Patrycja Chodnicka-Jaworska

University of Warsaw
e-mail: pchodnicka@wz.uw.edu.pl

COMPETITIVENESS AND CONCENTRATION OF THE BANKING SECTOR AS A MEASURE OF BANKS' CREDIT RATINGS

KONKURENCYJNOŚĆ I KONCENTRACJA SEKTORA BANKOWEGO JAKO MIARA CREDIT RATINGU BANKÓW

Summary: The aim of the paper is to verify the impact of the competitiveness of the banking sector and concentration on banks' credit ratings. A literature review was carried out and as a result the following hypothesis was put forward: the bigger the banks from the countries where the banking sector is more concentrated and more competitive, the higher the banks' credit ratings. The analysis was conducted using ordered panel data models on banks' credit ratings with the use of quarterly data on a European banks' sample. Long-term issuer credit ratings given to banks by the three largest credit rating agencies were used as a dependent variable.

Keywords: credit rating, panel data models, concentration, competitiveness.

Streszczenie: Celem artykułu jest weryfikacja wpływu konkurencyjności sektora bankowego i koncentracji na ratingi kredytowe banków. Przygotowano przegląd literatury, w wyniku którego wysunięto następującą hipotezę: im większe banki z krajów, w których sektor bankowy jest bardziej skoncentrowany i bardziej konkurencyjny, tym wyższe ratingi kredytowe banków. Analiza została przeprowadzona przy użyciu uporządkowanych modeli danych panelowych na temat ratingów kredytowych banków z pomocą kwartalnych danych, na próbie banków europejskich. Długoterminowe ratingi kredytowe emitentów nadane bankom przez trzy największe agencje ratingowe zostały użyte jako zmienna zależna.

Słowa kluczowe: ocena wiarygodności kredytowej, modele danych paneli, koncentracja, konkurencyjność.

1. Introduction

The financial crisis in the period between 2007 and 2009 brought a lot of negative consequences for the financial market. Credit rating agencies were among the entities affected. Their reputation was undermined. They have been accused of reacting too slowly to the changes in the financial situation of the rated entities. As a result, one of the main goals of the supervisors has been to reduce the monopoly of credit rating agencies and their significance in estimating default risk – hence, the obligation for banks to use their internal risk-based approach to estimate default risk. They have to prepare their own methods to verify the mentioned risk.

The first regulation considering the mentioned problem had been the Regulation EU No 1060/2009 of the European Parliament and of the Council, changed by the Regulation 462/2013 of 21 May 2013 on credit rating agencies. According to the mentioned law, institutions should rely on their own estimation of the default risk. In practice, during analyses the banks take into consideration also credit ratings, to verify the default risk, as a one of the determinants. The analyses carried out previously suggest that the estimation of default risk prepared by banks themselves gives underestimated results.

And so, the aim of this paper is to verify the impact of the competitiveness of the banking sector and concentration on banks' credit ratings. Taking the mentioned group of entities under consideration is strictly connected with the fact that banks are the main users of credit rating agencies. They use ratings to verify creditworthiness, make investment decisions and when cooperating with banks internationally – in correspondence banking.

Literature review was conducted and as a result the following hypothesis was put forward: the larger the banks from the countries where the banking sector is more concentrated and more competitive, the higher the banks' credit ratings. The analysis was carried out using ordered panel data models on banks' credit ratings with the use of quarterly data on a European banks' sample. No analysis of the impact of the mentioned factors was made for the European banking sector before.

2. Literature review

The problem of determinants of credit ratings is quite popular in the literature. In most cases there are verified factors influencing countries' notes and companies' credit ratings. There is only some research about the impact of determinants on banks' notes. The aim of this paper is to verify the impact of the competitiveness of banking sectors and concentration on banks' credit ratings.

There are three approaches proposed for measuring competition [Claessens 2009]. The first one relies on the measure of the mentioned phenomenon as a concentration of the financial system with Herfindahl indices or the number of banks.

The mentioned approach is strictly connected with the SCP paradigm that relies on the relationship between the structure, conduct and performance. The second one is based on regulatory indicators. The mentioned group of measures takes into consideration entry requirements, formal and informal barriers to entry for domestic and foreign banks, activity, etc. The third set uses formal competition measures, such as the so-called H-statistics. The mentioned group of factors take into consideration the relation of output to input prices.

There is a lot of research, where the degree of competition is measured with the Panzar and Rosse [1987] methodology [Bikker, Spierdijk 2007]. Evidence of monopolistic competition has been found [Wong et al. 2008; Gutiérrez de Rozas 2007; Hempell 2002; Bikker, Haaf 2000], also for emerging markets ([Nakane 2001; Prasad, Ghosh 2005; Yildirim, Philippatos 2007]. Using the Lerner Index, Kick and Prieto [2013] found that market power tends to reduce banks' default probability. In contrast, having used the Boone Indicator, they suggested that an increased competition lowers the riskiness of banks.

The larger banks receive higher ratings than the smaller ones. This can be connected with the opinion in the finance world that larger banks receive financial support from the government in the case of a crisis [Hawkins, Mihaljek 2001]. The same findings are reported by van Loon and de Haan [2015]. They also found that banks that are outside the Euro area receive lower notes. This suggests that it is also the location that has a significant impact on banks' credit ratings.

