USE OF STATISTICAL METHODS FOR ESTIMATING THE NEED FOR TEMPORARY STAFF

HANA STOJANOVÁ, PAVEL TOMŠÍK, VERONIKA BLAŠKOVÁ

Abstract
This paper examines the suitability of quantitative statistical methods and their application in human resources planning in the sugar industry. Expert managerial estimates tend to be applied when defining the number of needed employees in many manufacturing (food-processing) businesses. At the same time, statistical methods are underused due to their time-, processing- and information-demanding nature. This paper predicts the future need of temporary workers in the company Moravskoslezské cukrovary, a.s. It applies statistical methods of graphic analysis, trend analysis and regression analysis for the aforementioned company between the years of 1988 to 2015. Yearly company reports from 1993 to 2015 were used as the data source for the prediction of needed workers for Moravskoslezské cukrovary, a.s. Other significant data was extracted from the personal information system of the company (years from 1988 to 1993). The company's five-year plan for sugar beet processing was applied to find out the planned amount of future quantity. The 5 % level of significance was chosen in order to test hypotheses through regression analysis. The statistical program Gretl was applied to run the regression analysis, test statistical assumptions and determine predictions. The results are compared and their pros and cons are demonstrated at the end of this paper.

Key words: optimization, workforce planning, scheduling staff demand, human resource planning.

Classification JEL: M12 – Personnel Management.

1. Introduction

There are many methods to predict the number of needed workers. Managerial estimates are preferred when defining the number of needed employees in manufacturing (food-processing) businesses to statistical methods (as they tend to be demanding in time, processing and information sources). However, these methods can exercise excellent results as long as good information sources are available in the long term.

This paper examines the possibility to apply statistical methods in order to predict the need of workers in the sugar industry segment. There are five companies engaged in sugar production (through seven sugar factories) in the Czech Republic. There are two of those located in Bohemia and five ones in Moravia. The companies are as follows: Tereos TTD, a.s., Moravskoslezské cukrovary, a.s., Hanácká potravinářská společnost s.r.o., Litovelská cukrovarna, a.s., Cukrovar Vrbátky a.s.

The company Moravskoslezské cukrovary, a.s. was chosen out of those five companies as it was best suited for the requirements of the statistical methods. Moravskoslezské cukrovary, a.s. achieves the second biggest production volume (93,973 tons yearly) in the Czech Republic and the data availability covers all the years from 1988 till 2015 *(Sugar, 2015; Froněk, 2015; Reinberger, 2014).* The future need for company workers was predicted with the help of statistical methods, namely graphic analysis, methods based upon trend analysis and regression analysis. The results are mutually compared and their pros and cons are discussed at the end of this paper.

2. Human resources planning

Strategic prognosis is a foundation for planning, it should come from recognizing mutual relations between all factors with impact on employees' needs and possibilities to meet them *(Arpaia et al., 2010; Fombrun, Tichy & Devanna, 1984).* Quality and feasibility of such prediction is based upon quality of the current development analysis *(Armstrong, 2007;*

Bernardin & Russell, 1993). Prognoses are basic means to set up a plan, which is processes-focused-decision-making about the number of additional workers within a specific period of time.

Headcount planning (also known as workforce planning) is closely connected with planning a budget while reducing company's costs such as undesired fluctuation of employees, low production quality, harming company's reputation or putting a stop to investment projects. *(Dormann & Zapf, 2001; Cascio, 2005; Lawler, 2005; Toth, 2010; Boeri & Brücker, 2011).* Many companies conduct detailed periodical studies during HR audits. These provide complete informational source about their employees, work positions, salary and wage tariffs, age profile, duration of work contracts (*Parry & Tyson, 2011; Boella & Goss-Turner, 2013; Legnerová, 2010).* There are procedures to be followed in most of the companies when it comes to workforce planning, as function of HRM follows wider trends in organizations, strategies, and management philosophies rather than leading them *(Van Buren, Greenwood & Sheehan, 2011; Ferris et al., 1999; Mendenhall et al., 2003).* They include various internal documents such as ISO certifications, internal directives, established contracts between the company and union representatives. It has been revealed that when it came to Moravskoslezské cukrovary, a.s. there was no defined procedure for employee planning in any of those documents. HR planning is very close to the method of managerial estimations when management of a company formulates its five-year plan. HR planning is both time and cost consuming, therefore it brings only a little benefit to small-sized companies.

Methods for estimating staffing

Despite the fact that both quantitative and intuitive methods are considered valid when it comes to scientific research, it is necessary to mention that the intuitive methods (in spite of being based on qualitative analyses and information) are still subjective *(Tunc & Haddock, 1994; Rothwell & Kazanas, 2003).* The quantitative methods are mostly criticized for their gross simplifications of business reality or omitting significant variables in the created models *(Koubek, 2007; Plašil & Vlach, 2007).* It is, more than obvious that methods that are less complicated and time and money less consuming are preferable *(Stewart, et al., 1994; Toth, 2010; Urban, 2013; Tomšíková, 2014)*. Statistical methods (applying trend extrapolation and regression analysis) for estimating the number of needed workers are based upon the relationship between the dependent variable (represented by the staff need) and the independent variables (performance indicators). Three most frequently described statistical prediction methods are as follows: graphic analysis, trend analysis and regression analysis *(Urban, 2013; Hindls, 2007; Gujarati, 1992; Hušek, 1999; Cipra, 2013, Bowerman & O'Connell, 1997; Hančlová & Tvrdý, 2003; Arlt & Arltová, 2007).* These were taken advantage of when conducting the research.

