The financial condition of the construction companies before bankruptcy

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Abstract

The paper aims to discover the symptoms of the forthcoming bankruptcy in the Czech construction industry. The construction industry in the Czech Republic has been in deep crisis. The analysis compares the financial performance of 81 construction companies which went bankrupt between 1/2011 and 5/2013 with the similar sample of 81 construction companies having relatively good credit risk rating. The basic year for the comparison is 2010. The Propensity Score Matching method (PSM) statistically identifies two similar samples by total assets and NACE code. The comparison uses Mann-Whitney test of differences between two independent samples. The results point out that an inappropriate enterprise financial management is one of the main sources of business failure in the construction industry. Limited liability companies are less resistant to bankruptcy than other legal persons. The companies before bankruptcy do not manage their debts carefully in relation to their profitability. They do not create enough own funds to overcome a crisis. The analysis reveals statistically significant differences in key financial indicators between two samples.

Keywords: Bankruptcy, construction industry, financial analysis, insolvency

1. Introduction

The global economic recession has affected many industries. Generally, the extinction dynamics of the non-financial companies in the Czech Republic has been growing since 2011. The legal persons (companies) are significantly more resistant to the crisis than other types of companies. However, we can assume particularly higher vulnerability of the limited liability companies (Dubska 2013).

The crisis has hit not all sectors with the same intensity. The construction industry is one of the most threatened sectors. It is also relatively important sector of the economy, not only in the GDP (6.8 % in 2011) and employment (8.8 % in 2011) but also as the industry that improves the transport infrastructure. In the period 2008-2012, the number of terminations of companies in the construction industry increased three times. The significant rice of the terminations of companies in the construction industry was in 2012. A decline of production in the construction industry has been for four years due to a lack of particularly large contracts that were previously funded from public sources. Thus, the large contracts had to be suspended or postponed (Dubska 2013).

The most frequent sources of insolvency with respect to the firms' financial decision-making are the debt-equity ratio, lack of own financial reserves, problems with enforceability of claims and financial inflexibility in response to the decline in sales (Stehlikova 2013; Svobodova 2013). Since 2008, banks have reduced the number of loans. The credit risk management of banks adversely affected the number of bankruptcy petition. The willingness of banks to lend money in the recession decreases, which can be labelled as a cyclical financial distress (Kislingerova 2012). A growing number of insolvency in the region directly and indirectly helps to increase unemployment rate.

Zathurecky & Marinic (2013) provide the view on the situation in the construction sector from the internal point of view and through the analyses of the secondary data and also by their own empirical survey. They conclude

that the situation in the Czech construction sector has been still serious. The companies oriented on commerce transactions between businesses (B2B – Business-to-Business) perceive the current situation and economic outlook in the construction industry better than B2C (Business-to-Consumer) and B2G (Business-to-Government) companies.

Kislingerova (2013) estimates the development of the number of insolvency proceedings and the number of declared bankruptcies in the Czech Republic in the upcoming years. She predicts ongoing dynamic growth of insolvency petition as well as of the number of declared bankruptcies in the period 2013 and 2016. A higher number of insolvency proceedings will result in a significant burden on the courts. Therefore, in the following period it is necessary to look for such changes in the Insolvency Act and related regulations that would allow a reduction of administrative burden on the judicial system and the overall acceleration of insolvency proceedings.

Neumaierova & Neumaier (2013) use financial ratios for the assessment of the financial performance in the construction industry. They find that the relation between labor productivity and average wages are best set up for small businesses. Richter (2013) compares the financial and qualitative secondary data on a sample of businesses. He focuses on the differences between small and medium-sized enterprises (SMEs) and the whole construction industry. Through the financial statement analysis he concludes that the situation of SMEs essentially reflect the situation in the Czech construction industry as a whole. However, the large construction companies show specific features, mainly in the capital structure. When the crisis started, large companies promptly decided to get rid of the debt to reduce the debt service risk. However, the different strategy of debt management does not lead to significantly better financial performance of the large companies relative to the SMEs.

