

## **A Cross-sector Analysis of Financial Liquidity: Evidence from Silesian Region, Poland<sup>1</sup>**

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*The paper offers an original and valuable micro-economic perspective of researches within the problem of the financial crisis transmission to the real economy. The research is focused on examining the changes in the financial liquidity of sampled populations of non-financial companies. In particular, we analyze if in the post-crisis period the financial liquidity of companies deteriorated. Our research aims at justifying hypotheses that liquidity level of companies operating in Silesian Region within the period of 2005-2010 changed significantly. Also, we aim at testing whether there are any visible differences between the selected types of sectors as well as between Silesian Region and Poland as a whole. We apply our self-developed analytical method which uses four-elements module of financial liquidity analysis (FLA(M)) and is based on the methodology used in financial ratio analysis. The analysis covers the data collected by the Polish Central Statistical Office from financial statements of non-financial companies. We examine here five populations of companies: all Polish companies and all Silesian companies (as a base for comparison), then Silesian construction, industrial and trading companies. Our analysis shown that in time of crisis the financial liquidity of the examined populations of companies did not deteriorate significantly. In particular, there are no significant differences between trading and industrial companies as compared to all companies operating in Poland, whereas construction companies differ visibly. Financial liquidity in construction companies improves over the analyzed period whereas for other tested branches decreased in time of the appearance of financial crisis and then improved slightly.*

**JEL Codes:** G01, G30, G32

### **1. Introduction**

Recently, the problem of the global financial crisis is a common theme of researches, primarily with regard to its consequences. Most of these studies, however, focus on macro-economic perspective and try to explain the reasons of crisis, the ways in which the crisis spread globally and its possible consequences to the economy. In our study we offer another perspective of examining the consequences of crisis. We focus on micro-economic perspective by analyzing the changes of one, selected aspect of companies' financial performance – the financial liquidity. We associate financial liquidity of companies with their ability to repay current liabilities timely, which is consistent with the approach promoted by corporate finance and financial analysis disciplines.

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The reasons behind the focus on financial liquidity is the common belief that in time of crisis the companies face limited access to capital (in particular short-term borrowings), which may lead to financial distress and disturb their solvency. Moreover, the liquidity problems are considered to have spread on other companies (the domino effect), causing the gridlock of payments.

In particular, the objective of our study is to test a few plausible hypotheses about the deterioration of financial liquidity in selected samples of companies operating in Poland and in Silesian Region, with cross-sector comparisons. For that purposes we use self-developed analytical module (FLA(M)) which consists of four elements, based on the methodology used in financial ratio analysis.

The remainder of the paper is organized as follows. In the second section we present brief literature review within the approaches to analysis of crisis consequences. In the section three we present methodology of our researches, together with the examined variables embodied in selected financial ratios and the characteristics of sampled data. In section four we present the findings which are then discussed in section five. In section six we conclude our study.

## **2. Literature Review**

In the literature, both the reasons and the consequences of financial crises are widely discussed, mostly from macroeconomic perspective. An interesting course of these researches addresses crisis contagion (Bekaert et al., 2005). This problem is being revised mostly with regard to cross-national contagion through financial markets. Various types of contagion channels are being distinguished. Among these the channel based on herding (information cascade), financial linkages and trade linkages remain often disputed (Kaminsky et al., 2003; Classens and Forbes, 2001; Abd Majid and Hj Kassim, 2009; Račickas and Vasiliuskauskaitė, 2011; Gray, 2009; Kali and Reyes, 2009; Eichengreen and Rose, 1999; Dungey et al., 2011).

Crisis contagion is also being associated with crisis transmission from financial to the real sphere of the economy. The first studies over the crisis contagion to real economy appeared in the period of Great Depression. The recent global crisis prompted many researches to revise this problem both in general and with regard to particular economies (Cardarelli et al., 2008; Blot et al., 2009; Antony and Broer, 2010; Dolington and Roger, 2010; Boorman, 2009). Some of these studies address the situation of CEE countries, including Poland (Kaluza, 2010; Gray, 2009; Kizys and Pierdzioch, 2011; Frank and Hesse 2009).

Based on these studies we have decided to undertake the problem of crisis transmission to the real sphere of the economy and its consequences for the financial situation of the business entities operating in the Silesian Region (Voivodship), Poland.

