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BANK LIQUIDITY AND PROFITABILITY IN THE POLISH BANKING SECTOR

Summary

Liquidity and profitability are two very important aspects of the banking business. The aim of this paper is to thoroughly evaluate the development of bank profitability and liquidity in the Polish banking sector and to analyze the link between profitability and liquidity ratios with the use of correlation analysis over the period 2007-2013. Liquidity of the Polish banking sector has decreased during this period. Small banks are the less liquid, the most dependent on other sources of funding and their net interbank position is the most vulnerable. Profitability of Polish banks could be higher. With the exception of interest margin, profitability increases with size of the bank. The values of the Pearson's correlation coefficient showed mixed results: the links between profitability and liquidity ratios differ among individual groups of banks.

Key words: *profitability ratios, liquidity ratios, commercial banks, correlation analysis*

Introduction

Traditionally, banks are companies which take deposits and provide loans, and make profit by the difference between the costs of the deposits and the earnings from the loans. Or in other words, the fundamental role of banks is to transform short-term deposits into long-term loans. However, due to this transformation, banks not only create profit but they are exposed to liquidity risk. Therefore, it is evident that all banks should be managed in such a way that they achieve certain profitability while maintaining certain liquidity (and solvency as well).

Previous studies focused separately on the development of profitability ratios and on development of liquidity ratios¹ in the Polish

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¹ Vodová, P., *Liquidity risk of banks in the Visegrad Countries. An empirical analysis of bank liquidity, its determinants and liquidity risk sensitivity*, Lambert Academic Publishing, Saarbrücken 2013.

banking sector. However, it could be very interesting to study these two important groups of ratios together. The aim of this paper is therefore to thoroughly evaluate the development of bank profitability and liquidity in the Polish banking sector and to analyze the link between profitability and liquidity ratios with the use of correlation analysis over the period 2007-2013. Attention will be also paid to the size of the bank and its impact on bank profitability and liquidity.

The paper is structured as follows: Introduction; Section 1 which characterizes profitability and liquidity ratios as a tool for profitability and liquidity measurement; Section 2 which describes data and methodology used; Section 3 focuses on the development of selected ratios and the links between them; Conclusions which contain the summary of main findings.

1. Liquidity and profitability ratios

The bank must be liquid at any time. Liquidity means the ability of a bank to meet its obligations due at any time, especially to repay customer deposits or to make a payment on the client's order. Liquidity ratios are one of the possible tools to measure the liquidity risk (i.e. the risk that a bank would not have enough liquidity).

Liquidity ratios are various balance sheet ratios which should identify main liquidity trends. These ratios reflect the fact that the bank should be sure that appropriate, low-cost funding is available in a short time. This might involve holding a portfolio of assets than can be easily sold (cash reserves, minimum required reserves or government securities), holding significant volumes of stable liabilities (especially deposits from retail depositors) or maintaining credit lines with other financial institutions.

From the variety of possible liquidity ratios, three most important and most commonly used ratios will be given close attention: (i) liquid asset ratio, (ii) loan to deposit ratio, (iii) net interbank position.

Liquid asset ratio (LAR) is the share of liquid assets on total assets. As the BankScope measure of liquid assets is used, the term "liquid assets" includes cash, government bonds, short-term claims on other banks (including certificates of deposit), and where appropriate the trading portfolio. This ratio should give information about the general liquidity shock absorption capacity of a bank. As a general rule, the higher the ratio, the higher the capacity to absorb liquidity shock, given

that market liquidity is the same for all banks in the sample. Nevertheless, a high value of LAR may be also interpreted as inefficiency. Since liquid assets yield lower income liquidity bears high opportunity costs for the bank².

Loan to deposit ratio (LOD) relates illiquid assets (i.e. loans) to liquid liabilities (i.e. deposits). Its interpretation is opposite than in case of the previous ratio. For LOD, the higher this ratio the less liquid the bank. Values of this ratio also provide information which part of loans provided to non-bank clients is financed from clients' deposits. Values lower than 100% mean that loans are fully financed from clients' deposits. Values higher than 100% signal that bank needs also other source of funding such as interbank loans or funds from debt securities issuance. Although large proportions of clients' deposits are in the form of demand deposits, they are generally a stable source of funding. In terms of liquidity risk, banks should prefer lower value of this ratio. High value indicates that the bank is more vulnerable, especially in the event of market turbulence³.