The analysis by Harris et al. [2015] suggests that banks' credit ratings are determined by the level of regulation restrictiveness. One of the most significant measures are capital requirements. They found that an increase of the mentioned indicator can never decrease welfare if the banking sector's aggregate equity capital does not constrain its ability to fund profitable projects.

According to the opinion of Kiseľáková et al. [2013], the influence on the effectiveness of the banking sector is exerted by effective liquidity management, quality of balance sheet's assets and trends in assets' increase in total with a crucial share of earning assets (loans), efficient management of interest policy and net interest margin, increasing profitability rate in a long term. Most of the mentioned indicators are taken into consideration by credit rating agencies to verify banks' default risk.

In most research the financial indicators that can influence banks' notes have been verified. According to the research by Karminsky and Khromova [2016] CAMEL indicators explain between 62% and 95% of credit rating changes. Cole and White [2012] also pay attention to CAMEL indicators. For the mentioned group of factors, the impact of the capital adequacy, liquidity and earnings factors [Shen et al. 2012; Bissoondoyal-Bheenick reepongkaruna 2011; Chodnicka-Jaworska 2016; Pagratis, Stringa 2007] has been presented. Less popular are the determinants connected with assets' quality [Poon et al. 1999; Chodnicka-Jaworska 2016],

or management quality [Chodnicka-Jaworska 2016]. In the abovementioned previous research macroeconomic factors and their impact on banks' notes were also verified. Bellotti et al. [2011] found that a country's condition significantly influences banks' default risk. Poon et al. [1999] received opposite results. The macroeconomic influence on banks' credit ratings has also been verified by Bissoondoyal-Bheenick and Treepongkaruna [2011].

3. Data and methods description

The analysis of the impact of the competitiveness and concentration of the banking sector on banks' credit ratings was carried out using the long-term issuer credit ratings given by the three biggest credit rating agencies, i.e., S&P's, Fitch and Moody's during the period of 1995-2016. Quarterly data for 118 banks from European countries was used[1]. The data used for the estimation process was collected form the Thomson Reuters Database. The linear decomposition proposed by Feri, Liu and Stiglitz [1999] was used for the estimation. Selecting the mentioned method of decomposition has been strictly connected with the lack of banks' CDS spreads that are needed to use a nonlinear method. The results of estimation are presented in Table 1.

To analyse the impact of the competitiveness and concentration of the banking sector on banks' credit ratings the ordered logistic panel data models were used. The final version of the model is given by equation (1) below:

$$y_{it}^* = \beta F_{it}' + \alpha M_{it}' + \gamma Z_{it} + \delta(F * Z)_{it} + \varepsilon_{it}, \tag{1}$$

where: y_{it}^* is the Fitch Long-term Issuer Rating, S&P's Long-Term Issuer Rating, Moody's Long-Term Issuer Rating given for i European banks for t period of time.

F_{it}' is a vector of explanatory variables, i.e.:

$$F_{it}' = [tier_{i,j}, lev_{i,j}, llp_{i,j}, sec_{i,j}, nii_{i,j}, roa_{i.j}, opl_{i.j}, lg_{i.j}, dg_{i,j},$$
$$dep_{i,j}, sht_{i,j}, liq_{i,j}, ass_{i,j}, dep_{i,j}, gdp_{i,j}, inf_{i,j}, cr_{i,j}],$$

where: $tier_{i,j}$ is the Tier 1 ratio; $lev_{i,j}$ is the leverage ratio; $llp_{i,j}$ are the loan loss provisions as a percentage of average total loans; $sec_{i,j}$ is the value of securities as a percentage of earning assets; $roa_{i,j}$ is the return on assets; $opl_{i,j}$ is the operating leverage; $lg_{i.j}$ is the loan growth; $dg_{i.j}$ is the deposit growth; $dep_{i,j}$ is the ratio of loans to deposit; $sht_{i,j}$ is the value of short-

---

[1] Albania, Armenia, Austria, Belarus, Belgium, Bosna and Herzegovina, Bulgaria, Croatia, Cyrus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Moldova, Monaco, Netherlands, Norway, Poland, Portugal, Romania, Russia, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom.

-term borrowing to total liabilities, $liq_{i,j}$ is the value of liquid assets to total assets; $ass_{i,j}$ is the logarithm of the total assets; $gdp_{i,j}$ is the GDP growth; $inf_{i,j}$ is the inflation and $cr_{i,j}$ is the country's credit rating given by a particular credit rating agency (Fitch Long-term Issuer Rating, S&P's Long-Term Issuer Rating, Moody's Long-Term Issuer Rating).