We focused on Silesian Region as it is very specific fro two domain reasons. First, it is highly industrialized and its current situation relies heavily on its history. Silesia evolved into a distinctive region in 1740-1742 (Kamusella 2005). Since then, due to innovations, the mining of metals and coal developed increasingly. However, after the Second World War, the Polish part of this region was nationalized and then exploited by extensive development of heavy industry (Greiner 2011; Krämer 2001). In the wake of

transformations, the heavy industry required restructuring process which raised numerous problems and social issues (Szczepanski and Thomas 2004; Gorzelak 2002).

Second, Silesian Region still contributes significantly to the Polish economy. The region produces significant portion of GDP (13% in 2010, in addition in 2010 GDP per capita in Silesian Region was 39,2 thousands of PLN and was higher than the average for Poland). In the region lives 4,6 million persons (12,2% of the total population of Poland, giving the 2nd place in Poland) and 41% of these is employed in the industry (particularly in: manufacturing, mining and quarrying). At the same time the Silesian Region remains relatively small as its surface covers only 3,9% of Poland (Statistical Office in Katowice 2011).

The existing literature, as mentioned above, is usually focused on macro-perspective. Contrary to these studies, we applied a micro-perspective of analysis, which is directed to the examination of clearly selected aspect of companies' financial performance – their financial liquidity. Liquidity remains a valid indicator of company's financial strength. A constant deterioration of liquidity or its visible fluctuations often indicate the growing risk of bankruptcy. In the period of financial crisis (and its consequences with limited access to short-term funds), the problems of liquidity may significantly arise. The changes in the liquidity level in times of crisis are analyzed among others in: (Chen & Mahajan 2010; Lins, Servaes & Tufano 2010; Ivashina & Sharfstein 2010; Jimenez, Lopez & Saurina 2009) but mainly from the bank borrowings availability perspective and its influence on the corporate financial decisions. Comparing to these types of studies, our research brings original point of view by using cross-sector and cross-regional perspective.

### 3. Methodology

#### 3.1 Selection of Variables

Our micro-perspective approach of analysis is based on the observation of a set of financial ratios typically used in financial ratio analysis. Thus, the analyzed variables and the research design are based on the application of the module developed for financial liquidity analysis, hereafter denoted as FLA(M). FLA(M) is a set of the following elements:

$$FLA(M) = (FLA\_1, FLA\_2, FLA\_3, FLA\_4)$$

and

$$FLA\_1 = \frac{CA}{CL},$$

$$FLA\_2 = \frac{(CA - INV)}{CL},$$

$$FLA\_3 = \frac{C}{CL},$$

$$FLA\_4 = \frac{NWC}{A}, \text{ where } NWC = CA - CL = FC - FA$$

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where: *CA* - current assets, *CL* - current (short-term) liabilities, *INV* - inventories, *C* - cash & cash equivalents (short-term investments); *NWC* - net working capital, *A* - assets (capital) in total, *FC* - fixed capital (the sum of equity and long-term debt), *FA* - fixed assets.

The ratios applied in the FLA module are commonly used in the liquidity risk assessment based on the balance sheet information and reflect static approach to liquidity analysis (as opposed to dynamic one which is based on cash flows) (Shapiro and Balbirer, 2000; Baker and Powell, 2005; Fabozzi and Peterson, 2003). The FLA\_1, FLA\_2 and FLA\_3 are designed to assess the ability of the company to cover its current liabilities. The FLA\_4 is designed to examine the sources of funds financing current assets.

The FLA\_1 (the current ratio) is computed as the relation of company's current assets to its current liabilities. The recommended level of this ratio should be based on the average achieved by the industry the company operates in. However, the general recommendations range between 1,2-2,0 (Sierpińska and Jachna 2007). If the ratio is lower than 1,2 the problems with paying liabilities on time may arise, indicating high level of liquidity risk. The ratio above 2 is assessed negatively as it indicates over-liquidity which reduces the effectiveness (cash is tied up rather than being invested in operating cycle). From the point of view adapted in this study, over-liquidity is not judged negatively and we assume illiquidity if FLA\_1 reaches values below 1 (which is a border-line in terms of financial stability requirements).

The FLA\_2 (the quick ratio or acid test) extends information provided by the FLA\_1. It is computed as relation of current assets less inventories to current liabilities and informs about company's ability to pay short-term debt with most liquid assets: receivables and cash tied in short-term investments. This ratio is also industry-dependant, however it is commonly recommended to keep it around 1 to reduce liquidity risk.

The FLA\_3 (cash ratio) deepens the analysis and informs about the part of current liabilities that can be covered by cash and cash tied in short-term investments. There is no recommended level of this ratio, however the higher, the better for the liquidity maintenance.