3. Methods and sources

Prerequisites for statistical methods application (graphic analysis, trend analysis and regression analysis) are: sufficient information base and a medium-sized or large enterprise with a long enough history.

There are five companies engaged in sugar production (through seven sugar factories) in the Czech Republic. There are two of those located in Bohemia and five ones in Moravia. The companies are as follows: Tereos TTD, a.s., Moravskoslezské cukrovary, a.s., Hanácká potravinářská společnost s.r.o., Litovelská cukrovarna, a.s., Cukrovar Vrbátky a.s. The company Moravskoslezské cukrovary, a.s. was chosen out of those five companies as it was best suited for the requirements of the statistical methods. Moravskoslezské cukrovary, a.s. achieves the second biggest production volume (93,973 tons yearly) in the Czech Republic and

the data availability covers all the years from 1988 till 2015 *(Kmenta, 1990; Reinberger, 2014; Froněk, 2015).*

The number of temporary workers (part-time workers) was chosen to be predicted through statistical methods after having examined the HR conditions of the company (based upon internal HR statistics). Yearly reports from 1993 till 2015 were used as data sources. Other significant data was extracted from the personal information system of the company (years from 1988 to 1993). The company's five-year plan for sugar beet processing was applied to find out the planned amount of future quantity. The number of employees was predicted with statistical methods for the year 2016.

The statistical program Gretl was used for regression analysis, to test statistical assumptions and set predictions. Time series of followed indicators from 1988 to 2015 were used (based on regression analysis) to predict the future need of (part-time) workers. There were 27 observations. 5 % level of significance was chosen in order to test the hypotheses. The prediction results are demonstrated below in the following Tables and graphs.

3.1. Estimating staffing in Moravskoslezské cukrovary, a.s.

Changes to the number of part-time workers and amounts of processed sugar beet from 1988 to 2015 are shown in Figure 1. It can be noted that there is a correlation between the two sets of data and a small upward trend. In calculating the correlation between the number of temporary workers employed and the amount of treated sugar beets is 0.88 with a p-value less than 0.001.Extremes were observed in the company when it comes to the sugar beet processing (almost 840,000 t) and the number of part-time workers (171) in 2015.

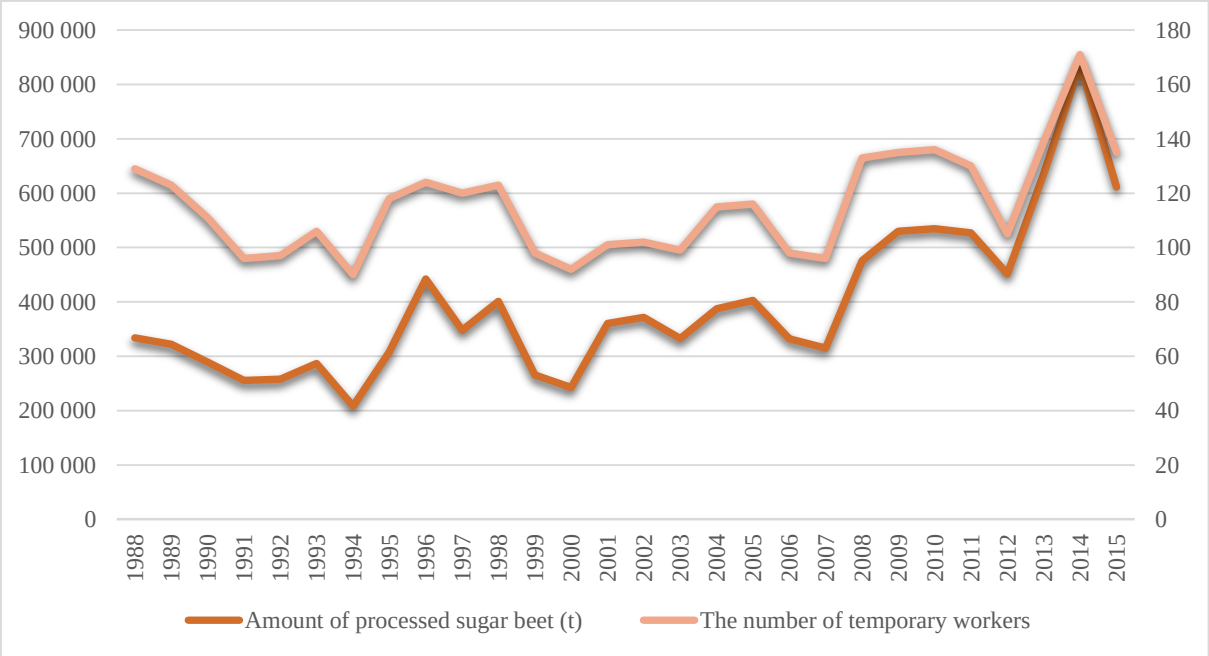

Figure 1. Employed temporary workers and processing sugar beet in the years 1988–2015 (own processing based on internal company documents)

Despite the upward trend of the processed amount of sugar beet, there is a lot of fluctuation between the individual years. That is why the use of simpler statistical methods such as graphic analysis or trend analysis can be unsuitable for setting predictions as more stable development is required.

3.2. Estimating staffing with graphic analysis

It is possible to estimate the needed number of part-time workers (based upon Figure 2) to process the planned amount of sugar beet. The planned amount 670,000 t processed sugar beet in 2016 means that the company will need approximately 159 part-time workers to meet the plan. If we suggest, instead of a point estimation the estimate based on 95% confidence interval, then the number of temporary workers should be in the range from 141 to 157.