Table 1. Linear decomposition of Moody's, S&P's and Fitch long-term issuer credit ratings

Moody's Long-Term Issuer Rating		S&P's Long-Term Issuer Rating		Fitch Long-Term Issuer Rating	
Rating	Code	Rating	Code	Rating	Code
Aaa	100	AAA	100	AAA	100
Aa1	95	AA+	95	AA+	94.74
Aa2	90	AA	90	AA	89.47
Aa3	85	AA–	85	AA–	84.21
A1	80	A+	80	A+	78.95
A2	75	A	75	A	73.68
A3	70	A–	70	A–	68.42
Baa1	65	BBB+	65	BBB+	63.16
Baa2	60	BBB	60	BBB	57.89
Baa3	55	BBB–	55	BBB–	52.63
Ba1	50	BB+	50	BB+	47.37
Ba2	45	BB	45	BB	42.11
Ba3	40	BB–	40	BB–	36.84
B1	35	B+	35	B+	31.58
B2	30	B	30	B	26.32
B3	25	B–	25	B–	21.05
Caa1	20	CCC+	20	CCC	15.79
Caa2	15	CCC	15	CC	10.53
Caa3	10	CCC–	10	C	5.26
Ca	5	CC	5	RD	–5
C	0	NR	0	D	–5
WR	–5	SD, D	–5	WD	–5
NULL	0	NULL	0		

Source: own study.

M'_{it} is one of the explanatory variables, i.e.:

$$M'_{it} = [con_{i,j}, bankcon_{i,j}, reg_{i,j}, boone_{i,j}, hstat_{i,j}, lerner_{i,j}],$$

where: $con_{i,j}$ is the 5-bank assets concentration; $bankcon$ is the bank concentration; $reg_{i,j}$ is the regulatory capital to risk weighted assets; $boone_{i,j}$ is the Bonne indicator; $hstat_{i,j}$ is the H-statistic indicator; $lerner_{i,j}$ is the Lerner indicator; T_t is a vector of year-dummies; μ_j is an unobservable time-invariant bank's effect.

4. Findings

The analysis of the impact of the concentration and the competitiveness of banks on their credit ratings was started with descriptive statistics analysis. The received results are presented in Table 2.

Table 2. Descriptive statistics

Variable	Observations	Mean	Std. dev.	Min	Max
opl	6,125	2.065091	375.8041	−21059.2	10346.1
lev	6,702	15.86557	41.21953	−916.6667	1944.444
llp	5,379	0.9817801	38.02288	−939.181	2524.49
tier1	3,125	11.85822	4.407446	1	52.3202
dep	6,044	34.2422	950.0079	−0.037852	59681.4
sec	6,008	20.38771	16.94233	0	129.026
roa	6,442	0.1944293	3.080577	−94.7601	49.4816
liq	6,703	0.2647782	0.1628054	0	1.329167
lg	5,657	0.0156321	0.2433758	−6.955236	3.999034
dg	5,601	0.0213583	0.3295184	−8.351819	8.321701
sht	6,152	1.211432	15.1379	−3.307692	382.3529
fitch	4,516	22.36469	37.68147	−5	94.7368
sp	5,123	67.36775	24.02625	−5	100
moody	1,404	78.57906	19.50182	−5	100
ass	7,067	23.17477	2.511739	14.19751	28.5525
cr_sp	17,238	74.83786	26.43105	−5	100
cr_fitch	16,081	25.25069	42.54353	−5	100
cr_moody	13,821	67.01415	28.37377	0	100
gdpg	18,355	2.282583	3.53236	−16.43029	13.8265
cpi	18,222	205.4448	631.5867	36.8	6739.645
con	18,676	76.56844	18.92294	30.24355	100
concentr	19,340	66.52374	21.21406	22.53471	100
reg	18,980	14.84443	3.630104	6.6	41.8
boonne	18,056	−0.0837476	0.1253851	−0.9516279	0.4021392
hstat	5,732	0.6545639	0.1287149	0.289	1.11
lerner	18,864	0.1994715	0.1299511	−1.60869	0.6283482

Source: own study.

The next step was to verify the impact of the financial indicators on banks' credit ratings. The first group of measures taken into consideration were capital adequacy indicators. From the mentioned factors the Tier 1 ratio and the leverage ratio were distinguished. The first of these variables has a statistically significant impact on banks' credit ratings. If the mentioned factor rises, the banks' notes are higher. The strongest reaction to Tier 1 ratio was noticed in the case of Fitch notes, and the lowest – for S&P's credit ratings. This can be strictly connected with the quality of

the portfolio of the rated entities. The leverage ratio statistically significantly positively influences Moody's credit ratings. For the rest of notes the mentioned variable is unimportant.

The next group of determinants was the assets quality indicator – the loan loss provisions as a percentage of the average total loans. In the case of Moody's and S&P's credit ratings a positive impact of the mentioned variable on banks' notes was observed. Only Fitch credit ratings reacts negatively to the changes of this factor. The mentioned relationship may be connected to the same reason as in the previous case. Management quality indicators comprise the value of securities as a percentage of earning assets. The impact of this factor is statistically significant but the coefficient equals nearly zero, so the sensitivity of the credit ratings is weak.

From the group of earnings' indicators, the following were considered: the return on assets, the operating leverage, the loan and deposit growth. The operating leverage has a minor impact on banks' credit ratings. The prepared analysis suggests that a significant influence was noticed in the case of all types of notes. A strong relationship was observed in the case of the return on assets indicator. The most sensitive ones are the notes presented by Moody's. Fitch ratings are free of any influence of the return on assets, according to the obtained estimations.