The FLA\_4 is computed as the relation of the net working capital to total assets. Net working capital represents the part of current assets that is financed by long-term sources of funds in the form of fixed capital. High level of FLA\_4 indicates that net working capital has significant importance in financing company's assets. Thus, additional liquidity reserve exists and the level of the liquidity risk is reduced. There might be a situation that net working capital is negative which indicates serious problems with liquidity maintenance and is simultaneously indicated by the FLA\_1 below 1 as the border level.

### **3.2 The Applied Data**

For the purposes of our analysis we use aggregated financial data that are gathered on a regular basis by the Polish Central Statistical Office (GUS). These data cover almost all key financial categories from companies' balance sheets and income statements. The GUS databases do not include cash flow statements, that is why we do not enlarge

our analysis with dynamic liquidity (and we rely on the above presented static measures: FLA\_1, FLA\_2, FLA\_3 and FLA\_4).

The GUS collects data derived from annual financial reports and two statistical reports required in Poland: F-02 financial report and F-03 report on the state and flow of the fixed assets. The GUS database covers companies with 10 and more persons employed. Among these there are both companies keeping accounting ledgers or revenue and expense ledgers. Data provided by the GUS are aggregated and structured according to numerous criteria, including regional context (Polish Central Statistical Office, 2006-2011; Statistical Office in Katowice; 2006-2011). Thus, it was possible to extract data for companies operating in Silesian Region.

The data applied in our analysis cover the period of 2005-2010. In particular, we treat 2005 and 2006 as pre-crisis observations, and 2009 and 2010 as post-crisis observations.

### 3.3 Research Design

From databases of the GUS we extracted aggregated financial data to compute analyzed variables (ratios). As we are focused on the cross-industry differences, we formed the following basic populations of companies:

- population *IS* – Silesian industrial companies;
- population *CS* – Silesian construction companies;
- population *TS* – Silesian trading companies.

For each of these populations we computed selected financial ratios. As the GUS data are aggregated within particular financial categories, the results of computed ratios should be treated as reflecting a 'typical' (average) company in each branch.

Our analysis is focused on cross-industry differences; however we compare the results with the general tendencies that characterize two populations:

- population *P* – all Polish non-financial companies;
- population *S* – all Silesian non-financial companies.

The number of companies in each of the analyzed populations is provided in table 1. The size of the analyzed samples is dictated by the number of companies belonging to particular category included in the GUS database.

**Table 1: Number of companies in the analyzed populations**

| Population | Number of companies |       |       |       |       |       |
|------------|---------------------|-------|-------|-------|-------|-------|
|            | 2005                | 2006  | 2007  | 2008  | 2009  | 2010  |
| <b>P</b>   | 46396               | 47048 | 48165 | 53847 | 53148 | 53220 |
| <b>S</b>   | 6150                | 6042  | 6341  | 6740  | 6823  | 6751  |
| <b>CS</b>  | 638                 | 642   | 704   | 832   | 813   | 823   |
| <b>IS</b>  | 2121                | 2083  | 2178  | 2206  | 2202  | 2211  |
| <b>TS</b>  | 1773                | 1712  | 1765  | 1930  | 1863  | 1848  |

Source: own elaboration based on the Polish Central Statistical Office and Statistical Office in Katowice; reports 2006-2011.

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In order to support our findings within the changes of liquidity level we used basic descriptive statistics (the mean  $\bar{x}$ , the maximum value  $X_{max}$  and the minimum value  $X_{min}$ , the range  $R$ , the standard deviation  $S(X)$  and the coefficient of variation  $V(X)$  – the computations provided in annex 1).

Assuming that the problem of financial liquidity is believed to arise in time of crisis (as indicated in literature review section), our research aims at testing the following plausible hypotheses:

**H1:** in the period of financial crisis the level of liquidity indicated the deterioration of company's ability to repay timely the current liabilities;

**H2:** financial liquidity ratios are worse after 2008 as compared to 2005-2006 in all examined populations of companies;