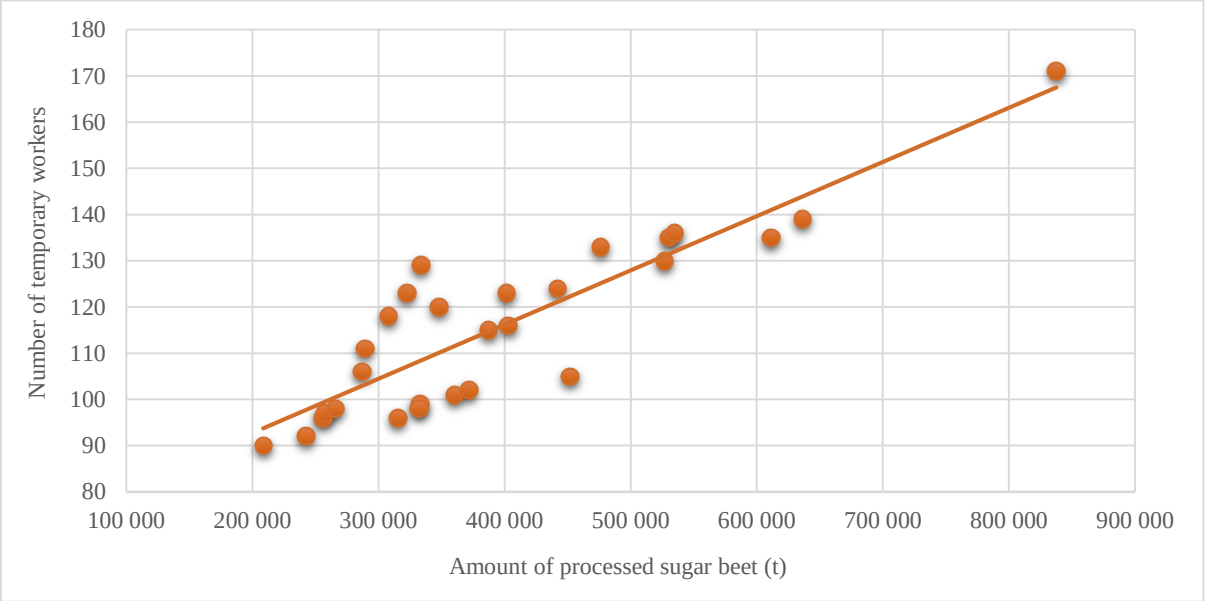

Figure 2. Graphical representation of the relationship between the number of temporary workers and the amount of sugar beet processing (own processing based on internal company documents)

3.3. Estimating Staffing with Trend Analysis

First, it is necessary to find the factor that is in relation to the number of predicted workers (based upon the trend analysis). In our case scenario, there is an obvious connection between the number of part-time workers in the company and the amount of sugar beet being processed. This productivity indicator is later used for calculations of the fixed-base index and chain-index numbers in all the following years from 1988 to 2015. The Table 1 demonstrates the results of these calculations.

The fixed-base index and chain-index numbers and their development is shown in the line Figure 3. The year 1988 was chosen as the base year for the fixed-base index numbers. It is obvious that the work productivity (the amount of processed sugar beet per worker) has increased since 1988 as the development of these index numbers suggests. However, this growth has not been gradual. There was a steep increase in work productivity in 2007 (caused by increased amount of processed sugar beet). There was another sharp increase in 2012 when the work productivity rose by 66.42 % when compared to the productivity in 1988. Another substantial increase happened in 2014 when the productivity raised by 89.40 % when compared to the productivity in 1988. Chain-index numbers mean year-on-year growth or decline in work productivity. It is obvious that they exercise higher stability (except for 1994 -2001) when compared to the fixed-base index numbers as suggested by the graph. There was an average 6.4 % year-on-year growth in productivity from 2012 to 2015. The index stability of the average chain-index numbers is 1.064 from 2012 to 2014, therefore these were used for our prediction purposes. The last chain-index 1.0699 from 2014 was applied to predict the number of needed

part-time workers as there were no planned investment projects for this period (that would lead to decrease in demand for the workers).

Table 1. Estimating the needs of temporary workers in the company Moravskoslezské cukrovary – results of the analysis of development trends (own processing, internal documents, plan beet processing)

Year	Amount of processed sugar beet (t)	The number of temporary workers	Processed amount to a temporary worker		
			(t)	Index	
				Basic	Chain
Current development					
1988	333 631	129	2 586	1.000	×
1989	322 317	123	2 620	1.0132	1.0132
1990	289 210	111	2 605	1.0074	0.9943
1991	255 766	96	2 664	1.0301	1.0225
1992	257 751	97	2 657	1.0274	0.9974
1993	286 851	106	2 706	1.0463	1.0184
1994	208 569	90	2 317	0.896	0.8564
1995	307 790	118	2 608	1.0085	1.1256
1996	442 034	124	3 565	1.3783	1.3667
1997	348 057	120	2 900	1.1215	0.8136
1998	401 283	123	3 262	1.2614	1.1248
1999	265 818	98	2 712	1.0488	0.8314
2000	242 468	92	2 636	1.0190	0.9716
2001	360 167	101	3 566	1.3788	1.3531
2002	371 530	102	3 642	1.4084	1.0214
2003	332 694	99	3 361	1.2994	0.9226
2004	387 444	115	3 369	1.3027	1.0025
2005	402 858	116	3 473	1.3428	1.0308
2006	332 213	98	3 390	1.3107	0.9761
2007	315 271	96	3 284	1.2698	0.9688
2008	475 994	133	3 579	1.3838	1.0898
2009	530 209	135	3 927	1.5186	1.0974
2010	534 632	136	3 931	1.5200	1.0009
2011	526 823	130	4 052	1.5669	1.0309
2012	451 926	105	4 304	1.6642	1.0621
2013	636 402	139	4 578	1.7703	1.0637
2014	837 609	171	4 898	1.8940	1.0699
2015	611 200	135	4 527	1.7505	0.9243
Prediction					
2016	**670 000**	**120**	**5 607**	×	**1,0640**

The number of needed part-time workers in 2016 was calculated as follows:
5 200 x 1.064 = 5,532 t
670,000/5,532 = 121 part-time workers

The number of needed part-time workers predicted with trend analysis for the year 2016 was 121.

