Impact of Macroeconomic Indicators on the Financial Stability of Construction Companies in the Czech Republic and Spain

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Abstract. The purpose of this study is to identify the relationship between macroeconomic factors and the financial stability of companies based on a comparative analysis of the construction industry in the Czech Republic and Spain for the 2007-2015 period. The negative impact of the 2007 financial crisis on the country economy, and thus on the construction industry, is a clear illustration of the dependence of the financial health of the construction sector on the economic stability of the country. This observation leads to the necessity of determining the relationship between the external factors and the financial stability of companies. The most common and available macroeconomic indicators of economic health of the country were selected for the purpose of this research: GDP, Inflation and Unemployment Rate. In order to find the relationship between the chosen macroeconomic indicators and financial ratios, Pearson Correlation and Pooled Ordinary Least Squares Regression, were applied. According to the results of the correlation, the majority of macroeconomic indicators have a weak positive and negative relationship with the financial coefficients of companies. In both countries, the most significant is the relationship between unemployment and liquidity of enterprises. In addition, in the Spanish construction industry, a negative correlation between ROE and unemployment has been observed. The regression analysis pointed out the impact of GDP on the liquidity of construction companies in Spain. In the Czech Republic, due to relatively stable situation in the period researched, insignificant relation between the selected macroeconomic indicators and financial stability of the country's construction industry have been revealed.

1. Introduction

According to the results of the statistical studies by Eurostat, construction industry represents approximately a tenth part of the country economy [1]. Construction is one of the main branches of material production. Development of all sectors of material production and, thus the economic potential of the state and national income largely depend on the quantity, quality and growth rates of the construction industry [2].

On the other hand, construction industry directly depends on the stability of the country. Current economic environment has been characterized by a high level of complexity and increasing instability. An example of the impact of economic instability of the country is the negative influence of 2008 global financial crisis, which led to the bankruptcy of a significant part of construction companies [3]. Due to impossibility to control external factors by enterprises, it is very important to find relationship between the structure of the organization and the external environment. The information about
external environment could help to create a company development strategy with timely response to any changes and to make effective decisions in order to increase financial stability of the company.

There are two types of external factors: direct and indirect factors. Direct external factors (suppliers, consumers, competitors, regulators, partners and others) directly affect the company and depend on the activities of the organization [4]. It is very important to analyse the impact of indirect factors, as the degree of their influence is highly significant, but much more complicated. One of the first major scientific studies devoted to this problem was held by Porter. He developed various methods for analysing external factors, such as the "five forces Porter" or a "PEST-analysis. Porter divided all external factors into 4 main groups: political, economic, social and technological factors [5]. Subsequently, the model was extended by addition of other factors (legal, environmental, sociodemographic and ethnic factors) and as a result PESTLE, SLEPT and STEPLE-analyses have been developed [6].

However, since the range of macroeconomic factors is very wide, managers often face the problem of selecting important indicators in the process of applying these analysis methods. After studying the available literature, the most common and available macroeconomic indicators have been selected: GDP, inflation and unemployment rate. It is very important to understand their connection with the financial stability of the company. In this study, effect of selected macroeconomic indicators on the stability of construction companies in the Czech Republic and Spain for the 2007-2015 period by applying correlation and regression analysis was determined.

2. Literature review and research method

Understanding the importance of analysing the external environment was finally formed in the late 50s, since external factors caused many problems in the management of companies. There are a big number of works aimed at finding solutions to this problem, but research results are inconsistent and sometimes contradict each other, what can be explained by considering different time periods, different countries, using different methods (for example, linear regression, OLS estimation approach, feasible generalized least squares method, GMM estimation approach, random effects estimation) and different indicators. Since the changes firstly affect the economy/finance sector, most of the works examined the impact of macroeconomic factors on the banking sector. According to the studied resources, the most commonly used external factors affecting the financial health of companies are Gross Domestic Product (GDP) and Inflation Rate. For example, Kanwal & Nadeem (2013) after analyzing the activities of EU companies agreed on positive significant relation between profitability, ROA and GDP, other researchers (Fotios & Kosmidow (2007), Bokpin, (2009)) affirm the negative and significant relation [7-9]. At the same time, Bastos, Nakamura & Basso (2009) argue that inflation does not have influence on company finance, when Sett & Sarkhel (2010), Mlinaric, Misivic, and Arneric (2017) find that inflation is negatively related to profitability [10-12]. Furthermore, Korajczyk & Levy (2003), Bastos, Nakamura & Basso (2009) and Bokpin, (2009) identified other groups of macroeconomic factors affecting the financial condition of enterprises (import, export, demography, public debts, market capitalization, unemployment rate and etc.) [9,10,13].