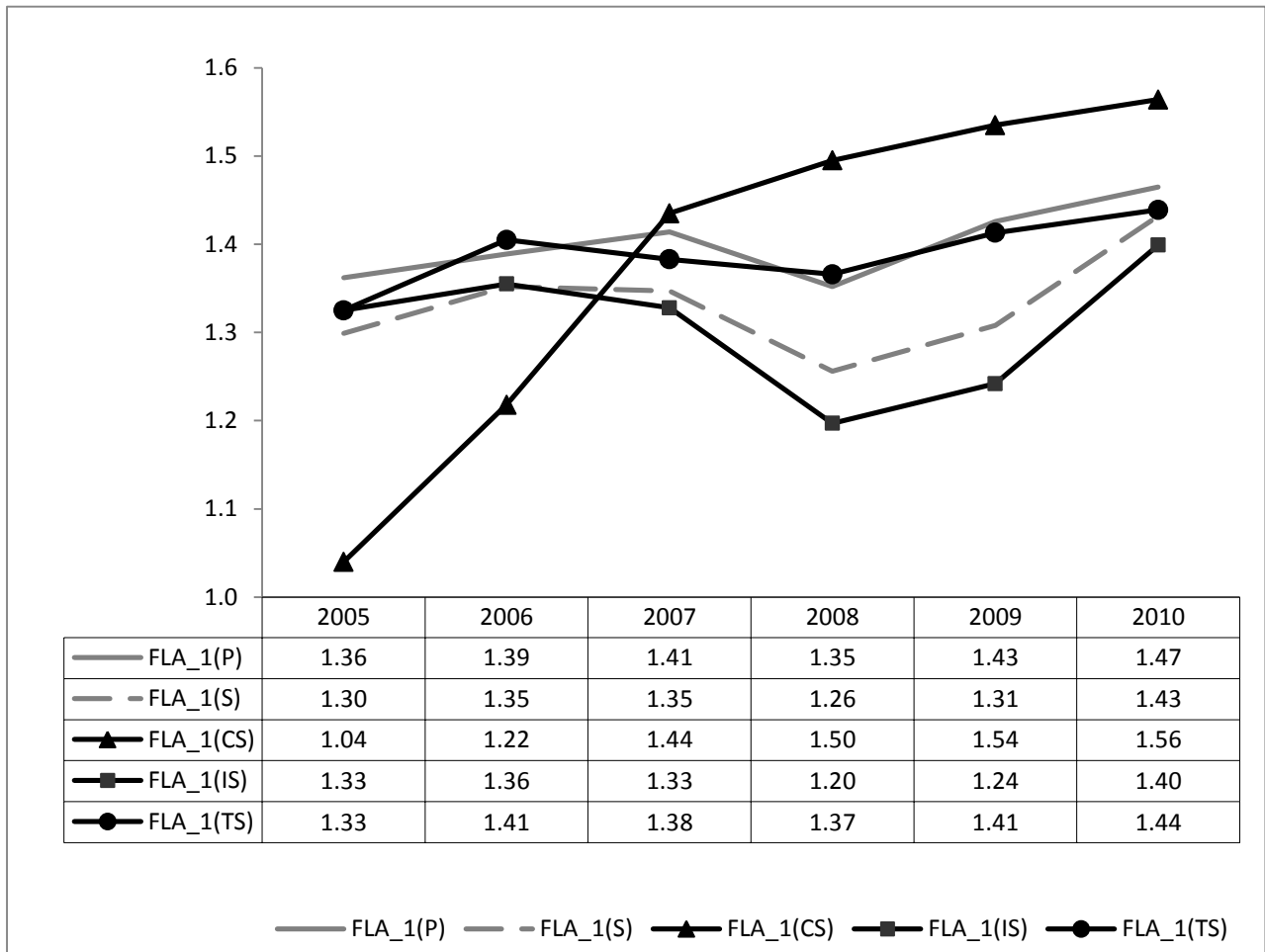
**H3:** the potential problems with maintaining liquidity are greater in the companies operating in Silesian Region as compared to all companies operating in Poland;

**H4:** the highest level of liquidity risk can be observed in the Silesian industrial companies.

### 4. Results

The results of FLA\_1 (current ratio) for all compared populations of companies are presented in Fig. 1. The first conclusion is that in all companies the FLA\_1 was visibly higher than the border level of 1.

