilisi, Georgia*

<sup>b</sup>*Email: mantskavamaka@bk.ru*

## **Abstract**

The article considers the application of complex marketing analysis to predict the sales volume of an organization, in order to plan the optimal amount of costs and assess the risks of making marketing decisions. The given method is not the usual prediction of the indicator by indicator, and takes into account the interaction of the studied indicator with various market factors. An information technology corresponding to the method was developed using the Ms Excel package.

**KeyWords:** Sales volume; factor of influence; trend; prediction; correlation; prediction error.

## **1. Introduction**

Market of goods and services represents complex system model with big amount of external and internal factors. Market situations has its own factors, but it's impossible to do future predictions of company sells based only tendency of concrete market factor. It is clear, many different factors can have influence on volume of sells as one of the most important market index: volume of competitors' sales, capacity of segment, conjuncture of goods or service and etc. Such influence decide behaviour not only volume of sales, also behaviour other market indicators. In accordance with this environment, it's necessary to be part of marketing research to do prediction of market tendency [1].

Let's discuss such task, organization needs to predict amount of sales of its own goods (service). We mean, market doesn't have any monopolists, there is no monopoly influence and behaviour on market situation - Many small and average enterprises are functioning on market. It's necessary to predict sales volume of enterprise for planning purchasing volume of enterprise and rate risk to make marketing decision.

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\* Corresponding author.

## 2. Selection Influential factors on sales volume

Research began with selection of factors which cause changes into volume of sales, that's means creation of hypothesis about factors which can influence on behaviour of sales curve. Choosing of factors happens with expert rule. Experts ask to name factors, which is part of marketing environment of organization, with external and internal factors and have influence on sales. It means, math dynamic of this factors are known on the same intervals, where we have volume of sales. Some external factors are exchange rate, volume of the consumer segment, volume of total sum of this segment, dynamic of number change of competitors' and etc. Some internal factors are supplies of goods, effective management of organization, type of advertisement and its costs, positioning of goods, number of distributors and etc. Chose factors are unlimited. In general high rate of factors represents accurate prediction results. With expert analysis chose three abstract factor:  $F_1$ ,  $F_2$ ,  $F_3$ . See example down below (table. 1).

**Table 1**

<i>F1-F3 factors, which has influence on Q Volume of sales</i>				
<i>Month</i>	<i>Volume of Sales</i> <i>Q</i>	<i>Factors</i>		
		<i>F<sub>1</sub></i>	<i>F<sub>2</sub></i>	<i>F<sub>3</sub></i>
March	23	22	12	240
April	34	36	2	280
May	55	45	3	318
June	35	58	67	260
July	24	77	32	325
August	37	99	22	254
September	43	102	33	312
October	45	111	89	285
November	56	122	11	324

### Sift out of influence factors

This stage involves identifying factors, which have a significant impact on changes in sales volume, the remaining factors will be removed from the discussion. The correlation coefficient can be considered as a criterion for such acceleration, which show how close the tendency is each of the two factors in time.  $F_1$ ,  $F_2$ ,  $F_3$  factors probabilistic distributions (draw. 1).

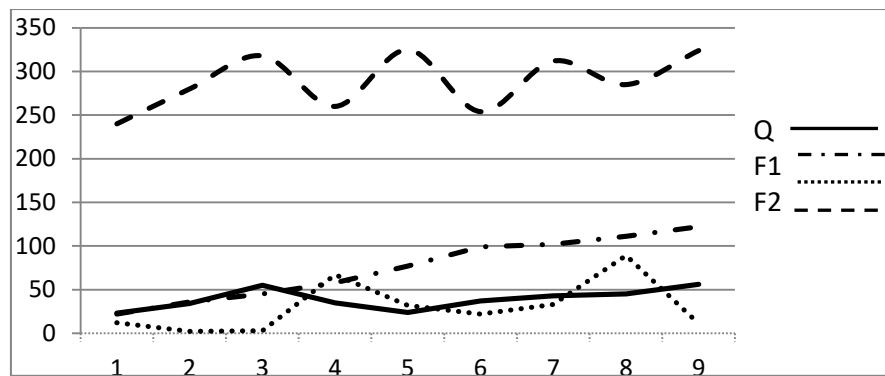


Figure 1

Draw. 1. Dynamics of research factors

Table. 2 represent Q volume of sales and the values of the coefficients of correlation between  $F_1$ ,  $F_2$ ,  $F_3$  factors, Excel has CORREL function. Calculation shows, that  $F_1$  and  $F_3$  are essential factors according Correlation coefficients, and it's possible to remove  $F_2$  factor from discussion, this last one has no influence.