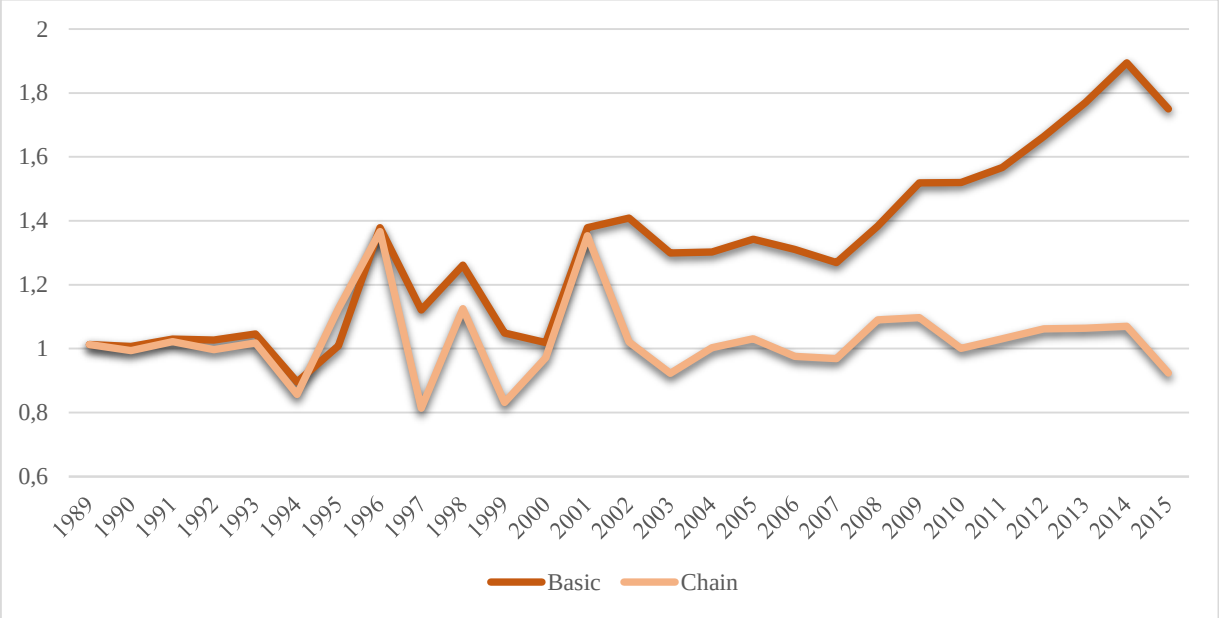

Figure 3. Development of basic and chain indices in the years 1988–2015 (own processing)

4.3. Estimating Staffing with Regression Analysis

The number of temporary workers changes throughout the years depending on the company's planned amount of processed sugar beet. This mutual correlation was set as the only statistical assumption for conducting trend analysis. There would be no way of applying the trend analysis without such correlation.

Time series of followed indicators from 1988 to 2015 were used (based on regression analysis) to predict the future need of (part-time) workers. There were 27 observations. The number of part-time workers of Moravskoslezské cukrovary, a.s., is the dependent variable in the analysis. It is marked as the 'Part-time Workers' in the model. The impact on the dependent variable was taken into account when choosing the independent variables (also known as the explanatory variables or regressors). These variables were selected from the company's planned indicators.

The selected **regressors** are as follows:

X_1 – Processed amount of sugar beet in tons *(Processing);*

X_2 – Processed amount of sugar in tons *(Production);*

X_3 – Sugar beet sales in tons *(Sales);*

X_4 – Revenues from own products and services in thousands of CZK *(Revenues);*

X_5 – Value added accounting in thousands of CZK *(VAA);*

X_6 – Earnings before interest and taxes in thousands of CZK *(EBIT).*

The sign of the 'processing regressor' is expected to be a plus as when the number of part-time workers increases, the amount of processed sugar beet increases, too. A plus sign is expected to appear along with the 'production regressor' as well. While the number of temporary workers raises, the amount of produced sugar is raised, too. The progress of this regressor's time series is very similar to the progress of the 'processing regressor's' time series. A strong correlation can be expected between these two variables which is not desired in the final regression model. A plus sign is also to be anticipated to go with sugar beet sales ('sales'). The time series of this variable looks almost identical to the 'processing' and 'production' time series. Again, a strong correlation can be expected. It is likely that the company will hire more temporary workers as its revenues increase. That is why the parameter revenues from own

products and services (‘revenues’) should have a plus sign. The value added accounting variable (‘VAA’) expresses the extra value in cash which was added to the already bought input. ‘VAA’ is the sum of sales margins, revenues from own products and services, changes in inventory of own production and activation, at the same time production costs are deduced (raw materials, energy, services), *(Business Center, 2015).* A strong correlation can be anticipated with the ‘revenues regressor’ as the ‘VAA’ regressor comprises the revenues from the company’s own products and services. EBIT is the sum of the company’s earnings from operational, financial and extraordinary business ventures. EBIT was chosen as it eliminates the impact of tax tariffs and their frequent changes on the company’s operations throughout the years. EBIT comprises both revenues and costs within itself and so the labour costs are included, too. The costs increase and EBIT decreases with the increasing number of workers, given that the other conditions remain the same. A minus sign is, therefore, expected to go along with this variable. A strong correlation between the ‘revenues’ and ‘VAA’ variables is also to be anticipated. Explanatory variables were selected in the previous step.