The forthcoming bankruptcy can be predicted through the bankruptcy models. Kubenka & Kralova (2013) use the bankruptcy model Z" Score. Based on the analysis of 473 companies they statistically confirm that 20 % of businesses in the construction industry had symptoms of bankruptcy in 2010. Nevertheless, they prove that the situation in the construction industry is better than the national economy as a whole.

Various models for prediction of business failure in construction are also described by other authors (Abidali & Harris 1995; Koksal & Arditi 2004; Dikmen *et al.* 2010; Thomas, Wong & Zhang 2011; Shuang *et al.* 2011; Horta & Camanho 2013). The original bankruptcy models are often adjusted to the features of the construction industry.

Arising from the current state of the art, the assessment of the financial performance of the bankruptcy companies is highly topical issue. The paper compares the financial performance of two groups of construction companies: i) the companies before bankruptcy and ii) the companies with relatively good solvency rating. The paper aims to discover the symptoms of the forthcoming bankruptcy in the Czech construction industry. Unlike other authors, the paper compares similar groups by the company's size and NACE code structure. This approach reduces the misinterpretation of the results.

The paper is organized as follows. After the literature overview, the material and methods are discussed. It includes research hypotheses, description of financial indicators and statistical methods and the basic information about the sample. The next part depicts the results of the analysis and identifies the symptoms of the financial crisis in the construction companies. The final part concludes the main findings.

2. Material and Methods

2.1 Data for analysis

The Commercial Register provides the financial statements of the companies in the construction industry. The construction industry is defined as the group of businesses under the "F code" of the NACE rev. 2 classification. It includes 3 divisions - Construction of buildings (NACE 41), Civil engineering (NACE 42) and Specialized construction activities (NACE 43). Construction of buildings includes development of building projects and construction of residential and non-residential buildings. Civil engineering covers construction of roads and railways, utility projects and other civil engineering projects. Specialized construction activities comprises demolition and site preparation, electrical, plumbing and other construction installation activities, building completion and finishing and other specialized construction activities, such as roofing activities. The construction company is defined through the prevailing share of construction activities in the total turnover.

The paper compares two groups of the construction companies. Group A includes companies before bankruptcy. Although the economic recession has fully appeared since 2009, the sharp drop of the construction industry delayed one year because of long-term production cycle (figure 1). The basic year for the comparison is 2010

because all companies in the group A were at the starting point of the crisis period. In the subsequent years the number of available financial statements considerably dropped because many companies stop publishing financial statements when they expect financial difficulties. The construction companies in the group A have to meet following assumptions:

- Financial statements in 2010 (12 month) since January 1st are available.

- The companies went bankrupt between January 2011 and May 2013.

- The companies are still in operation – the production consumption has to be positive and the operating profit/loss is available. Nevertheless, the company's turnover may be zero because the companies before bankruptcy can record zero sales.

The construction companies in the group B have had a relatively good financial condition because of their above-average solvency rating. The companies haven't experienced the bankruptcy. The solvency index of construction companies is provided by the credit risk company Bisnode that calculates the solvency index using the own survey on due invoices.

The extreme values and outliers are not removed from the sample of companies facing bankruptcy (group A). The bankrupt companies have often extremely deep financial losses and often negative equity. So, the extreme values and outliers get the picture of reality.

2.2 Statistical methods

The difference in financial condition between the two groups and identification of the main symptoms of the failure are the main issues. Because the results can be biased by the structure of specialization (NACE) as well as by the company's size (total assets), the similar groups have to be picked out. The Propensity score matching (PSM) is used to create treatment-control matches based on propensity scores and/or observed covariate variables (Khandker *et al.* 2010). The propensity score was introduced by Rosenbaum & Rubin (1985). Various approaches can be used to match pairs on the basis of the propensity score. Greedy data matching is used for propensity score data matching procedure in this paper (Bozik 2012). Mahalanobis distance within propensity score calipers (no matches outside calipers) is used in this paper as the distance calculation method (Gu & Rosenbaum 1993).

