

# **CORPORATE BANKRUPTCIES: CURRENT DEVELOPMENT IN THE CZECH REPUBLIC**

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## **Abstract**

This paper deals with the analysis of development of corporate bankruptcies in the Czech Republic since 2008. Corporate bankruptcies are an inherent element of the market economy. In the Czech Republic (CR) in 2006 was published a law no. 182/2006 Coll., On Bankruptcy and Its Resolution (Insolvency Act), which came into effect from January 1st, 2008. This law came into effect just at a time when the new financial crisis started getting stronger. This crisis has affected the development of corporate bankruptcies not only in the CR but also in other countries. Corporate Bankruptcies are the necessary selection mechanism in the world of business and have an important rationalizing function – they rid the market of entities that are unable to meet the appropriate efficiency requirements. The aim of this paper is to analyse the development of corporate bankruptcies – the comparison between the development of corporate insolvency proposals and corporate bankruptcies (using total and monthly data) in the CR since 2008 – in the period 2008 to 2019 with a forecast for 2020. The software STATGRAPHICS Centurion XVI will be used for this analysis. The data for this analysis has been taken over from the company Creditreform, s.r.o. CR. The results of this research are useful for prediction of corporate bankruptcies and corporate insolvency proposals development.

**Key words:** corporate insolvency proposals, corporate bankruptcies, development, dependence analysis, forecast

**JEL Code:** G31, G33

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## **Introduction**

From January 1st, 2008 the law no. 182/2006 Coll., On Bankruptcy and Its Resolution (Insolvency Act), which was published in 2006 came into effect. This law regulates not only bankruptcies of companies, but also personal bankruptcies. In the Czech Republic Bokšová and Randáková (2015), Bokšová et al (2014) and Hospodka et al (2015) published analysis results of personal bankruptcies in recent years. In this view bankruptcy models (Čámská, 2012) and basic characteristics of enterprises, which are in insolvency (Čámská, 2013), are very important. The analysis of the business property's changing trends of the entity should be one of the most

important tasks of the financial analysis for the assessment of the financial situation of the enterprise (Pakšiová, 2017). Detailed analysis of corporate insolvency during the crisis years (with data analysis from 2008 to 2013) were published by Kislingerová and Schoenfeld (2014), Benetti (2016 a, 2016 b and 2017) and forecasts of corporate insolvencies for the period 2013–2017 were published in 2013 by Kislingerová (2013), Benetti (2017, 2018) and Tatek (2018). However, no one has engaged in research of corporate bankruptcies within individual regions in the Czech Republic and their effects on their development (or economic performance).

The aim of this paper is to analyse the development of (using total and monthly data) corporate bankruptcies – the comparison between the development of corporate insolvency proposals (it means according to the law no. 182/2006 Coll., at the insolvency court filed a petition to initiate insolvency proceedings) and corporate bankruptcies (it means according to the law no. 182/2006 Coll., the debtor is in bankruptcy, if he has more than one creditor, a pecuniary obligation for more than 30 days after maturity, and he is not able to repay at the same time) in the Czech Republic since 2008 – in the period 2008 to 2019 with a forecast for the first quarter of 2020. The software STATGRAPHICS Centurion XVI will be used for this analysis. The data needed to analyse the development of corporate insolvency proposals and corporate bankruptcies has been taken over from the company Creditreform, s.r.o. Czech Republic.

## 1 Methodology and Data

In the research, scientific methods were particular used: induction, comparative analysis, synthesis of partial knowledge, elementary statistical analysis and dependence analysis.

For elementary statistical analysis were used the following selected three indicators (Hindls, et al, 2000):

- the first difference (absolute gain,  ${}_1\Delta_t$  CIP – for corporate insolvencies and  ${}_1\Delta_t$  CB – for corporate bankruptcies) (1)

$${}_1\Delta_t = \Delta_t - \Delta_{t-1} \quad (1)$$

- the average absolute gain (2) and

$${}_1\bar{\Delta} = \frac{\sum_{t=2}^n {}_1\Delta_t}{n-1} = \frac{y_n - y_1}{n-1}, \quad (2)$$

