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Implementation of special graphical method in the technical financial analysis

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Abstract
Overall state of the economy determines the ability of businesses to achieve the desired return. Essential part of financial management is a qualitative and quantitative economic analysis. Under current conditions, statistical methods are an essential tool in almost all areas of social life. Specific syntheses of intuitive and exact methods are some types of mathematical and statistical models in the area of financial management as a subsystem of the overall system of corporate management. The purpose of this document is to implement the chosen methods of technical financial analysis, to highlight the use of elementary statistical methods and statistical characteristics as well as highlight the application and use of the Z-diagram in financial and economic analysis of the production business undertaking.

Key words time series, diagram, business subject

INTRODUCTION

To predict the future development of the economic or financial variables it is necessary to record their progress with increasing time. If the databank of recorded data has a sufficient amount of records, it is possible to model predictions of future development by using existing technical tools for time series analysis. These include nonlinear models of stationary, non-stationary and seasonal time series, nonlinear models with varying modes, linear and nonlinear volatility and models of multivariate time

series. In practice, businesses can encounter several methods, but the simplest method for quantifying the linear model, or non-linear model which can be linearized, is the method of regression analysis.

1. TIME SERIES

Time series are generally understood long time records related to the most diverse comparison. Time series result from the interaction of multiple effects on an observed variable. It is characterized in a number of ways. By Chlebíková (2009, p. 124), "time series is a sequence of values on certain quantitative phenomenon, which are arranged chronologically in time and which we will mark as y_t, for time points t = 1, 2, ... , n."
(Chajdiak, 2009) describes the analysis of time series into several steps:

- obtain the values of the time series,
- graphically present the evolution of the time series,
- specify, if there are phases in time series,
- specify, if there is a trend in time series,
- specify, if there is seasonality in time series,
- estimate the future development of the time series,
- assess the reliability of future development estimate,
- assess the general nature of the variability in the time series.

Time series is usually broken down into four basic components, which result from interaction of character due to time movement. Some of the most simple time series models:

Additive model $y = T + C + S + N$
Multiplicative model $y = T \times C \times S \times N$
Trend function can take various forms, eg.:
Model of constant change $y = a + (b \times t), \quad t = 1,2,.....n$
Model with proportional growth rate $y = y_0 \times (1 + g)^t$
Model of quadratic trend $y = a + (b \times t) + (c \times t)^2$
Exponential trend model $y = a \times e^{b \times t}$

Trend Component (T) signaling the expansion, stagnation, recession is the result of movement caused by long-term trend of development. Cyclic component (C) is longer than one year. Seasonal fluctuation (S) is characterized by recurrent fluctuations during the year. Random fluctuation (Residual??, N) is a result of random interactions and impacts incurred. The trend is set by graphic equalizing time series, the method of moving averages, trend (regression) function.

2. ANALYSIS OF Z - DIAGRAM

Diagram *Z* as the method used in the analysis of time series is indicated for monitoring the development of the planned items and their comparison with desired trend. Its name resulted from the chart, which is shaped as letter *„Z“*. Even though the diagram is peculiar, it can be applied almost anywhere. According to Wisniewski (1996, p. 73) it can be no doubt that managers, in terms of their goals, wish to monitor the amount of items, for example volume of production, costs, revenues and number of customers and so on. *Z* diagrams can be constructed for daily, weekly, monthly, quarterly, half-yearly and other intervals.