These results are connected with the risky decisions and lower creditworthiness of the rated institutions than in the case of issuers whose ratings are given by Moody's and S&P's. S&P's does not take into consideration the loans growth and the deposits growth. Other credit ratings agencies have different opinions about the impact of the mentioned variables. The deposit growth is insignificant for the default estimation process also in the case of other rating agencies. Fitch notes react positively if the loan growth rises. The increase of the mentioned variable can create an additional source of income. On the other hand, Moody's suggests that a too fast increase of the loan growth can create problems with creditworthiness of clients and in a longer time – with banks' default risk.

The last group of factors, i.e., liquidity indictors, comprises of the ratio of loans to deposits, the value of the short-term borrowing to total liabilities and the value of the liquid assets to total assets. The value of the first indicator has a statistically significant negative impact on banks' credit ratings given by Fitch. This confirms the previous assumption that the quality of the credit portfolio of issuers is lower than in the case of other agencies. On the other hand, the high value of this factor can create liquidity problems. The same relationship was noted for the liquid assets to total assets factor. The strongest impact was observed for Fitch notes. The short--term borrowing to total liabilities has a negative influence in the case of S&P's. An opposite reaction was noticed for ratings proposed by other agencies.

The opinion about the impact of the size of the rated entities on credit ratings was confirmed in this study. Bigger banks receive higher notes in the case of all three agencies. The mentioned relationship is strictly connected with the probability of the financial support from the government in the case of a crisis or

insolvency problems. The mentioned relationship is strictly connected with the "too big to fail" phenomenon.

A positive impact of the countries' notes on the ratings received by banks was also observed. The higher market share credit rating agencies have, the stronger the influence of the mentioned determinant. The impact of the GDP growth is statistically significant, but the described relationship declines with the size of the credit rating agency. The inflation rate is insignificant or has a nearly zero coefficient in the analyses of default risk.

The next part of the analysis is focused on the verification of the impact of the concentration and the competitiveness of the banking sector on the notes given to the rated entities. Two measures of concentration were used. The first one is the value of the five biggest banks' assets to the total value of assets. The second one is the HHI index. In the case of Fitch notes both of these variables have a significant impact on banks' ratings. If the banking sector is more concentrated, the ratings presented by Fitch are higher. An opposite reaction was noticed in the case of Moody's. Ratings of this agency react negatively to a higher concentration of the banking sector. A more concentrated sector can create problems with the default risk of the whole financial system. In a monopolistic market the default of the biggest banks can create insolvency problems for the whole financial market. S&P's notes are insensitive to concentration measures.

The regulation restrictiveness indicator, that is the regulatory capital to risk weighted assets, has a significant impact only in the case of the notes given by Moody's. If the mentioned variable is higher, the banks' notes are decreased.

The last group of factors taken into analyses were the measures of competitiveness. This group of factors comprises the Lerner indicator, the Bonne index and the H-statistic factor. The first analysed factor was the Boone indicator, which measures the degree of competition, calculated as the elasticity of profits to marginal costs. This indicator suggests that higher profits are achieved by more efficient banks. As a result, the more negative the Boone indicator, the higher the degree of competition observed. This factor statistically significantly influences the notes presented by Moody's.

The Lerner index is defined as the difference between the output prices and marginal costs. The World Bank defines prices as total bank revenue over assets, whereas marginal costs are obtained from an estimated translog cost function with respect to output. If the mentioned variable is higher, competition between banks is lower. This factor has a statistically significant positive impact on the notes presented by Fitch, and a negative one – for the ratings given by other agencies. These findings suggest that Fitch puts attention to the negative effects of the competition. Higher competition can create problems with riskier investment to create additional profits.

A different attitude was presented by Moody's and S&P's. The last factor the impact of which was verified was the H-statistic indicator of the elasticity of banks

revenues relative to input prices. In the case of the perfect competition, an increase in input prices raises both marginal costs and total revenues by the same amount, and hence the H-statistic equals 1. Under a monopoly, an increase in input prices results in a rise in marginal costs, a fall in output, and a decline in revenues, leading to an H-statistic less than or equal to 0. When H is between 0 and 1, the system operates under monopolistic competition. It is possible for the H-statistic to be greater than 1 in some oligopolistic markets. The received findings for Moody's and S&P' confirm the previously presented opinion.