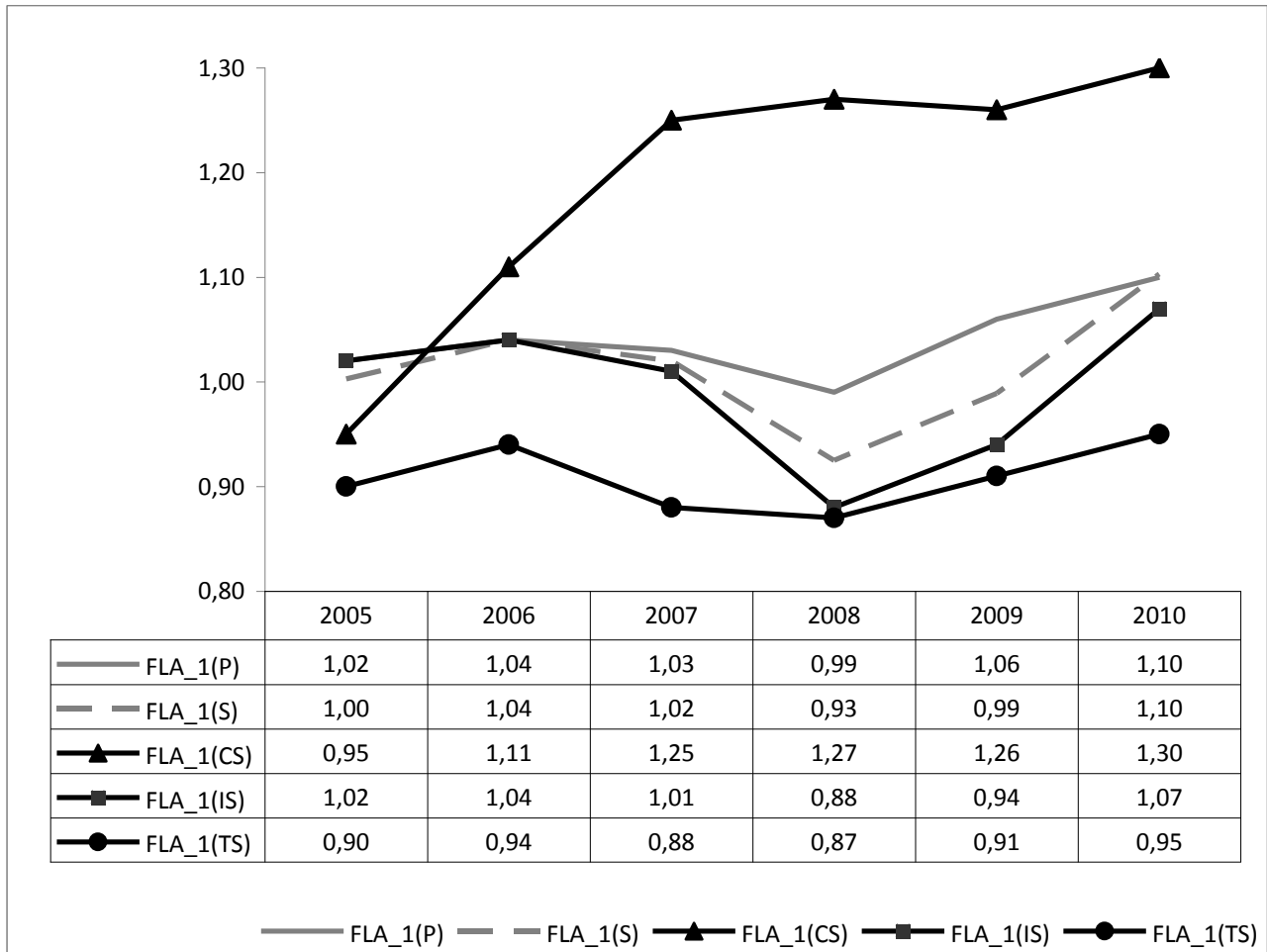
Figure 1: Results of FLA\_1 for analyzed populations



The FLA\_1 followed the same trend of changes in populations *P*, *S* and *IS*, with the lowest levels of liquidity observed in 2008, and then - improvement in 2010 with values comparable to these in pre-crisis observations (2005-2006). The fluctuations of FLA\_1 are more relevant in populations *S* and *IS* as compared to population *P* (see statistics in annex 1). The *TS* population managed to maintain similar level of liquidity over the analyzed period (also reflected in relatively low range and standard deviation). The FLA\_1 in population *CS* follows contrary trends which indicate continuous improvement. It proves that in the post-crisis as compared to pre-crisis period, the Silesian construction companies managed to improve their liquidity significantly.

The results of FLA\_2 (quick ratio) for all compared populations are presented in Fig. 2. As in case of FLA\_2, the *P*, *S*, *IS* and *TS* populations follow similar pattern of liquidity changes whereas *CS* population achieved visible upward trend.