After the similar groups A and B are selected, the next step is to perform the counterfactual analysis, i.e. to process the statistical difference tests. The Mann-Whitney U test compares the below mentioned indicators between two groups. The nonparametric Mann-Whitney U test enables to compare probability distribution $F(X)$, $F(Y)$ between two groups even if the assumption about normal probability distribution violates. The null and alternative hypotheses about indicators are: H_0: $F_A(X) = F_B(Y)$, H_A: $F_A(X) \neq F_B(Y)$. A normal approximation method is used for the distribution of the sum of ranks which corrects for ties and does have the correction factor for continuity. The null hypothesis is tested at the significance level of $\alpha = 0.05$. The mean, median and standard deviation (StDev) provide the key summaries about the sample. The statistical analysis was process through the NCSS 8.

2.2 Financial indicators

The relevant indicators are selected for the financial statement analysis. The financial statement analysis allows for companywide point of view, not owners expectations. Moreover, enterprises have various shares of remunerated liabilities and different attitudes to paying taxes (deferred taxes, payable taxes). So, the indicators of profitability use EBIT (Earnings before Interest and Taxes), instead of Net Income. Similarly, the total company turnover instead of sales of goods and production is used. The financial statement analysis consists of the following indicators.

A) Indicators of profitability:

- Return on Assets (ROA) = EBIT/Total Assets

- Long-term Profitability = (Retained Earnings + Reserve Funds + Net Income After Tax)/Total Assets

B) Indicators of productivity

- Total Assets Productivity = [(Sales of goods – Costs on goods sold) + (Sales of production – Costs of sales)]/Total Assets

- Labour Productivity = [(Sales of goods – Costs on goods sold) + (Sales of production – Costs of sales)]/Staff Costs

C) Indicators of the capital structure

- Debt Ratio = Total Debt/Total Assets

- Short-term Debt Ratio = (Short-term Liabilities + Short-term Bank Loans & Overdrafts)/Total Assets

- Long-term Debt Ratio = (Long-term Liabilities + Long-term Bank Loans & Overdrafts)/Total Assets

- Credit Debt Ratio = Bank Loans & Overdrafts/Total Assets

D) Indicators of liquidity:

- Current Ratio (L3) = Current Assets/Current Liabilities

- Cash Ratio (L1) = Short-term Financial Assets/Current Liabilities

E) Turnover indicators

- Total Assets Turnover = (Production + Revenue from Goods Sold)/Total Assets

- Liability Turnover = (Production + Revenue from Goods Sold)/(Total Payables + Short-term Bank Loans & Overdrafts)

- Accounts Receivable Turnover = (Production + Revenue from Goods Sold)/Total Accounts Receivable

F) Other indicators

- The share of long-term assets in the total assets

- The share of services in the total costs

- The age of the firm in 2010

Moreover, two credit risk models estimate the financial condition - the index IN05 (Neumaierova & Neumaier 2005) and Altman's Z'' score originally introduced in 1999 (Altman 2006). The two models are the most successful in prediction of business failure in the construction industry (Manasova 2008).

The sample of 81 companies in each group with available full accounting data in 2010 is the base for the analysis. Table 1 shows the effects of treatment-control sample matching. The differences between groups become smaller after the matching. Total 76 from 81 companies in the group A are limited liability companies.

In 2012, 1215 firms in the construction industry were in insolvency (Creditreform 2013). The sample of 81 seems not to be representative. But most of the 1215 firms were sole holders and very small firms without bookkeeping.

3. Results a discussion

Table 2 provides information about the profitability and productivity indicators. It clearly shows bad financial condition of the companies shortly before bankruptcy (group A). The companies have not only the negative return on assets shortly before the failure, but they also record financial losses over a long period. The average and median long-term profitability is deeply negative. It indicates the long-term cumulative loss. The median value denotes that one half of the sample A has the long-term profitability below -14.9 %. It is alarming. The long-term profitability indicators of the group B indicate sufficient retained earnings and financial reserves. The own financial sources enable companies to survive the bad years. Kislingerova (2012) confirms that the recession causes financial distress especially to those businesses with low equity. Nevertheless, the mean ROA in the group B is negative. So, the economic recession systematically affected both bankrupt and companies in a good financial condition.