Table 3. The results of the estimation of factors influencing Fitch notes

Fitch	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
opl	0.01	0.12	0.01	0.12	0.01	0.16	0.01	0.11	0.01	0.10	0.01	0.09
lev	−0.01	0.76	−0.01	0.61	−0.02	0.53	−0.01	0.63	−0.01	0.62	−0.01	0.77
llp	−2.59	0.00	−2.29	0.00	−2.41	0.00	−2.55	0.00	−2.40	0.00	−2.65	0.00
tier1	−0.32	0.00	−0.29	0.00	−0.28	0.00	−0.31	0.00	−0.30	0.00	−0.37	0.00
dep	−1.15	0.02	−1.50	0.03	−1.56	0.03	−1.45	0.04	−1.27	0.06	−1.43	0.04
sec	0.06	0.01	0.05	0.01	0.05	0.01	0.05	0.01	0.05	0.02	0.06	0.01
roa	−1.85	0.17	−1.88	0.21	−1.59	0.26	−1.93	0.18	−2.26	0.11	−2.36	0.12
liq	−5.99	0.07	−3.06	0.34	−2.58	0.41	−6.20	0.08	−2.93	0.40	−6.60	0.07
lg	0.70	0.07	0.63	0.11	0.68	0.08	0.74	0.05	0.72	0.06	0.74	0.06
dg	−0.13	0.90	−0.41	0.70	−0.51	0.64	−0.34	0.75	−0.35	0.74	−0.25	0.81
sht	4.77	0.00	3.95	0.00	4.14	0.00	4.69	0.00	4.18	0.00	4.90	0.00
ass	0.82	0.03	0.78	0.02	0.81	0.01	0.80	0.04	0.93	0.01	0.96	0.05
cr_fitch	0.05	0.00	0.05	0.00	0.05	0.00	0.05	0.00	0.05	0.00	0.05	0.00
gdpg	0.45	0.00	0.49	0.00	0.48	0.00	0.45	0.00	0.48	0.00	0.45	0.00
cpi	−0.01	0.14	−0.01	0.12	−0.01	0.08	−0.01	0.16	−0.01	0.15	−0.01	0.16
con			0.08	0.01								
concentr					0.06	0.00						
reg							0.01	0.92				
boonne									−0.57	0.47		
lerner											5.77	0.03
/cut1	−22.71	0.02	−14.74	0.09	−17.61	0.03	−22.73	0.02	−24.97	0.01	−26.34	0.04
/cut2	−22.45	0.02	−14.51	0.10	−17.37	0.04	−22.46	0.02	−24.73	0.01	−26.08	0.04
/cut3	−21.84	0.02	−13.93	0.11	−16.79	0.04	−21.83	0.03	−24.14	0.01	−25.46	0.04
/cut4	−21.40	0.02	−13.48	0.12	−16.34	0.05	−21.37	0.03	−23.69	0.01	−25.01	0.05
/cut5	−19.60	0.04	−11.73	0.18	−14.57	0.08	−19.55	0.05	−21.92	0.02	−23.23	0.06
/cut6	−16.20	0.08	−8.44	0.33	−11.16	0.17	−16.26	0.10	−18.48	0.05	−19.76	0.11
/cut7	−14.69	0.12	−6.93	0.43	−9.65	0.24	−14.75	0.14	−16.97	0.07	−18.25	0.15
no obs	1272		1123		1138		1150		1138		1065	
no group	53		51		51		51		51		48	
Wald	0		0		0		0		0		0	
LM	0		0		0		0		0		0	

Source: own study.