Net interbank position (NIP) captures the activity of banks on the interbank market. Comparing dues from banks with dues to banks, net position of the bank on the interbank market is obtained. If dues from banks are higher than dues to banks, the bank is a net lender on the interbank market. However, if dues to banks are higher than dues from banks, the bank is a net borrower on the interbank market. To be able to compare different-sized banks, it is better to calculate the share of net interbank position in total assets of the bank. The value of this ratio is positive for net lenders and negative for net borrowers. Comparing with clients' deposits, raising funds in the interbank market is significantly more flexible. But due to the low stability of this source of funding (bank is constantly under control of its counterparties which in case of doubts about the financial situation of the bank may not roll over loans), it is more risky. Banks that are net borrowers are thus much more vulnerable⁴.

Profitability means a situation where revenues exceed expenses and the bank generates profit. To make a profit is a prerequisite for the very existence of the bank. In order to measure bank profitability, many profitability ratios can be used. However, three ratios belong to the group

² Ibidem.

³ Ibidem.

⁴ Ibidem.

of most frequently used profitability ratios: (i) interest margin, (ii) return on assets, and (iii) return on equity.

Interest margin (NIM) is the share of net interest income in total assets. NIM is a measure of the difference between the interest income generated by banks and the amount of interest paid out to their lenders, relative to the amount of their assets. NIM is focused on the profit earned on interest activities⁵.

Return on assets (ROA) is the share of net income in total assets. ROA reflects how well the bank management uses the bank's real investment resources to generate profit. Value of the ROA around 1% is considered as positive. When evaluating the results of this ratio, it is possible to use also following recommended values (Table 1).

Table 1. The values of the ROA and the level of bank profitability

Vales of the ROA (in %)	Bank profitability
< 0.75	weak
0.75 – 1.00	below the standard
1.00 – 1.25	good
1.25 – 1.75	very good
> 1.75	excellent

Source: Ziegler, K., Žalman, L., Šperl, J., Mrkva, J., Černý, L., Lukáš, V., Nidetzky, T., 1997. *Finanční řízení bank*. Bankovní institut, Praha, p. 35.

Return on equity (ROE) is the share of net income in own equity of the bank. ROE measures the rate of return on the ownership interest and its value reflects the bank's efficiency at generating profits from every unit of shareholders' equity. So ROE also shows how well the bank uses investment funds to generate earnings growth. ROEs between 15% and 20% are considered desirable⁶.

Profitability and liquidity are interconnected. There should be an inverse relationship between liquidity and profitability because the most liquid assets are also the least profitable. However, the author will test if this theoretical assumption is valid for the current conditions in the Polish banking sector.

⁵ Gul, S., Irshad, F., Zaman, K., *Factors Affecting Bank Profitability in Pakistan*. The Romanian Economic Journal, vol. XIV, issue 39, 2011, pp. 61-87.

⁶ Ibidem.

2. Data and methodology

The author will use unconsolidated balance sheet and profit and loss account data on annual basis over the period from 2007 to 2013, which were obtained from the database BankScope. The data set includes a significant part of the Polish banking sector which is reflected by the share of assets of included banks on total banking sector assets (Table 2). The panel is unbalanced as some of the banks do not report over the whole period of time. Due to the homogeneity of the data set, only data from commercial banks are included and abstracted from branches of foreign banks, mortgage banks, building societies and state banks with special purpose (such as Bank Gospodarstwa Krajowego).

For these banks three liquidity and three profitability ratios will be calculated, as specified in Section 1. Emphasis will be also put on the fact that liquidity and profitability may be different for different groups of banks. Traditionally, banks are divided into three groups: small banks, medium banks and large banks. The criterion is the size of total assets. The author uses the approach of the European central bank⁷, which divides banks into groups according to the share of their total assets on the sum of total assets of all banks from the European Union countries. Banks with total assets greater than 0.5% of the total consolidated assets of EU banks are defined as large banks, while medium-sized banks have total assets of between 0.5% and 0.005% of these total consolidated assets. Banks with total assets of less than 0.005% of the total consolidated assets are considered as small.