Table 2. The correlation matrix – the company Moravskoslezské cukrovary (own study)

Variable	Processing	Production	Sale	Revenue	VAA	EBIT
Processing	1.000000	**0.955951**	**0.759122**	**0.718405**	**0.567954**	**0.556905**
Production		1.000000	**0.863907**	**0.857608**	**0.729770**	**0.686327**
Sale			1.000000	**0.968100**	**0.904440**	**0.830116**
Revenue				1.000000	**0.929938**	**0.841056**
VAA					1.000000	**0.893269**
EBIT						1.000000

Explanatory variables and their correlation coefficients are depicted in Table 2. Red numbers represent on the basis of a test the dependence. If the values are moreover greater than 0.8, so these ‘pairs’ should not be put together in the model based upon least-squares method. Stationarity of the time series was examined with the unit root tests ADF and KPSS. The variable *Part-time workers* was tested with the ADF test, its null hypothesis was non-stationarity. The calculated p-value was greater than the chosen 5% level of significance, therefore the null hypothesis of non-stationarity cannot be denied. Afterwards, the KPSS test was conducted testing the null hypothesis of stationarity. Its test score was 0.1595 which is a greater number than the critical value 0.149. The null hypothesis was denied, the time series was not proved stationary. Subsequently, transformation of the time series through differencing (the first difference) was implemented. The ‘Processing’ time series were worked with the same way, the aforementioned tests showed the time series was rendered not stationary. Similarly, other times series were examined with the unit root tests, some also went through the transformation and the first differencing. All variables were made stationary, therefore the trend portion of the time series was done away with. One observation was lost at the same time. Time series included 26 observations at this point. A basic model was constructed with the help of the least-squares method. Variables that were put through differencing were marked with a letter d and underscore as follows d_.

It is obvious that there were collinear variables included in the model and that almost all explanatory variables were not statistically significant (see data in Table 3). Therefore, it was necessary to adjust the model. First, the regressor with the greatest p-value (d_Revenues) was removed. Afterwards, the variable d_Production was discarded and also others were gradually eliminated until only the statistically significant explanatory variables were included in the model.

The final model comprises only one explanatory variable (see Table 4). A plus sign that goes with this variable (d_Processing) was already anticipated before. The value of the corrected determination coefficient was 0.845, therefore the resulting model explains 85.11% from the observed data.

Table 3. The values of the basic model – the company Moravskoslezské cukrovary (own study)

Variable	Coefficient	Standard error	t-share	p-value
const	−1.74656	1.40614	−1.2421	0.2286
d-processing	0.00012	3.52E-05	3.4233	0.0027
d-production	0.00036	0.00031	1.1679	0.2566
d-sale	−0.00012	9.08E-05	−1.3479	0.1928
d-revenues	0.00001	1.00E-05	1.3561	0.1902
d_VAA	−0.00003	1.59E-05	−1.7578	0.0941
d_EBIT	3.64E-06	1.28E-05	0.2840	0.7793

Further on, the statistical significance of the entire model was examined using the F- test. The null hypothesis was set as a statistical insignificance of the model. P-value of the test was 7.76 e^{-12} which is less than the selected 5 % significance level. The null hypothesis was rejected, the model was proved as statistically significant, see Table 4.

Table 4. The values of the basic model - the company Moravskoslezské cukrovary (own study)

Variable	Coefficient	Standard error	t-share	p-value
const	−1.52291	1.37156	−1.1104	0.2774
d-processing	0.00017	1.42E-05	11.9569	< 0.0001

The resulting model can be mathematically represented by an equation $\widehat{Y}_i = -1{,}5229 + 0{,}00017\, X_i$ where Y is the first difference of the dependent variable – number of temporary workers and X is the first difference of the independent variable – processed amount of sugar beet in tons. Thus, if there is an increasing the difference of the processed amount of sugar beet, there should be an increase in the increase the number of part-time workers by 0.00017.

The resulting model meets the assumptions of a classical linear regression model. The first prerequisite is a zero value of the error term. It was found that the mean value of the model's residues was zero, therefore the assumption was met. The second assumption was that the variance of the error was constant. As the residue graph (Figure 4.) showed, constant variance could be confirmed, the values oscillated around zero. This observation had to be verified by testing the residual homoscedasticity with White and Breusch-Pagan test. The null hypothesis for both tests was homoscedasticity. P-value was for both these tests higher than the 0.05 and the null hypothesis of homoscedasticity was not rejected. The second assumption was thus met.

The third prerequisite is the absence of serial correlation (also autocorrelation or cross-correlation) in the error term. Autocorrelation was tested by residual correlogram and Durbin-Watson test with the null hypothesis of the absence of serial correlation. The residual correlogram showed that there was a first order correlation in the error term. This was further examined by Durbin – Watson's test score of 2.7306. This value does not fall in between the values from 1.46 to 2.54 which indicates autocorrelation.

It is further assumed that the independent variables are not correlated with the error term. It has been found that the explanatory variable was not correlated with the error term according

to the correlation matrix. The fourth assumption was thus met. The fifth condition is the absence of multicollinearity (also collinearity) of explanatory variables. However, multicollinearity cannot occur as there is only one explanatory variable. This assumption is therefore met.