Comparative analysis of the impact of external factors on the construction industry between the Czech Republic and Spain for the 2007-2015, which include crisis and post-crisis period, was conducted. Country selection criterion was the difference in the degree of the crisis impact on the country economies. While in Spain, due to strong dependence on the world banks, the construction industry had strong negative consequences [14], according to Matyáš (2011) “Czech construction sector continued to operate smoothly” [15]. In order to analyse and compare the stability of the external environment in Spain and Czech Republic, three macroeconomic indicators were applied: GDP Growth, Unemployment Rate and Inflation Rate. Based on analysis of inflation changes and economic growth, Layard, Nickell and Jackman formulated four different stages of financial condition: peak (a high level of business activity), recession (decrease in all indicators), trough (critically low values of stability indicators) and expansion (positive dynamics of stability indicators) [16]. At the same time, financial ratio analysis was applied to obtain an insight into company
operations and performance. Analysis of financial ratios allows determining weaknesses in financial management of the company and identifying problems that need to be addressed to improve the enterprise efficiency. Financial ratios are divided into 4 main groups: liquidity, activity, solvency and profitability ratios [17]. In the study carried out, the company profitability and liquidity ratios were calculated.

To measure the profitability of construction companies, return on Assets (ROA) (1) and Return on Equity (ROE) (2) ratios were selected.

\[
\text{ROA} = \frac{\text{Net Income}}{\text{Total Assets}} \quad (1) \\
\text{ROE} = \frac{\text{Net Income}}{\text{Shareholder’s Equity}} \quad (2)
\]

ROA measures profit and reflects the efficiency of financial management to earn profit using financial and real resources. ROE ratio reflects the efficiency of financial management to transform every unit of shareholder’s equity into profit [18].

The need for assessment of balance sheet liquidity (Current Ratio (CR)) in the market conditions arises from increased financial constraints and necessity to assess the credit worthiness of the company (3).

\[
\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}} \quad (3)
\]

For calculation of financial ratios, solid database was used which includes information about more than 25,000 companies in the construction sector in Spain and 16,000 companies in the Czech Republic for the 2007-2015 period. The database of Spanish construction companies was obtained from the database of the Iberian Balance Analysis System (SABI), provided by the Bureau Van Dijk. Information about Czech companies was obtained from database of the Department of Justice of the Czech Republic.

In order to find the relationship between macroeconomic indicators and financial ratios, Pearson Correlation and Pooled Ordinary Least Squares (POLS) Regression were applied. Pearson correlation measures the degree of dependence between two variables. Pearson correlation can be positive (direct relationship) or negative (inverse relationship). The larger the coefficient, the stronger is relationship between the variables. Regression analysis assesses the relationship between an outcome variable and one or more variables. The coefficient of determination (r-squared) is the square of the correlation coefficient. Its value ranges between 0 to 1 [19]. It has an advantage over the correlation coefficient as it may be interpreted directly as the proportion of variance in the dependent variable that can be calculated by the regression equation (4).

\[
Y_i = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \epsilon \quad (4)
\]

Where \(X_1\) - Real Gross Domestic Product, \(X_2\) - Inflation Rate, \(X_3\) - Unemployment Rate, \(\beta_0\) - value of x-intercept, \(\beta_1, \beta_2, \beta_3\) - proportionate change in dependent variable due to independent variables, \(\epsilon\) - error term. The calculation of the correlation and regression analysis was carried out using Excel.

3. Results and discussions

3.1. Comparative analysis of macroeconomic indicators in the Czech Republic and Spain

The GDP growth Rate, Inflation Rate and Unemployment Rate are the most effective indicators for assessing the economic health of the country “Table 1”.
Table 1. Macroeconomic indicators in Spain and the Czech Republic over the 2007-2015 period