It is evident that this approach could not be applied to Polish banks (because of their size). But this approach was modified as follows: large banks are such banks, whose share in total assets of the national banking sector exceeds 6%, total assets of medium banks are between of 2% and 6%, and the share of small banks in the total assets of the national banking sector is less than 2%. This made it possible to compare the results for the Polish banking sector with banks from other countries in future research. In particular years, the sample includes 3–4 large banks, 4–9 medium banks and 12–25 small banks.

⁷ <http://www.ecb.int/stats/money/consolidated/html/index.en.html> (access 30 October 2015).

Table 2. Data set information

	2007	2008	2009	2010	2011	2012	2013
Number of banks	25	30	35	35	34	33	24
Share on total assets (%)	73	73	73	73	72	72	73

Source: Author's calculations based on data from the BankScope and from the European Banking Federation.

Finally, the link between individual profitability and liquidity ratios with the use of correlation analysis will be tested. Correlation analysis enables to determine the closeness of the correlation between two continuous random variables X and Y. The most frequently used tool to measure the correlation's strength is the Pearson's correlation coefficient. It takes the form of:

$$\rho = \frac{s_{XY}}{s_X s_Y}$$

where ρ is the correlation coefficient, s_x is the standard deviation of the variable X, s_y is the standard deviation of the variable Y, and s_{xy} is the covariance of the variables X and Y. Both random variables X and Y must show normal distribution (this condition is met for the studied data). The value of the correlation coefficient ranges at an interval of $\langle -1; +1 \rangle$. The greater the absolute value of the Pearson's correlation coefficient, the more closely both variables are correlated⁸.

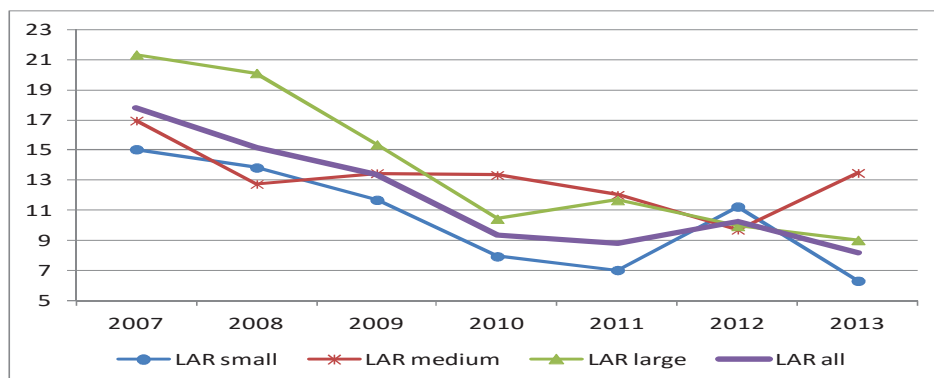
3. Empirical results and discussion

3.1. Trends in liquidity ratios in the Polish banking sector

The median values of the share of liquid assets in total assets (LAR), the share of loans in deposits (LOD) and the share of net interbank position in total assets (NIP) both for all banks in the sample and for groups of small, medium and large banks are presented in Figures 1-3.

⁸ Witte R.S., Witte, J. S., 2009. *Statistics*. 9th ed. Wiley, Hoboken.

Figure 1. Median values of the liquid asset ratio



Source: Author's calculations based on data from the BankScope

As higher value of the liquid asset ratio means higher liquidity, it is evident that bank liquidity in the Polish banking sector has decreased during the analyzed period. Banks financed increased demand for loans both to households and non-financial companies also by reduction of the part of liquid assets in 2007⁹. In 2008, the increase in lending activities continued. However, some important structural weaknesses occurred: due to banks exceeded due from banks and the Polish banking sector as a whole became net borrower in the interbank market; household debts in foreign currency grew rapidly, up to more than 25% of total loan portfolio¹⁰; and a very high loan to deposit ratio (which will be analyzed later in this section). The slight improvement of bank liquidity in the following years was caused by the fact that banks tightened their credit standards and held more government securities in response to the financial crisis¹¹. The lowest share of liquid assets in total assets had mainly Toyota Bank, Euro Bank and Santander Consumer Bank. These banks strongly focused on lending activity. But not only high lending activity is the source of low liquidity. In other cases, the volume of liquid assets decreased as a result of reduction of interbank transaction in respective years. Maximum values of the LAR were recorded by