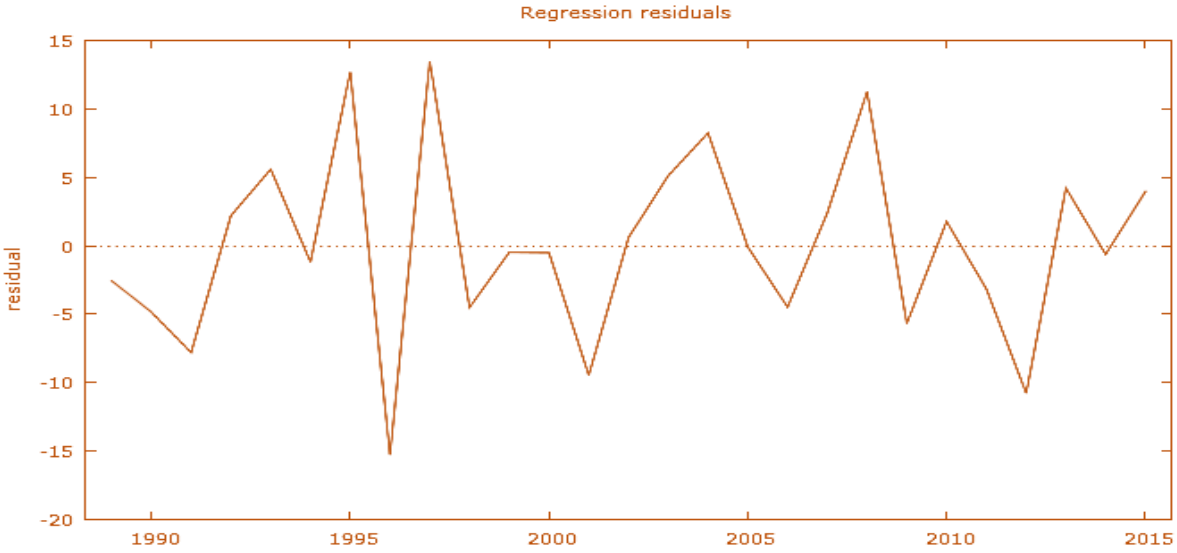

Figure 4. Graf of residues – company Moravskoslezské cukrovary (own processing)

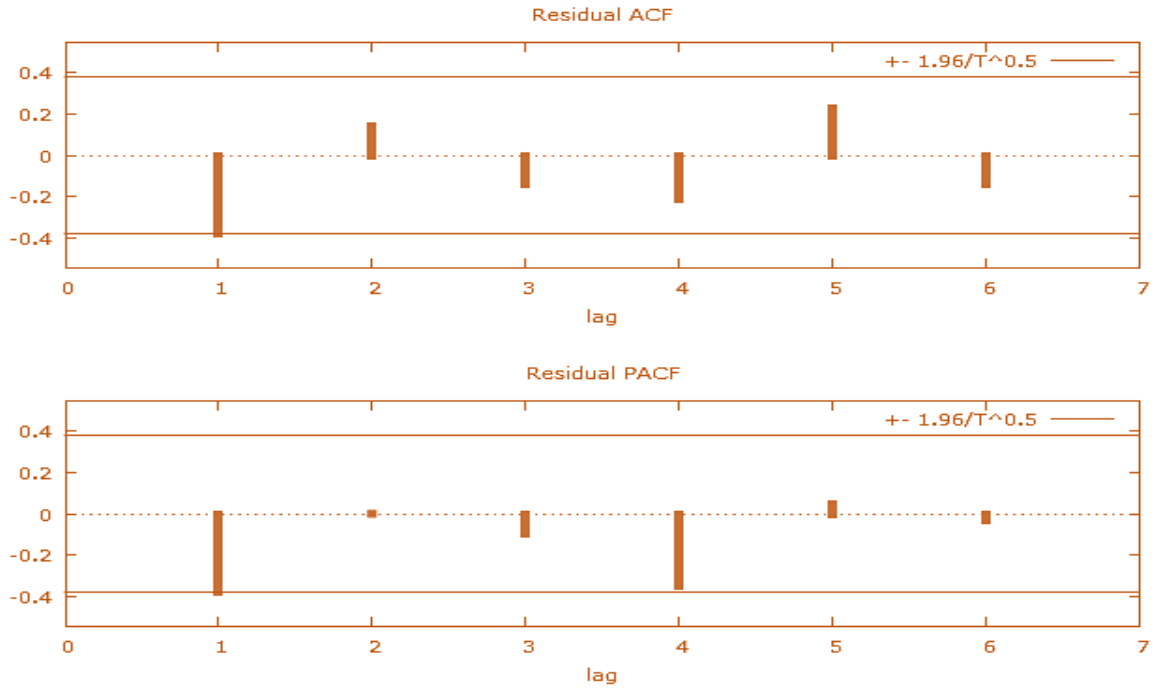

Figure 5. The residual correlogram – company Moravskoslezské cukrovary (own processing)

The sixth assumption is that the model is linear in its coefficients and correctly specified with an additive error term. Corrected coefficient of determination is 0.818214, the individual regression coefficients are statistically significant according to the t-test. Also, the F-test confirmed the conclusiveness of the model. The model is therefore correctly specified. The seventh assumption is normality of the error term. It is tested visually by depicting a histogram, Figure 6. Further on, three normality tests were put to use: Chi-square test, Shapiro-Wilk test

and Jarque-Bera test. The null hypothesis supposes normality error term in all three tests. Normal distribution can be assumed based upon a drafted histogram which was confirmed by the Chi-square test with the p-value of 0.7887. Shapiro-Wilk and Jarque-Bera test also indicate normality error term. As a conclusion, all the classical linear model assumptions were met with the only exception of the third assumption. The first order autocorrelation was discovered, however, all the estimations remained unbiased and consistent.