- the average growth coefficient (3)

$$\bar{k} = \sqrt[n-1]{\frac{y_n}{y_1}}, \quad (3)$$

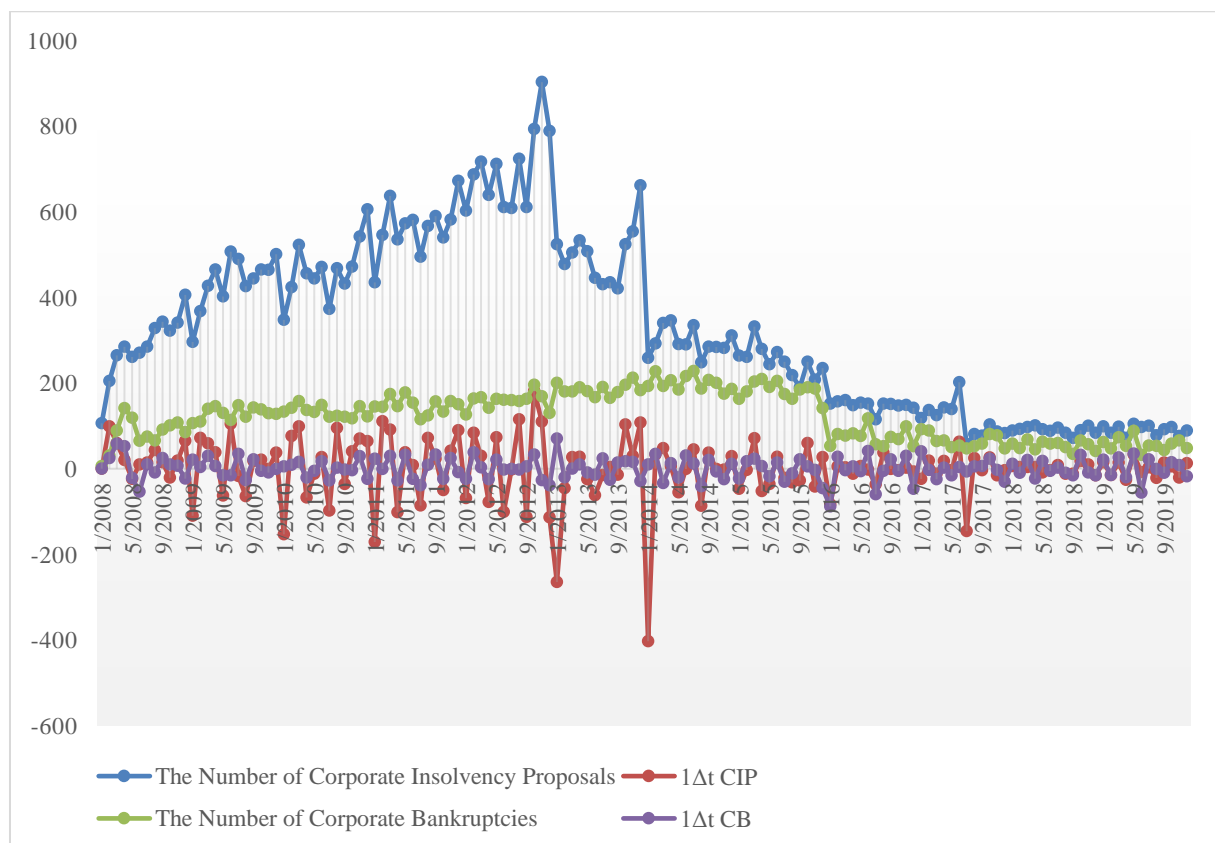
where  $n$  is the number of values (in this paper  $n = 120$ ).

For the dependence analysis, the software STATGRAPHICS Centurion XVI was used. The following methods were selected: automatic forecasting function – the ARIMA models in variants – (0,1,2), (0,1,1), (1,1,1), (2,1,1) was selected here by the results of the p-value, the standard error, the root mean squared error (RMSE), the mean absolute error (MAE), the mean absolute percentage error (MAPE), the mean error (ME) and the mean percentage error (MPE). For the analysis were used secondary data from Creditreform (2020).

## 2 Results and Discussion

The results of elementary statistical analysis, by selected three characteristics, of development of number of corporate insolvency proposals and corporate bankruptcies are given below. The basic development of number of corporate insolvency proposals and corporate bankruptcies with development of its first difference illustrates Figure 1.

**Fig. 1: Development of Number of Corporate Insolvency Proposals and Corporate Bankruptcies with Development of its First Difference**



Source: author from Creditreform (2009–2020)

According to the development of the values specified in Figure 1 can be deduced that the observed characteristics were examined over a period of very fluctuating development. For

this reason, does not make sense to describe the examined values other statistical characteristics (such as e.g. coefficient growth, growth rate and increase rate). For a basic overview of the development of the examined values sufficient to indicate the results of absolute average gain and average growth coefficient.

The result of average absolute gain is for corporate insolvencies proposals  $-0.14285$  and for corporate bankruptcies  $0.35294$ .

The results of average growth coefficient are for corporate insolvencies proposals  $0.99853$  (which corresponds to  $-0.147\%$ ). and for corporate bankruptcies  $1.01762$  (which corresponds to  $1.763\%$ ).