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|------|------|------|------|------|------|------|------|------|------|
| GDP Growth Rate | | | | | | | | | |
| Spain | 3.8 | 1.1 | -3.6 | 0.0 | -1.0 | -2.9 | -1.7 | 1.4 | 3.2 |
| Czech Republic | 5.5 | 2.7 | -4.8 | 2.3 | 2.0 | -0.7 | -0.5 | 2.7 | 4.6 |
| Inflation Rate | | | | | | | | | |
| Spain | 2.8 | 4.1 | -0.3 | 1.3 | 3.1 | 2.4 | 1.8 | -0.2 | -0.5 |
| Czech Republic | 2.9 | 6.3 | 1 | 1.5 | 1.9 | 3.3 | 1.4 | 0.4 | 0.3 |
| Unemployment | | | | | | | | | |
| Spain | 8.3 | 13.9 | 18.1 | 20.0 | 21.7 | 25.1 | 26.3 | 24.3 | 22.1 |
| Czech Republic | 6.6 | 5.4 | 8.1 | 7.1 | 8.5 | 6.8 | 7.7 | 7.7 | 6.5 |

Source: Eurostat, 2015

When comparing macroeconomic indicators, we should take into account that Spain and the Czech Republic are members of the EU and have a strong economic connection with each other. According to the analysed data in 2008-2009 period, when the GDP growth was negative, economy of both countries was heading towards or already was in a recession. The growth rate turned positive in 2010. Under the influence of new global financial negative changes in 2012-2013, the GDP of both countries decreased again. After recession, in just two years (2014-2015), the Spanish economy recovered 85% of the GDP loss. Despite the on high GDP growth, the inflation rate in Spain was lower than in the Czech Republic. Analysis of unemployment rate in 2007–2015 period reveals a relatively high difference between the unemployment level in the Czech Republic and Spain. The sharp decline in Spanish business activity since 2007 on and resulting unemployment rate was one of the highest in the EU, which negatively affected the country economic stability.

3.2. Financial analysis of construction sector of Spain and Czech Republic

For obtaining an insight into a financial situation of construction industry of Spain and the Czech Republic, financial ratio analysis was applied. First of all, coefficients of liquidity and profitability of construction companies in Spain and in the Czech Republic were calculated “Table 2” and “Table 3”.

Table 2. Rentability and liquidity ratios of the construction sector in the Czech Republic over the 2007-2015 period

| Quantity/Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---------------|------|------|------|------|------|------|------|------|------|
| ROE | 15.72 | 16.97 | 18.39 | 12.46 | 9.20 | 6.45 | 6.52 | 6.07 | 8.45 |
| ROA | 7.66 | 7.92 | 10.04 | 7.54 | 4.55 | 3.19 | 3.09 | 3.85 | 4.85 |
| Current Ratio | 1.33 | 1.4 | 1.49 | 1.48 | 1.13 | 1.23 | 1.26 | 1.10 | 1.07 |

Source: Database of the Department of Justice of the Czech Republic for 2007-2015 period

Table 3. Rentability and liquidity ratios of the construction sector in Spain over the 2007-2015 period

| Quantity/Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---------------|------|------|------|------|------|------|------|------|------|
| ROE | 29.9 | 23.3 | 32.7 | 26.7 | 32.6 | 12.4 | 12.3 | 7.95 | 8.86 |
| ROA | 4.45 | -3.2 | 1.47 | 1.83 | 3.78 | -0.6 | 1.2 | 1.55 | 1.63 |
| Current Ratio | 2.96 | 1.33 | 1.56 | 2.38 | 1.77 | 1.34 | 1.35 | 1.52 | 1.5 |

Source: SABI 2007-2015

The crisis adversely affected the quality and value of assets of the construction companies. According to the obtained data presented in "Table3" financial stability of construction companies in Spain was badly affected. 2013 year was a turning point for companies’ profitability, as the Spanish economy emerged from recession in the second half of the year.
The construction industry in the Czech Republic also suffered under the impact of the 2008 financial crisis "Table 2" with the decrease in profitability of firms over the period researched. According to the calculation, the ROE from the value of 15.7% in 2007 decreased to 8.45% by 2015. A similar situation was observed with ROA which decreased between 2007 and 2015 by 2.9%.

From a comparison of coefficients of profitability in “Table 2” and “Table 3” for the researched period, it is important to note that the changes in the Czech Republic, in contrast to Spain, were more predictable and slow. With regard to the liquidity of companies, the values of both countries deviated from the established world standards. To a greater extent, financial crisis also affected the liquidity of Spanish construction companies. Current ratio dropped to 1.5 in 2015 from 2.96 in 2007. However, from 2013-2014 there was a positive dynamics of growth in liquidity of companies which indicated a gradual exit from the state of repression.