Table 4. The results of the estimation of the factors influencing S&P's notes

S&P	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
opl	0.00	0.24	0.00	0.16	0.00	0.12	0.00	0.04	0.00	0.13	0.00	0.36	−0.01	0.00
lev	0.01	0.47	−0.01	0.76	0.00	0.92	0.00	0.99	0.00	0.78	0.00	0.92	−0.02	0.33
llp	0.37	0.18	0.57	0.07	0.59	0.09	0.64	0.05	0.55	0.08	1.35	0.00	1.11	0.01
tier1	−0.05	0.03	−0.13	0.00	−0.12	0.00	−0.02	0.64	−0.12	0.00	−0.10	0.00	−0.09	0.11
dep	−0.39	0.09	−0.83	0.12	−0.76	0.16	−0.24	0.66	−0.76	0.16	−0.47	0.40	−1.25	0.31
sec	0.00	0.62	0.00	0.98	0.00	0.97	0.00	0.92	0.00	0.94	0.00	0.71	0.04	0.00
roa	0.62	0.07	1.15	0.00	1.05	0.02	1.11	0.01	0.94	0.02	2.32	0.00	2.13	0.00
liq	−5.06	0.00	−4.51	0.01	−4.52	0.01	−2.81	0.11	−4.51	0.01	−3.11	0.09	1.61	0.71
lg	−0.36	0.12	−0.19	0.46	−0.23	0.37	−0.26	0.32	−0.22	0.39	−0.23	0.41	0.26	0.66
dg	0.11	0.86	−0.34	0.62	−0.34	0.63	−0.10	0.88	−0.30	0.67	−0.18	0.80	−1.72	0.16
sht	−0.42	0.41	−0.83	0.16	−0.88	0.16	−0.98	0.09	−0.81	0.16	−2.23	0.01	−8.73	0.09
ass	2.03	0.00	2.47	0.00	2.72	0.00	2.49	0.00	2.66	0.00	2.48	0.00	1.84	0.09
cr_sp	0.43	0.00	0.48	0.00	0.49	0.00	0.48	0.00	0.49	0.00	0.46	0.00	1.01	0.00
gdpg	0.00	0.88	0.03	0.19	0.03	0.19	0.01	0.72	0.04	0.11	0.03	0.26	0.10	0.16
cpi	0.00	0.14	0.00	0.06	0.00	0.05	0.00	0.33	0.00	0.05	0.00	0.19	0.00	0.98
con			−0.02	0.29										
concentr					0.02	0.23								
reg							−0.20	0.00						
boonne									1.00	0.09				
lerner											−3.90	0.00		
hstat													−6.96	0.01
/cut1	52.01	0.00	74.98	0.00	82.16	0.00	73.47	0.00	78.93	0.00	77.14	0.00	75.42	0.00
/cut2	62.10	0.00	76.30	0.00	85.49	0.00	76.88	0.00	82.44	0.00	79.61	0.00	82.57	0.00
/cut3	65.39	0.00	78.71	0.00	86.59	0.00	78.73	0.00	83.70	0.00	81.85	0.00	86.52	0.00
/cut4	66.89	0.00	80.71	0.00	88.90	0.00	80.79	0.00	86.03	0.00	85.09	0.00	89.43	0.00
/cut5	69.07	0.00	83.85	0.00	90.91	0.00	82.75	0.00	87.99	0.00	87.62	0.00	92.60	0.00
/cut6	70.85	0.00	86.80	0.00	94.11	0.00	86.01	0.00	91.37	0.00	89.77	0.00	97.88	0.00
/cut7	73.78	0.00	88.91	0.00	97.12	0.00	88.95	0.00	94.39	0.00	92.38	0.00	102.18	0.00
/cut8	76.37	0.00	91.37	0.00	99.27	0.00	90.92	0.00	96.53	0.00	96.45	0.00	109.31	0.00
/cut9	78.16	0.00	95.36	0.00	101.70	0.00	93.38	0.00	98.95	0.00	98.68	0.00	113.62	0.00
/cut10	80.36	0.00	98.16	0.00	105.64	0.00	97.21	0.00	102.84	0.00	103.23	0.00	118.73	0.00
/cut11	83.54	0.00	102.70	0.00	108.51	0.00	100.14	0.00	105.69	0.00	105.50	0.00	124.31	0.00
/cut12	86.13	0.00	104.91	0.00	113.07	0.00	104.79	0.00	110.26	0.00	109.89	0.00	136.12	0.00
/cut13	90.39	0.00	109.48	0.00	115.33	0.00	107.16	0.00	112.52	0.00	116.51	0.00	140.37	0.00
/cut14	92.58	0.00	115.89	0.00	119.85	0.00	111.73	0.00	117.05	0.00			148.87	0.00
/cut15	97.07	0.00			126.76	0.00	118.36	0.00	124.21	0.00				
/cut16	103.03	0.00												
no obs	1065		932		949		966		953		871		541	
no group	48		46		47		47		47		44		44	
Wald	0		0		0		0		0		0		0	
LM	0		0		0		0		0		0		0	

Source: own study.