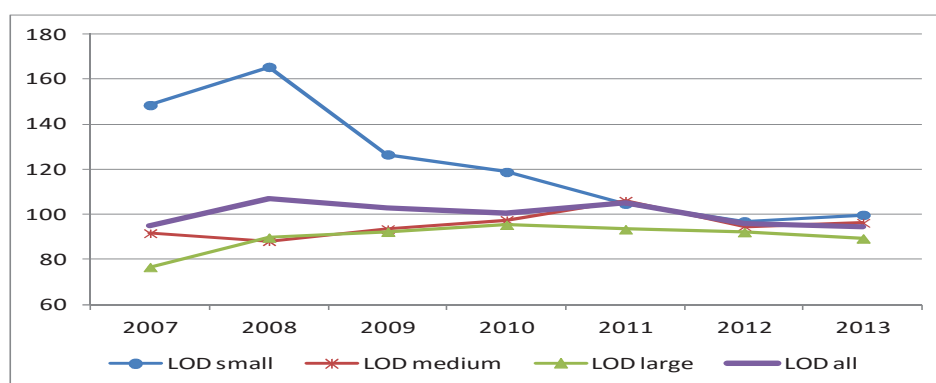
⁹PFSA, 2008. *Report on the condition of Polish banks in 2007*. Polish Financial Supervision Authority, Warsaw.

¹⁰PFSA, 2009. *Report on the condition of Polish banks in 2008*. Polish Financial Supervision Authority, Warsaw.

¹¹PFSA, 2011. *Report on the condition of Polish banks in 2010*. Polish Financial Supervision Authority, Warsaw.

Deutsche Bank Polska or Bank of Tokyo-Mitsubishi. These banks are focused primarily on trading on interbank market or with securities. Looking at Figure 1, it is also evident that small banks have the lowest liquidity. The level of liquid assets is substantially higher for medium and large banks.

Figure 2. Median values of the loan to deposit ratio

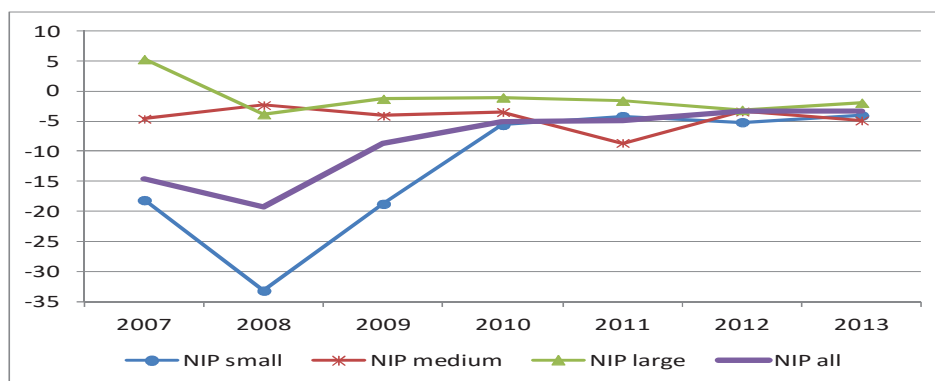


Source: Author's calculations based on data from the BankScope

The loan to deposit ratio provides information which part of loans provided to non-bank clients is financed from clients' deposits. As the median values for all banks in the sample are higher than 100%, it is evident that the majority of Polish banks are dependent on other sources of funding. Only for a few banks such as Alior Bank, Bank BPS, Bank BHZ, Bank Handlowy, Bank of Tokyo-Mitsubishi, Bank Pocztowy, Bank Pekao, Bank Zachodni, Deutsche Bank Polska and ING Bank, clients' deposits are sufficient for financing lending activity. Extremely high dependence on other sources of funding reached Fiat Bank Polska, SGB Bank and Toyota Bank Polska. Large proportion of funds in Poland is given by parent institutions¹². As in case of the LAR ratio, small banks are much more vulnerable than medium and large banks, as their loan to deposit ratio is significantly above average, at least in the first half of the analyzed period (Figure 2). The reason may lie in the fact that depositors had much higher confidence in the safety of large and medium banks during the crisis years. The decrease of deposits in small banks (together with their higher lending activity) made them much more dependent on other sources of funding.