Table 1 Values of Z-diagram

Quarters (2009-2011)	Normal values (conventional)	Cumulative value	Moving totals	Centered moving totals	Moving averages
1	353,92	353,92	-	-	-
2	420,06	773,98	-	-	-
3	416,67	1190,65	1623,79	1687,355	421,8388
4	433,14	1623,79	1750,92	1807,95	451,9875
1	481,05	2104,84	1864,98	1893,55	473,3875
2	534,12	2638,96	1922,12	1995,73	498,9325
3	473,81	3112,77	2069,34	2121,965	530,4913
4	580,36	3693,13	2174,59	2160,975	540,2438
1	586,30	4279,43	2147,36	2156,7	539,175
2	506,89	4786,32	2166,04	2141,565	535,3913
3	492,49	5278,81	2117,09	-	-
4	531,41	5810,22	-	-	-

Source: Own processing

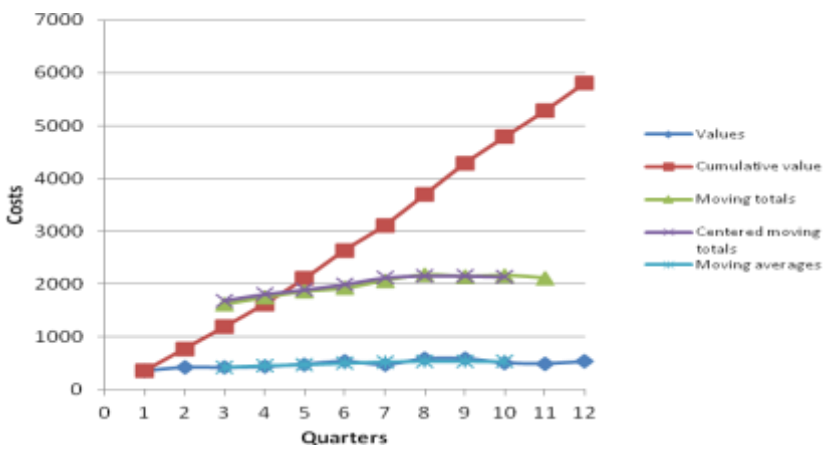

Figure 1 Z diagram of company
Source: Own processing

On the basis of quarterly data for the period 2009-2011 on the cost in tens of thousands of euros, in the analyzed company development trend and seasonal effect are detected. Based on the trend, the costs are predicted for each month next year. For better orientation, the Z diagram is shown in picture 9. During the monitored period, a quadratic model function was determined by regression statistics. Coefficient of determination reached R2 = 88.10%, the correlation coefficient is 77.63% on significance level α = 0.05, p = 0.001, which is less than 0.05. Appropriate model, second-degree polynomial function is designed in the form:

$y = f(t) = 304{,}82 + (50{,}40 \times t) + (-2{,}74 \times t^2)$.

Based on the equation, column 9 is indicated in rows 2, 3, 4, 10 (equalized values). In row 9, deviation s2 is determined as difference of period average and average of equalized values. Based on obtained information, row 10 is set, where expected costs of company are specified in the respective quarters of 2012.

Variables 1a, 1b, 1c represent quarters of 2009 to 2011. Average $\bar{y}$ (473.76) is determined from first quarters of 2009-2011. The amount in the sixth row is determined by the sum of the second to fourth row of the respective column.

Deviation in the seventh row, s1, e.g. (-10,43) = (473,76 – 484,19), is determined as the difference of $\bar{y}$ and $\bar{y}_i$. The second to fourth row in the eighth column is determined as the average of each quarter (1a, 1b, 1c), the following actual data are shown in picture 10. Entry in the fifth row and eighth column (484.19) is the average of the individual averages in quarters of 2009-2011. The values in the eighth row, of third to sixth column are determined by the difference of function $y=f(t)=304{,}82+(50{,}40\times t)+(-2{,}74\times t^2)$ and deviation s_1, e.g. 452,21 = 304,82 + (50,40 × 4) + (-2,74 × 16) – 10,43. The values in the ninth column are the settlement and are shown in picture 10. The values of the time series in the first quarter of 2012 are presented in the tenth row, e.g. 543,54 = 304,82 + (50,40 × 4) + (-2,74 × 16) – 80,90.