Table 5. The results of the estimation of factors influencing Moody's notes

Moody	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
opl	−0.01	0.03	−0.01	0.01	−0.01	0.01	−0.01	0.02	−0.01	0.02	−0.01	0.01	0.00	0.99
lev	0.13	0.00	0.13	0.00	0.13	0.00	0.11	0.00	0.11	0.00	0.09	0.00	0.32	0.00
llp	0.36	0.05	0.48	0.01	0.48	0.01	0.39	0.04	0.40	0.03	0.43	0.02	7.33	0.03
tier1	−0.24	0.00	−0.36	0.00	−0.37	0.00	−0.33	0.00	−0.36	0.00	−0.32	0.00	−0.20	0.00
dep	0.04	0.45	0.05	0.38	0.05	0.36	0.10	0.10	0.09	0.11	0.08	0.20	0.02	0.86
sec	0.02	0.16	0.02	0.05	0.02	0.04	0.02	0.06	0.02	0.07	0.02	0.12	0.05	0.12
roa	6.47	0.00	8.41	0.00	8.48	0.00	7.67	0.00	7.88	0.00	8.61	0.00	11.69	0.00
liq	−0.84	0.67	−4.10	0.05	−3.95	0.07	−2.30	0.30	−2.56	0.25	−0.47	0.83	0.41	0.91
lg	−3.07	0.09	−3.40	0.09	−3.41	0.09	−4.67	0.02	−4.45	0.03	−3.02	0.15	−0.53	0.89
dg	0.12	0.91	0.84	0.52	0.88	0.50	1.49	0.28	1.45	0.29	1.05	0.47	1.47	0.53
sht	2.97	0.00	1.94	0.07	1.82	0.10	3.59	0.00	3.40	0.00	3.62	0.00	−1.21	0.81
ass	4.51	0.00	1.54	0.01	1.62	0.03	5.53	0.00	4.92	0.00	5.30	0.00	−0.88	0.51
cr_m	0.27	0.00	0.27	0.00	0.27	0.00	0.29	0.00	0.28	0.00	0.29	0.00	0.63	0.00
gdpg	−0.08	0.03	−0.10	0.01	−0.10	0.01	−0.13	0.00	−0.12	0.00	−0.18	0.00	0.52	0.00
cpi	−0.09	0.00	0.00	0.61	0.00	0.71	−0.09	0.00	−0.08	0.01	−0.06	0.03	−0.04	0.43
con			−0.09	0.02										
concentr					−0.04	0.08								
reg							−0.06	0.34						
boonne									1.32	0.18				
lerner											−14.60	0.00		
hstat													−11.05	0.00
/cut1	116.52	0.00	44.96	0.01	51.81	0.01	139.60	0.00	125.83	0.00	135.61	0.00	7.44	0.83
/cut2	117.07	0.00	45.58	0.00	52.43	0.01	140.26	0.00	126.52	0.00	136.63	0.00	8.72	0.80
/cut3	119.99	0.00	48.66	0.00	55.63	0.00	143.75	0.00	130.05	0.00	141.47	0.00	15.94	0.64
/cut4	121.61	0.00	49.90	0.00	56.97	0.00	145.10	0.00	131.38	0.00	143.19	0.00	19.29	0.57
/cut5	124.35	0.00	53.37	0.00	60.42	0.00	148.54	0.00	134.87	0.00	146.81	0.00	24.43	0.47
/cut6	125.26	0.00	53.79	0.00	60.84	0.00	149.18	0.00	135.30	0.00	147.24	0.00	25.32	0.46
/cut7	127.55	0.00	56.22	0.00	63.26	0.00	151.75	0.00	137.80	0.00	149.75	0.00	28.74	0.40
/cut8	129.44	0.00	58.15	0.00	65.19	0.00	153.88	0.00	139.88	0.00	152.00	0.00	32.70	0.34
/cut9	131.98	0.00	60.56	0.00	67.59	0.00	156.67	0.00	142.54	0.00	154.87	0.00	38.44	0.26
/cut10	133.78	0.00	62.31	0.00	69.33	0.00	158.61	0.00	144.36	0.00	156.80	0.00		
/cut11	139.91	0.00	68.24	0.00	75.28	0.00	164.80	0.00	150.58	0.00	163.23	0.00		
no obs	493		449		449		452		449		449		227	
no group	14		14		14		14		14		14		14	
Wald	0		0		0		0		0		0		0	
LM	0		0		0		0		0		0		0	

Source: own study.

5. Conclusions

The aim of the paper was to verify the impact of competitiveness of the banking sector and concentration on banks' credit ratings. The following hypothesis has been put forward: the bigger the banks from the countries where the banking sector is more concentrated and more competitive, the higher banks' credit ratings are; this has been verified positively.

Financial indicators have been taken into consideration for the analysis. From the capital adequacy indicators, the Tier 1 ratio and the leverage ratio have been distinguished. If the Tier 1 rises, the banks' notes are higher, especially in the case of Fitch notes. It can be strictly connected with the quality of portfolio of the rated entities. The leverage ratio positively statistically significantly influences Moody's credit ratings. From the assets quality indicators, the loan loss provisions as a percentage of the average total loans have got a negative impact on the Fitch credit ratings, which confirms the mentioned relationship.

The sensitivity of credit ratings to the management quality indicators is weak. From the group of earnings indicators, the operating leverage has got a minor impact on banks' credit ratings in the case of all types of notes. The most sensitive to the return on assets are the notes presented by Moody's. S&P's does not take into consideration the loans growth and the deposits growth. Fitch notes react positively if the loan growth rises. The increase of the mentioned variable can create an additional source of income. On the other hand, Moody's suggests that a too fast increase of the loan growth can create problems with creditworthiness of clients and in a longer time – with banks' default risk. Among the liquidity indicators, the strongest impact on the changes of the liquid assets to total assets was observed for Fitch notes. The short-term borrowing to total liabilities has a negative influence in the case of S&P's. An opposite reaction was noticed for ratings proposed by other agencies.

The obtained findings suggest that banks' notes are especially sensitive to the capital adequacy, the assets quality and the earnings factors. These results confirm previous research. Bigger banks receive higher notes in the case of all three agencies, which may be connected with the probability of the financial support from the government in the case of a crisis or insolvency problems and the "too big to fail" phenomenon. The mentioned relationship rises with the market share of the agencies. The impact of countries' notes is higher in the case of the ratings given by bigger CRAs. An opposite relationship was noticed for the GDP growth.

The concentration of the banking sector has a significant impact on the notes proposed by Fitch and Moody's, but the direction of the impact has been varied. Fitch notes are positively correlated with the concentration indicators. As a result, this CRA presents an opinion that bigger banks on more concentrated markets can receive the financial support from the government, because in the case of default problems they would have an influence on the whole financial system. Moody's puts attention to insolvency problems of the financial market, and as a result its notes are negatively correlated with the concentration of the banking sector.

The competition in the banking sector has a significant impact on the described notes. Fitch ratings react negatively to a higher competition on the financial market by taking into consideration the Boone and Lerner indexes. Higher competition can create problems with riskier investment to create additional profits. An opposite

relationship was observed in the case of Moody's and S&P's. The same opinion was confirmed by the impact of the H-statistic indicator. The received results can be useful for the supervisors, investors and entities that would like to receive ratings.