The automatic forecasting function (with Akaike Information Criterion, AIC)<sup>1</sup> was used for the forecasting of the corporate insolvency proposals and corporate bankruptcies in Czech Republic. The ARIMA (0,1,2) model was selected for the forecasting of the corporate insolvency proposals by the results of the p-value, the standard error, RMSE, MAE, MAPE, ME and MPE. The results of selected indicators for different ARIMA models see in Table 1. Forecasted values of number of corporate insolvency proposals for the Czech Republic for January 2020 was point value  $89.6854$  (rounded to 90) and from February to March 2020 was  $88.3065$  (rounded to 88). The number of corporate insolvency proposals which was reported (Creditreform, 2009–2020) for January 2020 was 78. The forecast by the selected model was accurate only  $86.66\%$ , that not corresponds to the selected confidence interval. The number of corporate insolvency proposals which was reported for February was 84 and for March  $90^2$  (Creditreform, 2009–2020). The forecast by the selected model was  $95.45\%$  for values in February, which corresponds to the selected confidence interval. The forecast by the selected model was  $97.77\%$  for values in March, which correspond to the selected confidence interval.

If we change in the program STATGRAPHICS Centurion XVI the analysis options – by the ARIMA models without optimization model order and parameters. By the using of function of automatics forecasting options we have another result – the ARIMA (2,2,2) model was selected with forecasting for January 2020 in value  $88.4465$  (rounded to 88), for February 2020 in value  $83.559$  (rounded to 84) and for March 2020 in value  $85.668$  (rounded to 86). The

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<sup>1</sup> AIC is founded on information theory. When a statistical model is used to represent the process that generated the data, the representation will almost never be exact; some information will be lost by using the model to represent the process. AIC estimates the relative amount of information lost by a given model: the less information a model loses, the higher the quality of that model.

In estimating the amount of information lost by a model, AIC deals with the trade-off between the goodness of fit of the model and the simplicity of the model. In other words, AIC deals with both the risk of overfitting and the risk of underfitting.

<sup>2</sup> The number of corporate insolvency proposals in this month is affected by the situation regarding COVID-19.

forecast by the selected model was 88.63% for value in January – which not correspond to the selected confidence interval, 95.45% for value in February and 97.72% value in March, which corresponds to the selected confidence interval.

**Tab. 1: Results of Selected Indicators for Different ARIMA Models (Data: Corporate Insolvency Proposals)**

MODEL	RMSE	MAE	MAPE	ME	MPE
<b>ARIMA(0,1,2)</b>	64.765	43.7436	15.0735	-0.79532	-3.86356
ARIMA(1,1,1)	65.1103	43.6638	14.9272	-0.74809	-3.82958
ARIMA(0,1,1)	65.6461	42.6305	14.5821	-0.550704	-3.56518
ARIMA(2,1,1)	64.8918	43.4809	14.974	-0.744888	-3.7658

Source: author

The ARIMA (0,1,2) model was selected for the forecasting of the corporate bankruptcies by the results of the p-value, the standard error, the root mean squared error (RMSE), the mean absolute error (MAE), the mean absolute percentage error (MAPE), the mean error (ME) and the mean percentage error (MPE). The results of selected indicators for different ARIMA models see in Table 2.

**Tab. 2: Results of Selected Indicators for Different ARIMA Models (Data: Corporate Bankruptcies)**

MODEL	RMSE	MAE	MAPE	ME	MPE
<b>ARIMA(0,1,2)</b>	22.7382	17.2235	18.3117	0.425932	-3.79153
ARIMA(0,1,1)	22.9003	17.1167	18.171	0.456079	-3.59197
ARIMA(1,1,1)	22.7491	17.1964	18.2963	0.438005	-3.79223
ARIMA(2,1,1)	22.8094	17.2143	18.3042	0.424707	-3.80659

Source: author

Forecasted values of number of corporate bankruptcies for the Czech Republic for January 2020 was point value 51.7652 (rounded to 52) and from February to March 2020 was 53.189 (rounded to 53). The number of corporate bankruptcies which was reported (Creditreform, 2009–2020) for January 2020 was 58. The forecast by the selected model was 89.66%, which not corresponds to the selected confidence interval. The number of corporate bankruptcies which was reported for February was 52 and for March 62<sup>3</sup> (Creditreform, 2009–2020). The forecast by the selected model was 98.11% for value in February, which corresponds to the selected confidence interval. The forecast by the selected model was accurate only 85.48% for value in March, which does not correspond to the selected confidence interval. If

<sup>3</sup> The number of corporate bankruptcies in this month is affected by the situation regarding COVID-19.

we change in the program STATGRAPHICS Centurion XVI the analysis options – by the ARIMA models we not optimize model order and not optimize parameters. By the using of function of automatics forecasting options we have another result – the Simple exponential smoothing with  $\alpha = 0.5183$  model was selected with forecasting from January to March 2020 in the value 53.6759 (rounded to 54). The forecast by the selected model was 93.10% for values in January, which not correspond to the selected confidence interval, 96.3% for values in February, which corresponds to the selected confidence interval and 87.1% in March, which does not correspond to the selected confidence interval.