¹² PFSA, 2009. *Report on the condition of Polish banks...* op. cit.

Figure 3. Median values of the net interbank position



Source: Author's calculations based on data from the BankScope

The last liquidity ratio NIP enables to assess the activity of banks in the interbank market. The Polish banking sector is very vulnerable as it is in the position of the net borrower for the whole analyzed period. RCI Bank Polska, SGB Bank and Bank BPS are the largest borrowers. However, it is possible to find banks that are net lenders on the interbank market, such as Bank Pocztowy, Getin Noble Bank, Deutsche Bank or RBS Bank. As reported by the Polish regulatory body¹³, mainly small and medium banks with poorly developed deposit base use funds from the interbank market. This is proved also by the fact that the net interbank position of small banks is the most negative one. Although medium and large banks are (as whole groups) also in the position of net borrowers, their net interbank position is not so negative. This makes them less vulnerable.

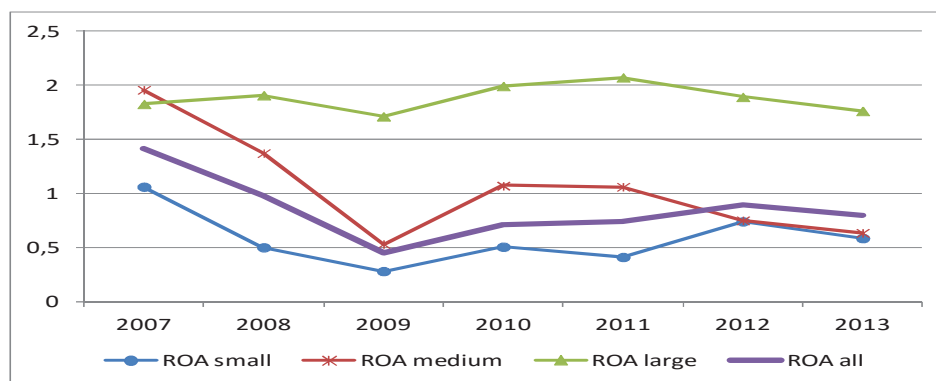
In all cases, the difference between the average level of liquidity of small, medium and large banks is statistically significant, which we confirmed by the results of the analysis of variance for a single factor (ANOVA).

3.2. Trends in profitability ratios in the Polish banking sector

The median values of the return on assets (ROA), the return on equity (ROE) and the interest margin (NIM), again both for all banks in the sample and for groups of small, medium and large banks, are presented in Figures 4-6.

¹³ PFSA, 2008. *Report on the condition of Polish banks...* op. cit.

Figure 4. Median values of the return on assets



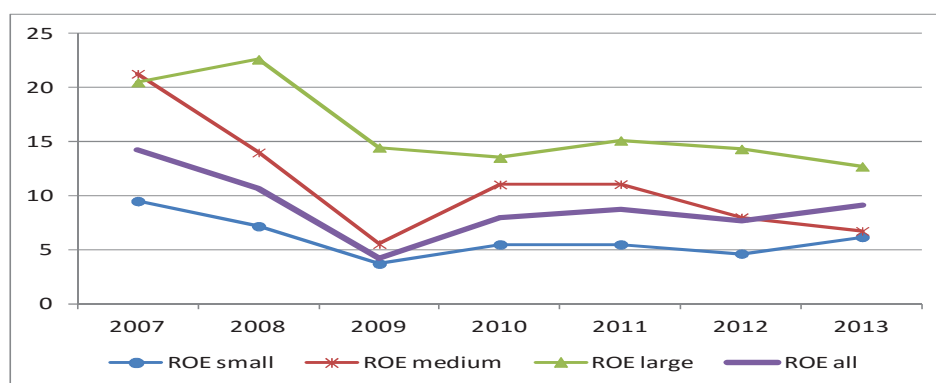
Source: Author's calculations based on data from the BankScope

As can be seen from median values of the ROA ratio for all banks in the sample, although bank profitability measured by this ratio is quite volatile, the values remained higher than 0.5% even in crisis years. However, even these quite positive values should be marked as “below standard” or “weak” (Table 1). Getin Noble Bank, DNB Bank Polska, HSBC Bank Polska or Fm Bank belong to the group of banks with minimum values of ROA; the group of banks with the highest values of ROA consists of Plus Bank, RCI Bank and Santander Consumer Bank. The results also show significant differences among individual group of banks. Profitability of small banks is definitely the lowest; medium and large banks earn much more revenues and their profitability is above average. ROA of large banks is even “very good” or “excellent” (Figure 4). This finding is quite surprising: small banks are the less liquid group of banks so at least sufficient profitability of small banks could be expected.