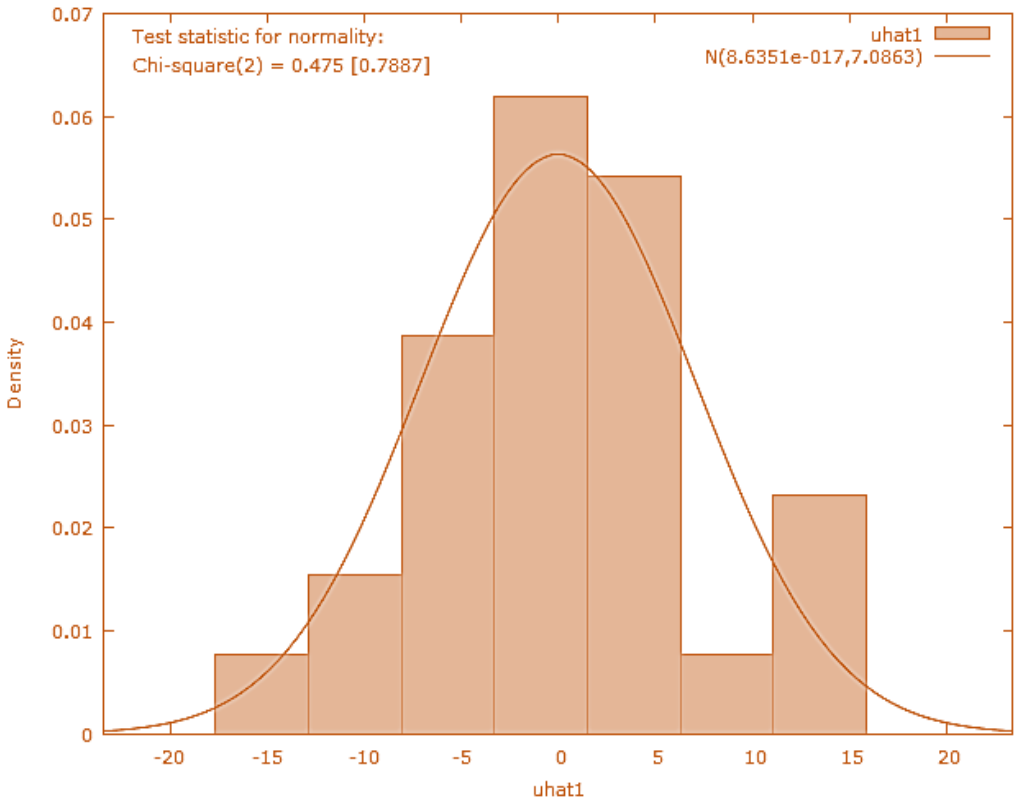

Figure 6. Histogram – company Moravskoslezské cukrovary. The test statistic for normality Chi-square Chi-square= 0.475 [0.7887], (own processing)

4.4. Predictions

The year 2016 forecast can be formulated based upon the final regression model. Planned amounts of processed sugar beet were used for the prediction. Values of the dependent variable d_parti-time workers are predicted. These estimated values can differ from the real ones. That is why there are 95 % confidence intervals marked in green on the Figure 7.

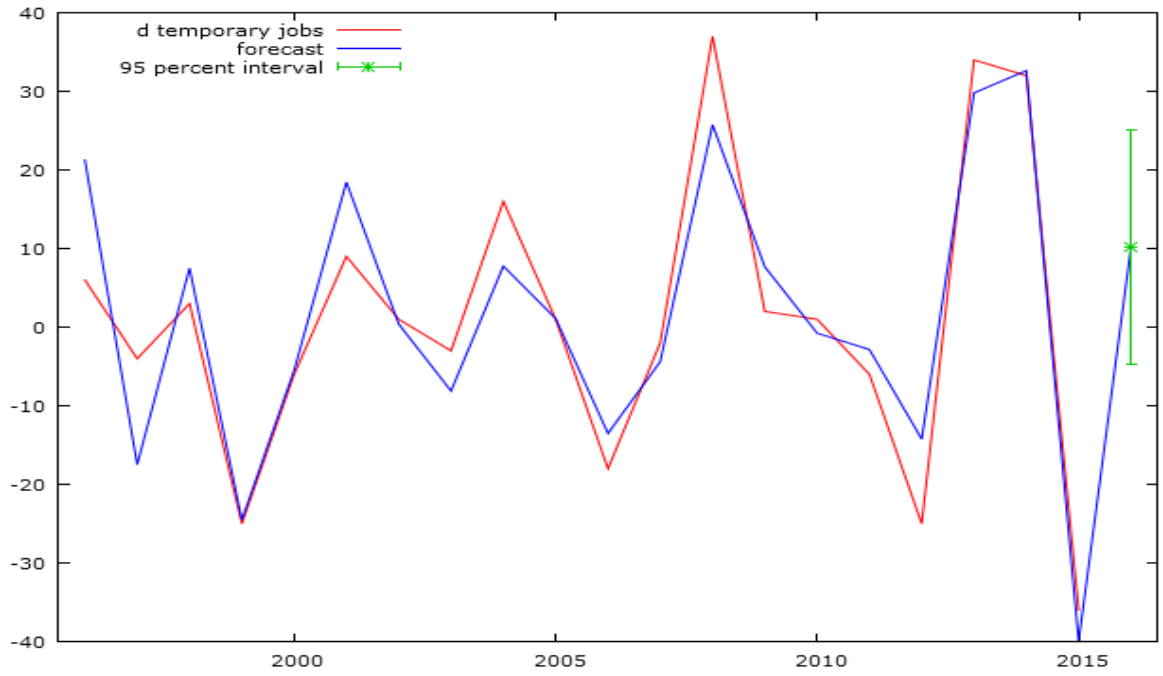

Figure 7. Forecast of future values of the dependent variable d_temporary jobs (own processing)

There are predictions for the dependent variable *d_part-time workers* in the Figure 7 and the final numbers of part-time workers (instead of differences) in Table 5 for the year 2016. Their numbers were predicted to be as follows: 145 workers in 2016.