For dependence analysis will be used monthly data. Firstly, was conducted multiple variable analysis, summary statistics illustrated Table 3, results from correlations show Table 3 and Figure 2.

The Table 3 shows summary statistics for each of the selected data variables. It includes measures of central tendency, measures of variability, and measures of shape. Of particular interest here are the standardized skewness and standardized kurtosis, which can be used to determine whether the sample comes from a normal distribution. Values of these statistics outside the range of -2 to +2 indicate significant departures from normality, which would tend to invalidate many of the statistical procedures normally applied to this data. In this case, the variables the number of corporate insolvencies proposals show standardized skewness outside the expected range.

**Tab. 3: The Summary Statistics from Multiple Variable Analysis**

	<b>The Number of Corporate Insolvencies Proposals</b>	<b>The Number of Corporate Bankruptcies</b>
<b>Count</b>	144	144
<b>Average</b>	328.292	122.347
<b>Standard deviation</b>	202.163	54.9915
<b>Coefficient of variation</b>	61.5802%	44.947%
<b>Minimum</b>	56.0	6.0
<b>Maximum</b>	903.0	228.0
<b>Range</b>	847.0	222.0
<b>Standard skewness</b>	2.24525	-0.17589
<b>Standard kurtosis</b>	-1.80668	-3.01755

Source: author

The Table 4 shows Pearson product moment correlations between each pair of variables. In this case is Pearson product moment correlation 0.6382. Correlation coefficients whose magnitude are between 0.5 and 0.7 indicate variables which can be considered moderately correlated. Pearson product moment correlation coefficients range between -1 and +1 and

measure the strength of the linear relationship between the variables. Also shown in parentheses is the number of pairs of data values used to compute each coefficient. The third number in each location of the table is a P-value which tests the statistical significance of the estimated correlations. P-values below 0.05 indicate statistically significant non-zero correlations at the 95.0% confidence level. All from the analyzed pairs of variables have P-values are below 0.05. This is the reason, why is for this case the Pearson product moment correlations correct indicator, we not must use for this case the Spearman correlation coefficient.

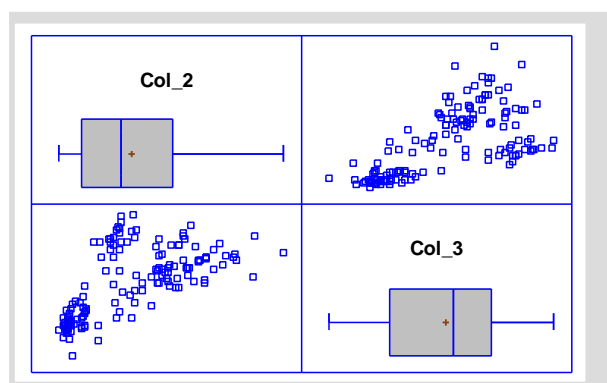
**Tab. 4: Correlation**

	<b>The Number of Corporate Insolvencies Proposals</b>	<b>The Number of Corporate Bankruptcies</b>
<b>The Number of Corporate Insolvencies Proposals</b>		<b>0.6382</b> (Correlation) (144) (Sample Size) <b>0.0000</b> (P-Value)
<b>The Number of Corporate Bankruptcies</b>	<b>0.6382</b> (Correlation) (144) <b>0.0000</b>	

Source: author

However, the results shown in Table 4 cannot be properly assessed without visualization - see Figure 2.

**Fig. 2: Scatterplot Matrix**



Note:

Col\_2 = The Number of Corporate Insolvencies Proposals

Col\_3 = The Number of Corporate Bankruptcies

Source: author, data from Creditreform (2009–2020)

In this case it is interesting, that from the results in the Figure 2 it is not evident that between variables is correlation.

## Conclusion

This paper had as objective: firstly, to describe the development of the number of corporate insolvencies proposals and the number of corporate bankruptcies in the Czech Republic in the period 2008 to 2019 with a forecast for first quarter of 2020. Secondly, analyse the dependence between these examinees' variables. From the results of the analysis, it is clear that the

development of the examined variables during the monitored period was not highly variable (fluctuating). Dependence between examined variables was prove – between examined variables was prove that there is moderately correlation.

For further research is recommended detailed analysis of corporate insolvencies proposals and corporate bankruptcies by region and then also in terms of business sectors or correlation between the number of corporate insolvencies proposals and economic growth (and the number of corporate bankruptcies and economic growth).

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