The development trend of ROE ratio differs significantly from that for ROA. Return on equity of Polish banks significantly fluctuates. As it is known, recommended value for ROE is 15-20%. It is evident that focusing on the banking sector as a whole, this value has not been met. It is not surprising: if the values of ROA are below standard or even weak, we should not expect excellent return on equity. Again, there are significant differences among individual banks in the sample. Exactly the same banks as in case of previous ratio can be mentioned. Recommended values of ROE occurred for example in PKO, Pekao or Bank Zachodni. Focusing on the impact of the size of the bank on the return on equity,

there are similar differences as in case of the ROA ratio: profitability of small banks is significantly below average, ROE for medium banks is slightly above average and the profitability of large banks is the highest (Figure 5).

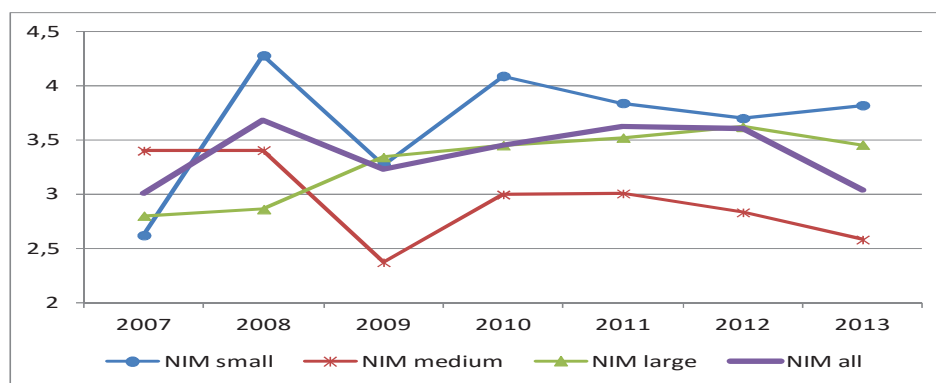
Figure 5. Median values of the return on equity.



Source: Author's calculations based on data from the BankScope.

Net interest margin measures the ability of the bank to earn profit on interest activities. As seen in Figure 6, both the values and the development trend are completely different from two previous indicators. There are banks with high NIM and low ROA, such as Fm Bank. Of course there are also banks with high values of both ratios. As it can be seen, the ratio NIM only reflects the profitability of basic banking activities: accepting deposits and providing loans. However, total profitability of banks, measured by ROA or ROE, is strongly influenced also by other items of costs and revenues, such as fees, commissions, creation of loan loss provisions, personal costs and other. Moreover, the link between size of the bank and its interest margin is not as straightforward as in the case of two previous profitability ratios: interest margin of small banks is above average, the profit of medium banks from interest activities is the lowest.

Figure 6. Median values of the interest margin.



Source: Author's calculations based on data from the BankScope

Also in the case of profitability ratios, the difference between the average level of profitability of small, medium and large banks is statistically significant, which was confirmed by the analysis of variance for a single factor (ANOVA).

3.3. Correlation analysis

The Pearson's correlation coefficients were calculated with the use of correlation analysis within the MS Excel. Results of mutual correlation between each two pairs of financial ratios are recorded in Table 3.

All pairs of ratios where strong correlation was found (i.e. those pairs with the absolute value of the Pearson's correlation coefficient higher than 0.7) are highlighted by grey background. It can be noticed that the least number of strong links is typical for group of all Polish banks. Banks with high values of liquid asset ratio have at the same time very low net position on the interbank market. Moreover, banks with high ROA reach high ROE, too. Focusing on the link between profitability and liquidity, banks with high values of loan to deposit ratio (i.e. banks that are more dependent also on other sources of funding) have high interest margin. This is completely logical, as the business strategy of the group of banks with high share of loans in deposits is oriented primarily on the lending activity.