Table 2

Q	$F_1$	$F_2$	$F_3$
23	22	12	240
34	36	2	280
55	45	3	318
35	58	67	260
24	77	32	325
37	99	22	254
43	102	33	312
45	111	89	285
56	122	11	324
	K(Q,F1)	K(Q,F2)	K(Q,F3)
$\sigma$	0.492	-0.044	0.520

### Predicting Impact Factors

In our case, we have dynamics of influencing factors and sales volume during the March-November period and we try to predict the behavior of each factor over the next four months. With the dynamics of the factors, we use a linear functional model for prediction, which is implemented through the FORECAST function of the Excel package (table. 3) [2,3].

**Table 3**

<i>F1</i>	<i>F3</i>
22	240
36	280
45	318
58	260
77	325
99	254
102	312
111	285
122	324
140	316
152	314
165	316
177	328

***Sales Forecasting According To The Forecast Of Impact Factors***

It is impossible to predict sales only according to the sales trend over time, whereas, it will be the prediction of the research factor itself according to this factor. But we also have a trend of influencers, which in its essence, as it appears from the calculated correlation coefficients, determines the behavior of the sales curve. It is this predicted trend that allows us to forecast sales volume according to the values of the factors. This value (Q TREND) is calculated as the arithmetic mean of the predicted values (Q1 TREND, Q3 TREND) according to individual factors (Table 4). (table. 4).

**Table 4**

<i>Q</i>	<i>Q TREND</i>	<i>F1</i>	<i>Q1 TREND</i>	<i>F3</i>	<i>Q3 TREND</i>
23		22		240	
34		36		280	
55		45		318	
35		58		260	
24		77		325	
37		99		254	
43		102		312	
45		111		285	
56		122		324	
	47.0	140	49.7	316	44.3
	45.9	152	48.2	314	43.5
	46.0	165	47.7	316	44.2
	55.9	177	69.8	328	42.0

### Estimation of forecasting errors

We must keep in mind that forecasting takes place under certain assumptions, which affects the quality of the forecast. These are assumptions:

- The factor that does not have a significant impact on the study rate may not be included in the analysis;
- The above methodology uses linear forecasting, while the functional relationship between market indicators may be more complex.
- The predictive value of the study indicator is calculated as the arithmetic mean of the predicted values according to the factors, without taking into account the level of correlation of the relevant factor.

These assumptions certainly reduce the accuracy of the prediction. Moreover, the periods that follow in december of the current year are forecasted not on the basis of time-tested values, but also on the basis of mathematically predicted data. This means that the longer the period of time we try to predict, the less accurate the predicted values can be.

The above limitations indicate the need to calculate forecasting error (risk). In the case of our methodology, this error can be estimated according to the projected values of sales trend (Q TREND) and the projected values of sales for each factor (Q1 TREND and Q3 TREND). In particular, the calculation of the error is based on the calculation of the average value ratio of the average deviations of the forecast values and the sales trend:

$$VAR = ((ABS(QTREND - Q1TREND) + ABS(QTREND - Q3TREND)) / 2) / QTREND.$$

The results of the calculation of the forecast error (VAR) using the MS Excel package are as follows table. 5.

Forecasting errors are taken into account by adjusting the percentage of sales according to its percentage value. In our case, taking into account the 6% forecast error, it is advisable to plan the next volume of sales for December this year:

$$Q = QTREND \times VAR = 47.0 \times 0.94 = 44.18.$$

**Table 5**

<i>Q TREND</i>	<i>F1</i>	<i>Q1 TREND</i>	<i>F3</i>	<i>Q3 TREND</i>	<i>VAR</i>	<i>VAR %</i>
47.0	140	49.7	316	44.3	0.057	6%
45.9	152	48.2	314	43.5	0.051	5%
46.0	165	47.7	316	44.2	0.038	4%
55.9	177	69.8	328	42.0	0.249	25%

### **3. Conclusion**

Factors influencing sales volume were identified based on expert opinions to substantiate the marketing decision of sales volume planning. Subsequently, based on the analysis of correlation coefficients, the factors whose influence on the study index were insignificant were excluded. The values of the influencing factors were predicted and sales volume was forecasted based on them. The forecasting error was estimated and the forecasted sales volume was adjusted according to it.

The discussed methodology can be used for any number of influencing factors. Due to the dynamics of the factors and in order to reduce the prediction errors, other functional prediction models can be used instead of the linear model.

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