Figure 2: Results of FLA\_2 for analyzed populations

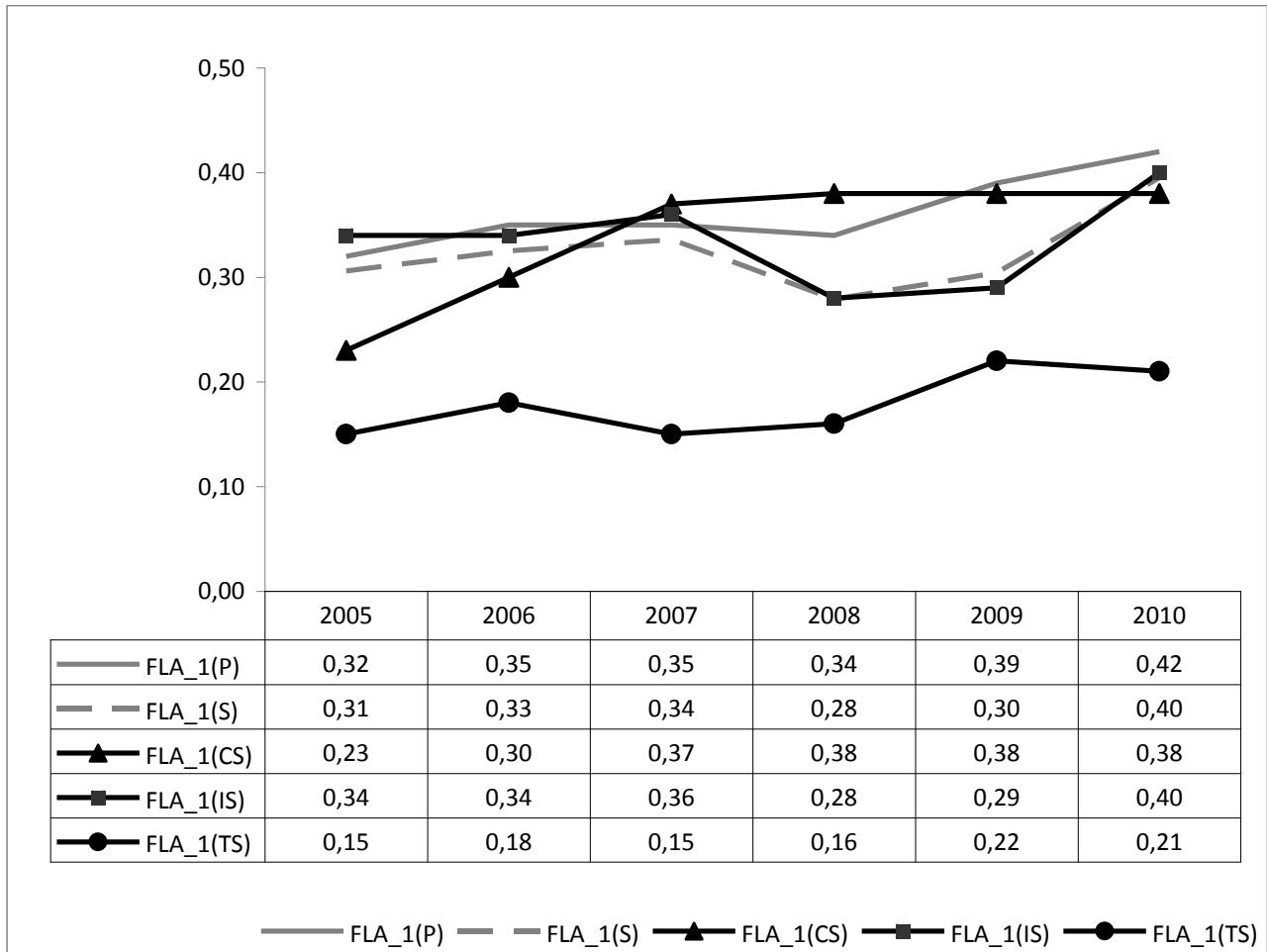


The changes of FLA\_2 reflect similar trend in population *P*, *S* and *IS*, however in 2008 the drop of liquidity was the highest in population *IS*. In 2010 all these populations managed to reach comparable level of liquidity - almost equal to these achieved in 2005 and 2006. The FLA\_2 was the lowest in *TS* population, with values below 1. Also, the fluctuations of the ratio were not so significant as compared with population *S* and *IS* (see range and standard deviation in annex 1). However, taking into account the level of FLA\_2 in *TS* population the liquidity maintenance should be assessed positively. As mentioned, construction companies follow a different trend of liquidity level. The achieved levels of FLA\_2 as compared to FLA\_1 indicate, however, that the increase of liquidity is not dependant on the increase of inventories.

The results of FLA\_3 (cash ratio) analysis – presented in Fig. 3 – indicate that apart from *TS* and *CS* populations, ability to cover current liabilities by most liquid part of assets remained on a comparable level in the whole analyzed period.