When banks are divided into three groups according to their size, very different results are obtained. What remained the same is the positive correlation between ROA and ROE ratios, although this link is the weakest for large banks. The relation between ROE and NIM is not

straightforward: positive for medium banks, but negative for all other groups of banks. Also the relations among individual liquidity ratios are mixed. In some cases, strong positive links can be observed, while within another group of banks the result of the Pearson's coefficient is negative.

Table 3. Results of the correlation analysis

	LAR	LOD	NIP	ROA	ROE	NIM	LAR	LOD	NIP	ROA	ROE	NIM
	Small banks						Medium banks					
LAR	1						1					
LOD	0.8	1					-0.3	1				
NIP	-0.8	-0.9	1				0.0	-0.9	1			
ROA	0.5	0.2	0.0	1			0.6	-0.3	0.1	1		
ROE	0.5	0.6	-0.4	0.8	1		0.7	-0.3	0.0	0.9	1	
NIM	-0.5	-0.1	0.1	-0.6	-0.4	1	0.3	-0.3	0.1	0.9	0.9	1
	Large banks						All banks					
LAR	1						1					
LOD	-0.7	1					0.1	1				
NIP	0.5	-0.8	1				-0.9	-0.4	1			
ROA	-0.2	0.4	-0.2	1			0.6	-0.4	-0.5	1		
ROE	0.9	-0.6	0.3	0.1	1		0.5	-0.3	-0.5	0.9	1	
NIM	-0.9	0.7	-0.5	0.2	-0.9	1	-0.2	0.7	-0.1	-0.2	-0.2	1

Source: Author's calculations based on data from the BankScope

However, the aim of the study was primarily to analyze the link between profitability and liquidity ratios. For the group of small banks, any strong link was found. Medium banks with sufficient level of liquid assets (i.e. with high values of liquid asset ratio) reach good profitability (in terms of return on equity). The same link, even stronger, was proved for group of large banks. This relation is not in accordance with standard finance theory which emphasizes negative link between liquidity and profitability. It seems that in case of the Polish banking sector, these results just show that both aspects of the banking business (liquidity and profitability) are important for banks which can be marked as financially stable.

For the group of large banks, one more link was found. Large liquid banks do not profit much from lending activity, as their interest margin is low. This is logical: banks can focus either more on trading with securities and activities on the interbank market (which will reflect in higher level of liquid assets), or on lending to nonbank customers (which

will increase profitability but decrease liquidity). This finding is also confirmed by the positive result of correlation coefficient between LOD and NIM: banks with higher loan to deposit ratio (which probably focus more on lending) reach higher interest margin.

Conclusions

The aim of the paper was to thoroughly evaluate the development of bank profitability and liquidity in the Polish banking sector and to analyze the link between profitability and liquidity ratios with the use of correlation analysis over the period 2007-2013.

Three liquidity (liquid asset ratio, loan to deposit ratio and net interbank position) and three profitability (return on assets, return on equity and interest margin) ratios were calculated for all banks in the sample and for three groups of banks: small, medium and large. Bank liquidity in the Polish banking sector decreased during the analyzed period; partly due to the increased demand for loans both to households and non-financial companies, partly because of important structural weaknesses. Small banks are the less liquid group of banks. Customer deposits are not sufficient for financing of lending activity for the majority of Polish banks. Some other sources of funding are needed. Again, small banks are the most dependent on these other sources of funding. The Polish banking sector is very vulnerable, as it is in the position of the net borrower for the whole analyzed period. Also in this case, the position of small banks is the worst. Profitability measured by the return on assets increases with size of the bank: large and medium banks earn much more revenue than small banks. Although profitability of the banking sector as a whole remained positive even in crisis years, values of both return on assets and return on equity could be higher. Interest margin is the only ratio where small banks are the most successful. Finally, with the use of the Pearson's correlation coefficient, it was possible to focus on the link between profitability and liquidity ratios. For the whole Polish banking sector, banks with high values of loan to deposit ratio have high interest margin. Medium and large banks with high values of liquid asset ratio reach very good profitability. Moreover, large liquid banks have low interest margin. Any strong link for the group of small banks could be determined.

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