4.5. Results and Evaluation

The number of needed part-time workers in the company Moravskoslezské cukrovary was predicted with the help of graphic analysis, trend analysis and regression analysis. The results are depicted in Table 5.

Table 5. Estimates of the number of temporary workers in the company Moravskoslezské cukrovary for year 2016 according to the used methods (own study)

Statistical method	**Number of employees in 2016**
Graphical analysis	149
Analysis of development trends	121
Regression analysis	145

The processed amount of sugar beet is the only variable that is used for predicting the future need for part-time workers. The number of predicted workers differs depending on what particular method was put to use (see Table 6). The smallest difference in predicted numbers is between the graphic and regression analysis. The difference is 6 temporary workers in the 2016 prediction, respectively. The trend analysis and its results are not suitable for the prediction in Moravskoslezské cukrovary as stable development in data is required. However, the time series in question do not exercise such stability. Therefore, the regression analysis method comes out as the most fitting one for predictions about the future workforce needs.

The Processing of predictions for year 2017 and the subsequent years will be affected by the currently planned new form of agreement on the EU Common Agricultural Policy. The agreement includes also a new form of the Common Market Organisation for sugar for the period 2015-2020, when the current form of the oldest agricultural market organizations will

terminate in the last month of the economic year 2016/17 (Evolution of the sugar imports in the European Union, 2013). The basic elements of the system as quotas and minimum beet price, then expire without compensation *(Froněk, 2015).*

5. Discussion

Sufficient information sources and long enough history of a company is one of the prerequisites to apply statistical methods successfully and achieve reliable results. It is important that the company in question be a well-established enterprise, not a newly founded business, so selected indicators well in the past could be examined *(Szabo & Grznár, 2015).* This prerequisity can be difficult to set, as HRM has changed its focus in last several decades, most recently from making the organization lean and efficient through business process reengineering to seeking to add value to the organization through strategic HRM *(Van Buren, Greenwood & Sheehan, 2011; Mendenhall et al., 2003; Ferris et al., 1999; Wright & Snell, 1998; Wilmott, 1994).*

The advantage of the regression analysis (when compared to the graphic and trend analysis) is mainly the fact that more factors (variables) having potential impact on the number of future workers can be included in the model. This method is closer to real conditions as the number of employees is never determined by only one factor (variable) in the real business environment. However, the disadvantage of this method is that it works under the assumption of ceteris paribus *(Gambardella, Panico & Valentini, 2015).* That means a certain degree of necessary simplification, unlike in real life.

Plašil and Vlach consider application of graphs while analysing data as fitting when looking for significant characteristics of data and relations between factors *(Burns & Carter, 1985; Techawiboonwong & Yenradee, 2003; Plašil & Vlach, 2007).* Graphic analysis is relatively simple, quick-to-do and does not require a lot of expertise in statistics and mathematic relations, especially when compared to the regression analysis method. It is recommended this method be used in combination with other methods, too *(Anderson 2001; Cappelli, 2009; Klimoski et al., 2014).* It is not advised to rely solely on graphic analysis for predicting the future need of workers.

6. Conclusion

Graphic analysis, trend analysis and regression analysis were applied to estimate the number of needed workers. The prediction was implemented for future period of 2016. The number of needed workers for Moravskoslezské cukrovary was predicted during the time of campaigns. The followed factors (variables) did not have a stable development throughout the years as the company does its business in the agricultural industry. The predicted results differed tremendously depending on whether they were delivered through the graphic or trend analysis. The application of trend analysis is not advised for the company Moravskoslezské cukrovary as stable development of data (the known variables vs the predicted one) is required. There is no such development at the company as of yet. The smallest difference in predicted numbers of workers occurred between the results from the graphic and regression analysis. The regression analysis proved to be the most fitting one for predictions in the company Moravskoslezské cukrovary, a.s.

In the context of the above mentioned new form of the Common Market Organisation for sugar for the period 2015–2020, valid from 2017, when the hitherto used elements of the system as quotas and minimum beet price, will expire, the valid and demonstrable prediction of the number of needed workers cannot be performed.

We can, however, be based on the following recognition. Sugar is the most regulated agricultural commodity in the European Union. Abolition of quotas is scheduled for 2017, along with the revision of tariffs that raise the price of sugar on the EU's borders imports from outside

Europe. Currently, the share of active duty on the price of imported sugar to the EU is about 50%.

Based on studies *(Evolution of the sugar imports, 2013; Sugar, 2015; Sugar market presentations, statistics and prices 2016)* we can assume that the worldwide gradual rise in agricultural commodity prices will continue regardless of the amount of sugar quotas in the EU. Sugar tariff liberalization under the WTO is closely related to the technical use of crops, sources of sugar production. If this form of exploitation will continue, the price and thus the labour force demanding processing of sugar will increase more than it would be in the case for food use only.

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