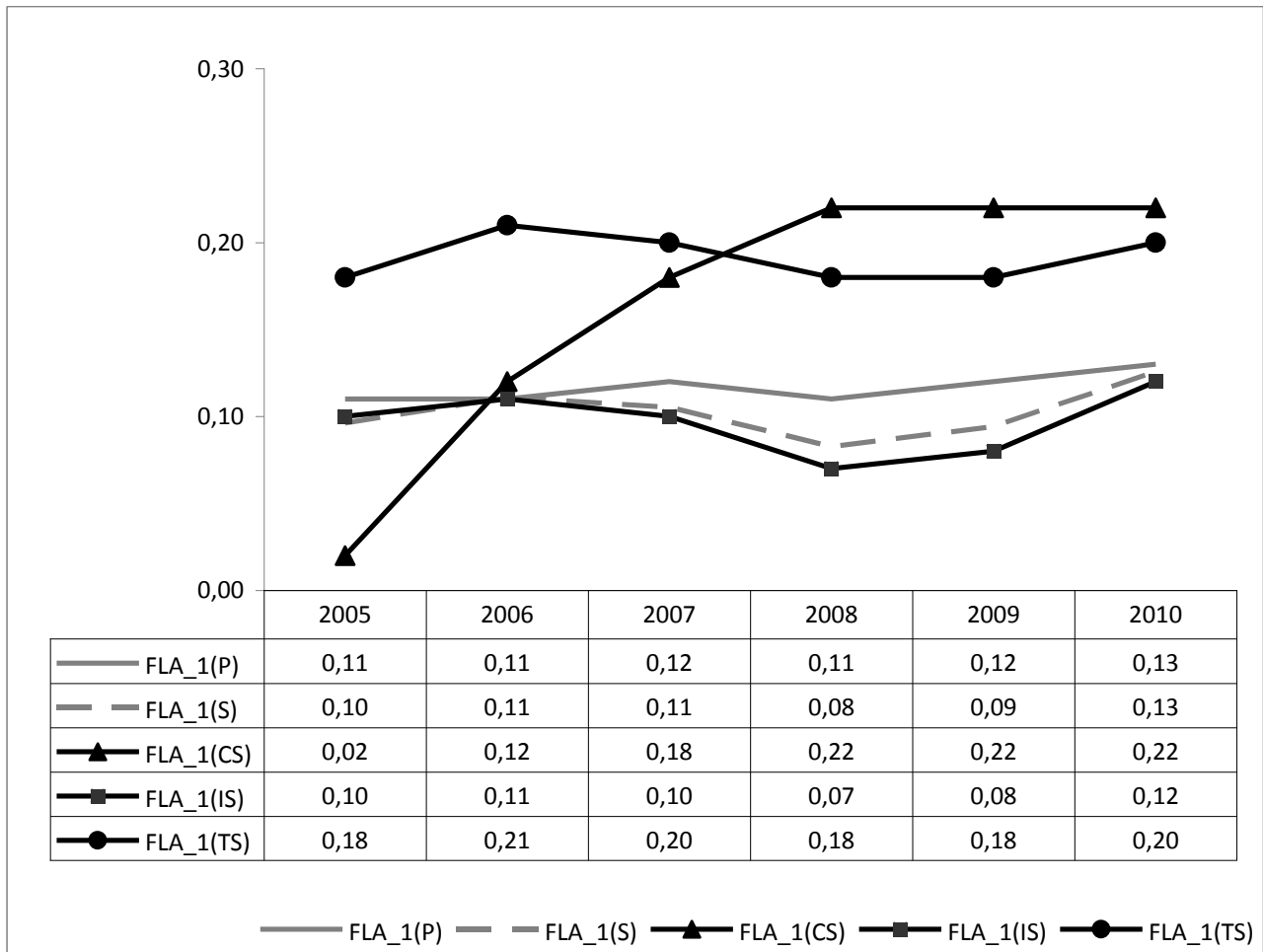
Figure 3: Results of FLA\_3 for analyzed populations



In case of population *S* and *IS* a slight deterioration is observed in 2008 and 2009. The *CS* population notes an upward trend, however in 2010 the *FLA\_3* of *P*, *S*, *IS* and *CS* populations remains on a comparable level of c.a. 35-40%. In the *TS* population the ratio relied on significantly lower level, ranging between 14,8% and 21,8%. However, these results should not be interpreted negatively due to the specifics of trade branch.

The analysis of *FLA\_4* (net working capital to total assets) leads to slightly surprising conclusions (see Fig. 4). According to literature, net working capital and its relation to assets is often low, but acceptable in companies operating in trading (Sierpińska and Jachna, 2007). Our analysis indicates that over the analyzed period the *FLA\_4* remained significantly higher for *TS* population as compared to *P*, *S* and *IS* (where the ratio with the values c.a. 10% does not fluctuate significantly). In addition, the changes of *FLA\_4* in population *P*, *S*, *IS* and *TS* follow similar pattern: slight improvement in 2006, slight deterioration in 2007 and 2008 and once again slight improvement in 2009-2010.