3.3. Financial analysis of construction sector of Spain and Czech Republic

The results of the Pearson correlation between macroeconomic indicators and financial ratios of construction sector are presented in “Table 4” and “Table 5”.

|                | ROA% | ROE% | CR%  | GDP% | Un.% | Inf.% |
|----------------|------|------|------|------|------|-------|
| ROA%           | 1    |      |      |      |      |       |
| ROE%           | 0.968| 1    |      |      |      |       |
| CR%            | 0.793| 0.776| 1    |      |      |       |
| GDP%           | -0.163| -0.125| -0.405| 1    |      |       |
| Un.%           | -0.186| -0.282| -0.170| -0.477| 1    |       |
| Inf.%          | 0.235| 0.424| 0.362| 0.123| -0.678| 1     |

|                | ROA% | ROE% | CR%  | GDP%       | Un.% | Inf.% |
|----------------|------|------|------|------------|------|-------|
| ROA%           | 1    |      |      |            |      |       |
| ROE%           | 0.451| 1    |      |            |      |       |
| CR%            | 0.602| 0.478|      |            |      |       |
| GDP%           | 0.078| -0.219| 0.479| 1          |      |       |
| Un.%           | -0.164| -0.605| -0.667| -0.492   | 1    |       |
| Inf.%          | -0.343| 0.283| 0.153| 0.022     | -0.389| 1     |

Obtained results of the dependence of the financial stability of the construction companies of the Czech Republic and Spain on the external factors are significantly different. Anderson, Sweeney & Williams (1990) noted that correlation is high when its value is above 0.70 [20]. According to the results of the correlation presented in “Table 4” and “Table 5”, the majority of macroeconomic indicators have a weak positive and negative relationship with the financial coefficients of construction companies with correlation lower than 0.5. In both countries, the most significant is the relationship between unemployment and liquidity of enterprises. In addition, in the Spanish construction industry, there is a negative correlation between ROE and unemployment. There are also different results of the GDP effect on liquidity of companies: in Spain this relationship is positive (0.48), in the Czech Republic it is negative (0.4). To get an accurate output, regression was applied “Table 6” and “Table 7”.
Table 6. Regression analysis for the Czech construction companies

|             | Regression ROA | Regression ROE | Regression CR |
|-------------|----------------|----------------|---------------|
| Inf.%       | 0.18           | 0.16           | 4.24          |
| GDP%        | -0.13          | 0.08           | -1.0          |
| Un.%        | -0.07          | -0.06          | -7.94         |
| R           | -              | -              | -             |

* Significant at 5% level (NS) = Not significant

Table 7. Regression analysis for the Spanish construction companies

|             | Regression ROA | Regression ROE | Regression CR |
|-------------|----------------|----------------|---------------|
| Inf.%       | 0.08           | -0.05          | 2.2           |
| GDP%        | -0.41          | -0.31          | -6.88         |
| Un.%        | -0.24          | 0.04           | -0.45         |
| R           | -              | -              | -             |

* Significant at 5% level (NS) = Not significant

The empirical analysis of the POLS regression confirmed the result of the correlation analysis. According to regression results, GDP has significant relationship at 5% level with Current Ratio. Insignificant positive relationship of inflation and negative effect of GDP with financial indicators, except liquidity of Spanish construction companies, is in accordance with results of correlation analysis in both countries. Insignificant negative effect of unemployment also confirms the results of the correlation.

4. Conclusions

By analysing the macroeconomic indicators, it can be concluded that both the Czech Republic and Spain have been emerging from the repression. Comparing the dynamics of the change of the stability of construction industry, it was found out that the construction sector directly dependents on the stability of the country. According to the data obtained, the share of the construction industry in the Czech Republic during the period researched was practically unchanged. In Spain large number of construction companies went bankrupt, which led to a sharp increase in unemployment level in the country. The growth of inflation in 2008 also had a negative impact on the construction industry. According to the results of the correlation, the majority of macroeconomic indicators have a weak positive and negative relationship with the financial coefficients of companies. In both countries, the most significant is the relationship between unemployment and liquidity of enterprises. In addition, in the Spanish construction industry, a negative correlation between ROE and unemployment has been observed. The regression analysis pointed out the impact of GDP on the liquidity of construction companies in Spain. In the Czech Republic, due to relatively stable situation in the period researched, insignificant relation between the selected macroeconomic indicators and financial stability of the country's construction industry have been revealed.