The productivity indicators bear out the results of profitability test. The companies before bankruptcy have significantly lower total assets productivity and labor productivity than companies not facing the business failure. Mann-Whitney test confirms the statistically significant differences of profitability and productivity at α = 0.05.

The table 3 summarizes the output of statistical analysis of the differences in capital structure. The debt ratio of the group B indicates that the construction companies had 65.3% share of debt in total liabilities on average in 2010. It is slightly above the recommended level of 50 %. However, it is significantly lower than in the group A where the debt of many construction companies reaches more than 100% of the total assets. One half of companies in the group A has the debt ratio above 102.67 %. Such companies have negative equity and do not have enough assets available to pay off all debts. The business failure of the construction companies is caused by high level of short-term liabilities, i. e. by short-term insolvency. The share of bank credits and loans is also

significantly higher in the sample of companies before bankruptcy. Alternatively, the long-term debt ratio of the group A does not significantly differ from the group B.

The tables 2 and 3 generally indicate that the combination of high level of short-term debts including credits and loans together with long-term cumulative loss causes the serious problems with settlement of the debt service costs in the sample A. It is confirmed by Stehlikova (2013). During a crisis, holding of own resources is the best way to keep the company's financial stability (Kislingerova 2010).

The table 4 contains ratio indicators of liquidity and turnover. It attempts to measure the differences of the business activity and short-term liquidity between two groups of construction companies. Acid-test ratio (liquidity ratio L2) is not calculated because construction companies do not have much inventory and L2 is roughly the same as L3.

The liquidity indicators are significantly lower in companies before bankruptcy than in other companies. On average, the group A covers the short-term liabilities by the current assets only 1.17 times. The mean cash ratio is below recommended level of 0.2 in the group A. It means the construction companies before bankruptcy have insufficient cash liquidity. It indicates grave problems with cash flow.

The total assets turnover does not significantly differ between two groups of companies. Both the companies before bankruptcy and other companies generate revenues in the crisis period. But the companies expecting failure often sell their long-term tangible assets either to bridge the gap in the production or to offload the useless assets after drop of production.

The liability turnover and accounts receivable turnover are significantly lower in the companies before bankruptcy. The mean liability turnover is lower than the mean accounts receivable turnover in both groups. It means that the construction companies often use the commercial credit by their suppliers. When the construction companies get into problems with solvency, the suppliers do not receive money and can fall in financial difficulties. So, the crisis quickly shifts to other branches.

Table 5 provides information about other indicators than financial ratios. The share of long-term assets in the total assets significantly differs between two groups. The construction companies before bankruptcy have lower share of long-term assets. So, they have relatively large current assets, mainly the receivables (60 % of the total assets on average), than the companies in a good financial condition. The irrecoverable claims can be a serious problem for all companies during the crisis.

Generally, the construction companies use relatively little own assets. Instead, they lease it. The Czech accounting legislation puts the lease instalment into the costs on services. The share of services in the total costs does not differ between groups. Thus, it is not evident that the construction companies before failure lease more tangible assets than other companies. Nevertheless, the share of services reaches 50 % which is relatively high.

The age of the construction companies are not much different. In both groups, the mean age of the companies is close to 10 years. It can't be concluded that the significantly younger companies are less resistant to crisis. However, the year of company formation in the database does not reflect previous merges and acquisitions of the firm.

The bankruptcy models IN05 and Altman's Z'' Score predict the business failure of the companies. The value of the bankruptcy indicators significantly differ between group A and group B. The index IN05 predicts bankruptcy for 80 % of the construction companies in the group A. The Z'' Score predicts bankruptcy for 82 % of the construction companies in the group A. So, their information value of the indices is relatively high. On the contrary, both bankruptcy models predict business failure for 35 % in the group B. It means that more than one third of the construction companies with good payment habits were jeopardized by the business failure in 2010. It indicates the negative effects of the economic recession on the whole construction industry.