Figure 4: Results of FLA\_4 for analyzed populations



The data lead to conclusion that on average *IS*, *P* and *S* populations tend to keep low level of net working capital, which increases their risk of liquidity. In case of *CS* population the *FLA\_4* supports previous conclusions about the increase of liquidity. In *CS* population on average the level of *FLA\_4* increased, from barely 2% to about 22%. It is significant, that in *CS* population the continuous improvement of all analyzed liquidity parameters was observed to 2008 and then remained relatively stable.

## 5. Discussion

As outlined previously, there were four plausible hypotheses concerning the differences of liquidity levels in pre- and post-crisis periods, addressing the examined populations of companies, including their industry affiliation. The results lent some support to first, third and fourth hypothesis, but no evidence was found to support the second one.

In line with the first hypothesis stating that in the period of financial crisis the level of liquidity indicate the deterioration of company's ability to repay timely current liabilities we found only partial evidence. In case of all Silesian companies (population *S*), Silesian industrial companies (population *IS*) and Silesian trading companies (population *TS*) as compared to all Polish companies (population *P*), we found that the examined ratios (*FLA\_1*, *FLA\_2*, *FLA\_3* and *FLA\_4*) followed similar patterns of fluctuations with a slight deterioration observed in 2008 and 2009. Silesian companies

operating in construction sector (population *CS*) followed different pattern of liquidity changes, with visible improvement till 2008, and then stabilization in 2009-2010.

The research lent no support to the second hypothesis stating that liquidity ratios are worse after 2008 as compared to 2005-2006 in all examined populations. In the construction sector we observed a continuous improvement of liquidity. In industry and trading sector, as well as for all Silesian and all Polish companies on average, we observed that there was a decrease of liquidity ratios in 2008-2009, but all ratios improved in 2010 visibly and reached levels comparable (or even better) to their values in the pre-crisis period of 2005-2006.

Our research lent some support to the third hypothesis stating that the potential problems with maintaining liquidity are greater in the companies operating in Silesian Region as compared to all companies operating in Poland. In population *S* (all Silesian companies) liquidity ratios in 2008 and 2009 remained at significantly lower levels as compared to population *P* (all Polish companies). The differences were even more visible in case of the *IS* population, where liquidity ratios remained on lower levels as compared to population *S*.

The research lent some support the fourth hypothesis about the highest level of liquidity risk to be observed in the Silesian industrial companies. As mentioned previously, in case of Silesian construction companies the level of liquidity improved significantly over the analyzed period. In case of Silesian trading companies, the level of *FLA\_1*, *FLA\_2* and *FLA\_3* is lower as compared to population of Silesian industry companies. However, the differences are not that significant. With regard to *FLA\_4* it is clear that Silesian industrial companies bear the highest risk of liquidity, as the levels of net working capital are very low as compared to trading companies.

## **6. Conclusions**

Our analysis aimed at revealing whether there are any visible changes of the core liquidity ratios observed in the population of companies operating in Silesian Region (including the cross-sector data) as compared to population of companies operating in Poland. The study contributes to the existing body of knowledge by providing some evidence on the changes of liquidity in the analyzed populations of companies, which contradict the common belief of deterioration of liquidity in post-crisis period. Additionally, the study contributes to the discussion over the consequences of crisis by providing some original conclusions addressing regional context – Poland and Silesian Region.

In general, the results of our analysis indicate that the liquidity of all Silesian companies on average, as well as in the Silesian industry and trade, did not deteriorate significantly in the period of crisis. The tested liquidity ratios decreased visibly in 2008-2009, but then in 2010 most of the cases reached the comparable or even better levels than in the pre-crisis period of 2005-2006. Quite surprisingly, we discovered that the companies operating in Silesian construction sector managed to improve significantly their liquidity in 2005-2008 and to maintain good liquidity condition on a relatively stable level till 2010.

By providing an original field of analyzing the consequences of crisis from the micro-perspective of companies operating in different sectors, the study offers a chance to

apply the methodology for similar purposes on other populations of companies, creating a platform of comparison on multinational, national, regional and even individual levels. We believe that cross-country comparative studies may contribute to the researches over the consequences of crisis to the companies as a part of real economy. The presented analytical module may be easily adjusted by the extension with other applicable financial ratios.

## **Endnote**

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