This study once again confirms the importance of paying attention to all possible internal and external factors in the management of the company. According to the results, the influence of macroeconomic factors varies across countries and depends on features of the financial management methodology of the company. Furthermore, external factors play a great role in a financial decision-making process. Information about changes in external environment and knowledge about their influence on company activity provides managers with support in creating effective financial strategy for stable and successful development. The suggestion for further research assumes to extend the sample as well as investigated period, expand the group of countries, choose external factors such as exchange rate, imports, exports, tax rates and income level which are not highly correlated between
each other, and create a regression model in order to make results more significant and reliable. In addition, other methods of econometrics should be used to confirm the results.

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References
[1] European Commission. Final report. Economic Impacts of the Construction Products Regulation, 2017.
[2] T. M. Lewis, "The construction industry in the economy of Trinidad & Tobago." Construction Management and Economics, May 2010, pp. 541-549.
[3] A.C. Silva and G. A. Chávez, "Microfinance, country governance, and the global financial crisis." Venture Capital 17.1-2, May 2015, pp. 191-213, doi.org/10.1080/13691066.2015.
[4] V. Markova and S. Kuznetsova Strategic management. Moscow: "Infra-M", 2008.
[5] Porter, Alan L. Forecasting and management of technology. Vol. 18. John Wiley & Sons, 1991, pp. 3-17.
[6] Z. Srdjevic, R. Bajcetic and Srdjevic, B., “Identifying the criteria set for multicriteria decision making based on SWOT/PESTLE analysis: a case study of reconstructing a water intake structure”. Water resources management, 2012.
[7] S. Kanwal and M. Nadeem, "The impact of macroeconomic variables on the profitability of listed commercial banks in Pakistan." European journal of business and social sciences 2.9, Dec. 2013, pp. 186-201.
[8] P. Fotios and K. Kosmidou, "Factors influencing the profitability of domestic and foreign commercial banks in the European Union." Research in International Business and Finance, 2007, pp. 222-237.
[9] G. A. Bokpin, "Macroeconomic development and capital structure decisions of firms: Evidence from emerging market economies." Studies in economics and finance, 2009, pp. 129-142, doi.org/10.1108/10867370910963055
[10] D. D. Bastos, W. T. Nakamura and L. F. Basso, "Determinants of capital structure of publicly-traded companies in Latin America: the role of institutional and macroeconomic factors." Journal of international finance and economics, 2009, pp. 24-39, DOI: 10.2139/ssrn.1365987.
[11] D. Milanić, P. Mišević, and J. Arnerić. "Commercial Bank Profitability Analysis: Evidence from Croatia." International Conference on Law, Education, Business and Interdisciplinary Studies, March 2017, London (UK), pp.127-131, doi.org/10.17758/URUAE.ED0317008.
[12] K. Sett and S. Jaydeb. "Macroeconomic variables, financial sector development and capital structure of Indian private corporate sector during the period 1981-2007." IUP Journal of Applied Finance, Jan. 2010, pp. 40, doi:17115/196827341.
[13] R. A. Korajczyk and A. Levy, "Capital structure choice: macroeconomic conditions and financial constraints." Journal of financial economics, Jan. 2003, pp. 75-109, doi.org/10.1016/S0304-405X(02)00249-0.
[14] E. Ortega and J. Peñalosa. "The Spanish economic crisis: key factors and growth challenges in the euro area.", Banco de Espana, 2012, ISSN: 1696-2230 (on line).
[15] V. Matyáš, “There is no money…” Deloitte. Journal of Smart construction. Sept. 2011, pp. 3-4. (on line).
[16] H. Treasury. Reforming Britain's economic and financial policy: towards greater economic stability. Springer, 2001, pp. 203-229.
[17] E. Vitková and T. Semenova, "The Impact of Key Parameters Change on Economic Development of the Company." Procedia Computer Science 64, 2015, pp. 744-749, doi.org/10.1016/j.procs.2015.08.605.
[18] G. E. Halkos and D. S. Salamouris, "Efficiency measurement of the Greek commercial banks with the use of financial ratios: a data envelopment analysis approach." Management accounting research 15.2 (2004): 201-224, doi:10.1016/j.mar.2004.02.001.

[19] V. Bewick, L. Cheek and J. Ball, “Statistics review 7: Correlation and regression.” Critical care, 7(6), 2003, pp. 451. DOI: 10.1186/cc2401.

[20] R. A. Anderson, D.J. Sweeney and T. A. Williams. "Statistics for Business and Economics." St. Paul: West Publishing Company, 1990.