References

Bellotti T., Matousek R., Stewart C., 2011a, *A note comparing support vector machines and ordered choice models' predictions of international banks' rating*, Decision Support Systems, vol. 51(3), p. 682-687.

Bellotti T., Matousek R., Stewart C., 2011b, *Are rating agencies' assignments opaque? Evidence from international banks*, Expert Systems with Applications, vol. 38(4), April, p. 4206-4214.

Bikker J.A., Haaf K., 2000, *Measures of competition and concentration in the banking industry: A review of the literature*, Economic and Financial Modelling, no. 9, p. 53-98.

Bikker J.A., Spierdijk L., 2007, *How Banking Competition Changed over Time*, mimeo, De Nederlandsche Bank, Amsterdam, December.

Bissoondoyal-Bheenick E., Treepongkaruna S., 2011, *An analysis of the determinants of bank ratings: comparison across ratings agencies*, Australian Journal of Management, vol. 36(3), p. 405-424.

Chodnicka-Jaworska P., 2016, *Wpływ wskaźników finansowych na ratingi kredytowe banków z krajów strefy euro*, Nauki o Finansach, no. 3, p. 27-37.

Claessens S., 2009, *Competition in the financial sector: Overview of competition policies*, IMF Working Paper, no. WP/09/45.

Feri G., Liu L.-G., Stiglitz J., 1999, *The procyclical role of rating agencies: Evidence from the East Asian Crisis*, Economic Notes, vol. 28(3), p. 335-355.

Gutiérrez de Rozas L., 2007, *Testing for competition in the Spanish Banking Industry: The Panzar-Rosse Approach Revisited*, Banco de España Research Paper, no. WP-0726.

Harris M., Opp C.C., Opp M.M., 2015, *Bank Capital Requirements in a Competitive Financial System*, Stanford Working Papers, https://events.barcelonagse.eu/live/files/798-fir15-opppdf (8.05.2017).

Hawkins J., Mihaljek D., 2001, *The banking industry in the emerging market economies: competition, consolidation and systemic stability – an overview*, BIS Papers, no 4.

Hempell H. S., 2002, *Testing for competition among German Banks*, Economic Research Centre Discussion Paper, no. 04/02.

Karminsky A.M., Khromova E., 2016, *Extended modelling of banks' credit ratings*, Procedia Computer Science, vol. 91, p. 201-210.

Kick T., Prieto E., 2013, *Bank risk taking and competition: evidence from regional banking markets*, Discussion Paper Deutsche Bundesbank, no. 30/2013.

Kiseľáková D., Hečková J., Chapčáková A., 2013, *Trends of development and factors of competitiveness of banking sector in global economy – empirical study from Slovakia*, International Journal of Finance and Accounting, vol. 2(3), p. 138-149.

van Loon E., de Haan J., 2015, *Location of banks and their credit ratings, Location of banks and their credit ratings*, vol. 16 issue 3, p. 220-232.

Nakane M.I., 2001, *A Test of Competition in Brazilian Banking*, Banco Central do Brasil Working Paper, no. 12.

Pagratis S., Stringa M., 2007, *Modelling bank credit ratings: A reasoned, structured approach to Moody's credit assessmen*t, Working paper, http://www.efmaefm.org/0EFMAMEETINGS/ EFMA%20ANNUAL%20MEETINGS/2008-Athens/papers/Pagratis.pdf (8.05.2017).

Panzar J.C., Rosse J.N., 1987, *Testing for 'Monopoly' Equilibrium*, Journal of Industrial Economics, vol. 35, p. 443-56.

Poon W.P.H., Firth M., Fung H., 1999, *A multivariate analysis of the determinants of Moody's bank financial strength ratings*, Journal of International Financial Markets, Institutions and Money, vol. 9(3), p. 267-283.

Poon W., Lee J., Gup B.E., 2009, *Do solicitations matter in bank credit ratings? Results from a study of 72 countries*, Journal of Money, Credit and Banking, vol. 41, p. 285-314.

Prasad A., Ghosh S., 2005, *Competition in Indian Banking*, IMF Working Paper, no. 05/141.

Regulation (EC) No 1060/2009 of the European Parliament and of the Council of 16 September 2009 on credit rating agencies.

Regulation (EU) No 462/2013 of the European Parliament and of the Council of 21 May 2013 amending Regulation (EC) No 1060/2009 on credit rating agencies.

Shen C., Huang Y., Hasan I., 2012, *Asymmetric benchmarking in bank credit rating*, Journal of International Financial Markets, Institutions & Money, vol. 22, p. 171-193.

Wong J., Wong E.T.C., Fong T.P.W., Choi K.F., 2008, *Competition in Hong Kong's Banking Sector: A Panzar–Rosse Assessment*, [in] Genberg H., Hui C.H., *The banking sector in Hong Kong, Palgrave Macmillan UK*, p. 17-31.

Yildirim H.S., Philippatos G.C., 2007, *Restructuring, Consolidation, and Competition in Latin American Banking Markets*, Journal of Banking and Finance, no. 31, vol. 3, p. 629-639.