4. Conclusion

The paper compares the financial performance of the construction companies approaching bankruptcy and the companies with relatively good solvency. The paper aims to discover the symptoms of the forthcoming bankruptcy in the Czech construction industry. Based on the statistical hypotheses testing, the clear symptoms of the business failure are established.

More than 90 % of the construction companies that went bankrupt between 1/2011 and 5/2013 are limited liability companies. It confirms the assumption that smaller limited liability companies are more vulnerable than large companies. The construction companies went bankrupt due to the extremely high debt ratio (more than 100 %), significantly lower labor- and total assets productivity and negative profitability (the mean ROA was -66.52

% in 2010) which could not generate enough sources to cover the costs on debt service. The problem is especially the short-term liabilities. But they can be reduced more promptly than the long-term liabilities if the financial management properly works.

The current and cash liquidity of the construction companies before bankruptcy is significantly lower than in other companies. There is high share of accounts receivables of which mainly irrecoverable claims are the most dangerous. Moreover, the construction companies often use the commercial credit by their suppliers. Then, the solvency problems in the construction industry can cause a domino effect over other branches.

In the construction industry, the share of services in the total costs is relatively high, about 50 % on average. On the other hand, the construction companies generally use low tangible assets. So, they often lease sub-contractors. There is no difference in the use of services between the companies before bankruptcy and the other construction companies.

Finally, it can be concluded that an inappropriate financial management is one of the main sources of business failure in the construction industry. The companies should manage the debts more carefully in relation to their profitability. They should also create own financial reserves to overcome a crisis.

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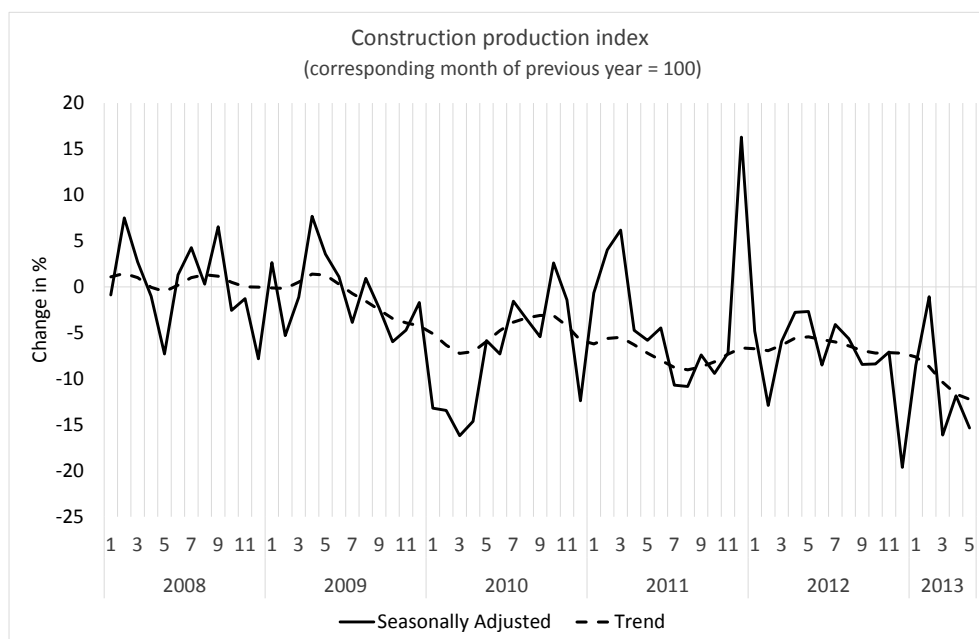
Figure 1. Construction production index in the Czech Republic

Source: Czech Statistical Office

Table 1. The effect of data matching

	Group A	Group B *before* matching	Group B *after* matching
Sample size	81	4 382	81
Total Assets – Mean ('000 CZK)	28 921.77	34 172.16	29 030.73
Total Assets – StDev ('000 CZK)	50 668.33	133 355.12	50 840.21
NACE 41 (%)	49.4	41.9	49.4
NACE 42 (%)	9.9	10.2	9.9
NACE 43 (%)	40.7	47.9	40.7