Table 2 Regression Statistics

Multiple R	0,881093492
R Square	0,776325742
Adjusted R Square	0,726620351
Standard Error	36,41197834
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	41415,13	20707,57	15,61854216	0,001183783
Residual	9	11932,49	1325,832		
Total	11	53347,62			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	304,8204545	37,63282895	8,099855	2,00436E-05	219,689081
X Variable 1	50,40186314	13,30987977	3,786801	0,004303768	20,29282328
X Variable 2	-2,736878122	0,996684877	-2,74598	0,022625068	-4,991535956

Source: Own processing MS Excel

Tab. 3 Values of time series

	1	2	3	4	5	6	7	8	9
1		sign	months				Σ	average($\bar{y}_i$)	y = f (t)
2	2009/1a	1	353,92	420,06	416,67	433,14	1623,79	405,95	352,4854396
3	2010/1b	2	481,05	534,12	473,81	580,36	2069,34	517,34	394,6766683
4	2011/1c	3	586,3	506,89	492,49	531,41	2117,09	529,27	431,3941409
5	average	$\bar{y}$	473,76	487,02	460,99	514,97	1936,74	484,19	392,85
6	sum	Σ	1421,27	1461,07	1382,97	1544,91	5810,22	1452,56	1178,56
7	$\bar{y} - \bar{y}_i$	s_1	-10,43	2,84	-23,20	30,79	-	-	-
8	2012	4	452,21	465,48	439,44	493,42	-	-	462,64
9	$\bar{y}$- settlement	s_2	80,90	94,17	68,14	122,12	-	-	365,33
10	**2012**	**4**	**543,54**	**556,81**	**530,78**	**584,76**	**2215,88**	-	

Source: own processing

Tab. 4 Values settlement

Term			Months		Sum
1	433,39	446,66	420,62	474,60	1775,27
2	475,58	488,85	462,81	516,79	1944,04
3	512,30	525,57	499,53	553,51	2090,91
4	543,54	556,81	530,78	584,76	2215,88

Source: own processing

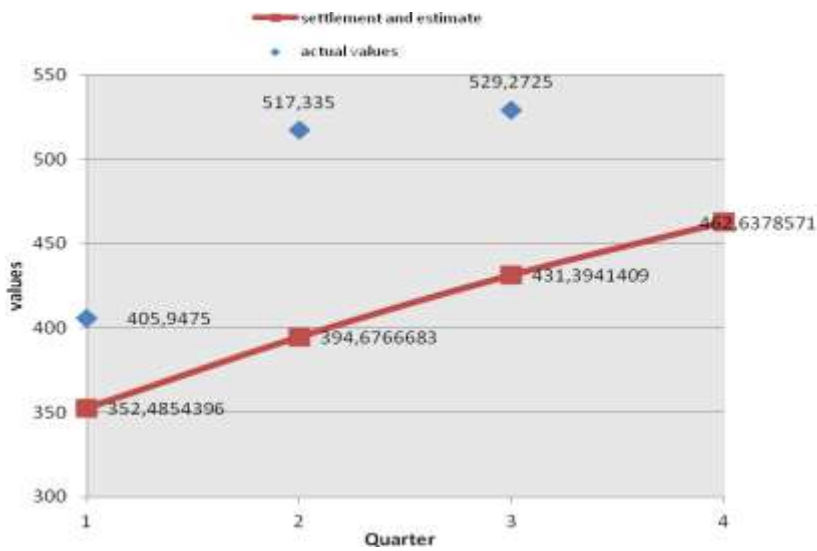

Figure 2 Settlement and estimate of company production

Source: Own processing

CONCLUSION

In this document we have used the basic statistical characteristics and methods that are used in several areas of the business entity. The expert, accountant or financial manager implements the Z diagram into the company for explanatory capabilities. Produced results, findings and conclusions of the technical financial analysis help in generating development concepts, options strategies as well as the planning of all financial aspects in the short or long term. Use of statistical methods by financial managers in practice requires knowledge and understanding of mathematical statistics, just as mutual logical connection of statistics and economy.

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