Source: Author

Table 2. The difference in profitability and productivity indicators

Indicator	Unit	Sample features	Group A	Group B	Mann-Whitney Z	p-value	Reject H_0 at 0.05
ROA	%	Mean	-66.52	-1.62	4.5155	<0.0001	Yes
		Median	-5.09	1.98			
		StDev	290.78	31.28			
Long-term Profitability	%	Mean	-114.17	18.90	6.6894	<0.0001	Yes
		Median	-14.90	25.82			
		StDev	421.82	56.54			
Total Assets Productivity	CZK	Mean	0.10	0.53	4.2575	<0.0001	Yes
		Median	0.15	0.44			
		StDev	1.41	0.50			
Labour Productivity	CZK	Mean	0.23	1.89	-4.8668	<0.0001	Yes
		Median	0.82	1.28			
		StDev	3.29	3.93			

Source: Author

Table 3. The difference in the capital structure

Indicator	Unit	Sample features	Group A	Group B	Mann-Whitney Z	p-value	Reject H_0 at 0.05
Debt Ratio	%	Mean	196.62	65.30	-7.2020	<0.0001	Yes
		Median	102.67	59.47			
		StDev	383.08	43.29			
Short-term Debt Ratio	%	Mean	185.46	55.05	-6.7229	<0.0001	Yes
		Median	97.27	52.94			
		StDev	385.82	38.19			
Long-term Debt Ratio	%	Mean	13.35	11.38	0.5670	0.5707	No
		Median	0.44	1.58			
		StDev	31.75	21.74			
Credit Debt Ratio	%	Mean	28.19	8.03	-3.8395	0.0001	Yes
		Median	7.82	0.00			
		StDev	105.41	18.13			

Source: Author

Table 4. The difference in liquidity and turnover indicators

Indicator	Unit	Sample features	Group A	Group B	Mann-Whitney Z	p-value	Reject H$_0$ at 0.05
Current Ratio (L3)	x	Mean	1.17	6.29	5.7381	<0.0001	Yes
		Median	0.80	1.29			
		StDev	2.90	33.98			
Cash Ratio (L1)	x	Mean	0.17	4.72	6.9241	<0.0001	Yes
		Median	0.02	0.25			
		StDev	0.97	33.59			
Total Assets Turnover	x	Mean	2.82	2.37	0.3986	0.6902	No
		Median	1.70	1.80			
		StDev	4.83	2.13			
Liability Turnover	x	Mean	2.22	5.37	5.2828	<0.0001	Yes
		Median	1.60	3.80			
		StDev	3.77	5.67			
Accounts Receivable Turnover	x	Mean	4.87	12.20	3.8155	0.0001	Yes
		Median	3.09	5.27			
		StDev	12.05	21.34			

Source: Author

Table 5. The difference in miscellaneous indicators

Indicator	Unit	Sample features	Group A	Group B	Mann-Whitney Z	p-value	Reject H$_0$ at 0.05
The share of long-term assets in the total assets	%	Mean	19.77	26.45	2.8248	0.0047	Yes
		Median	8.39	18.81			
		StDev	30.12	24.85			
The share of services in the total costs	%	Mean	49.15	50.95	0.3953	0.6926	No
		Median	51.84	51.44			
		StDev	28.19	3.13			
The age of the firm in 2010	Years	Mean	9.17	10.31	1.1159	0.2645	No
		Median	9.00	11.00			
		StDev	5.93	6.08			
IN05*	Score	Mean	-1.89	2.79	5.5639	<0.0001	Yes
		Median	0.27	1.17			
		StDev	11.64	14.86			
Altman Z'' Score (1999)*	Score	Mean	-16.25	1.94	6.5354	<0.0001	Yes
		Median	-1.10	2.59			
		StDev	61.76	5.71			

Notes: * The thresholds of the bankruptcy zone are IN05 < 0.9, Altman Z'' < 1.1.

Source: Author