ORIGINAL PAPER

Citation: Chodnicka-Jaworska, P. (2017). Macroeconomic aspects of banks' credit ratings. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 12(1), 101–120. doi: 10.24136/eq.v12i1.6

Contact: pchodnicka@wz.uw.edu.pl, University of Warsaw, Faculty of Management, ul. Szturmowa 1/3, 02-678 Warsaw, Poland

Received: 5 May 2016; Revised: 9 September 2016; Accepted: 9 November 2016

Patrycja Chodnicka-Jaworska

University of Warsaw, Poland

Macroeconomic aspects of banks' credit ratings

JEL Classification: G01; G15; G21; G24

Keywords: country credit rating; bank credit rating; country risk; macroeconomic determinants

Abstract

Research background: The practical analysis suggests that credit ratings are especially significant for banks. The literature review suggests that in previous analysis researchers usually took into consideration financial factors of the banks' credit ratings methodology. This article analyses the impact of macroeconomic factors on the banks' credit ratings.

Purpose of the article: The paper examines and analyses the impact of the macroeconomic risk factors on the credit ratings received by banks. In the article, the methodology of credit risk assessment proposed by Moody's Investor Service and Standard & Poor's Financial Service is presented. Two hypotheses are put herein. The first one is: Changes in countries' credit ratings convey new information and influence on banks' financial condition. The second hypothesis is: A highly-developed, stable economy with an advanced financial market has a positive influence on banks' credit rating assessment.

Methods: The study used banks' and countries' ratings assigned by Standard & Poor's and Moody's for the period from 1 January 2005 to 1 January 2016. To verify the hypotheses static panel data models have been applied.

Findings & Value added: In credit rating agencies guidelines and previous research, the impact of countries' credit ratings on those received by banks is not indicated. The impact of macroeconomic factors has not been verified. The analysis confirms that changes in countries' credit ratings convey new information and influence the banks' environment condition. But only for the assessment given by S&P the condition of banking sector is an important group of factors. For all verified types of credit ratings the risk of country is presented by countries' credit rating, not by particular factors. These analyses suggest that during

the risk estimation process prepared by banks, a country's risk represented by its credit ratings should be taken into consideration more often than particular macroeconomic factors.

Introduction

Credit ratings play an important role in the financial market. The practical analysis suggests that they are especially significant for banks. Strong credit ratings give banks greater access to capital markets on better financial terms. They will directly influence banks' operations. On the other hand, banks' credit ratings are important for borrowers, investors and supervisors because they assess the possibility of default.

The last crisis and — as an effect — a lot of unexpected default events and downgrades of credit ratings have overshadowed the reputation of credit rating agencies. The main criticism is focused on the conflict of methodologies for assessing credit risk (Bolton *et al.*, 2011; Hunt, 2009; Sy, 2009; White, 2010). Some researchers suggest that there are differences between the notes given by particular credit rating agencies (Laere *et al.*, 2012). Different opinions have been noticed about the level of conservatism in banks' notes (Livingston *et al.*, 2010; Laere *et al.*, 2012)

This article makes a significant contribution to the existing literature. Literature studies have been conducted concerning the impact of macroeconomic determinants on bank's credit ratings. The process of credit risk assessment given by Standard & Poor's Financial Service and Moody's Investor Service is also analysed. Two hypotheses have been put forward. The first one is: Changes in countries' credit ratings convey new information and influence on banks' environment condition. The second hypothesis is: A highly-developed, stable economy with an advanced financial market has a positive influence on banks' credit rating assessment. To verify the presented hypotheses, static panel data models have been used, taking into consideration macroeconomic variables that can influence countries' long-term issuer credit ratings from 2005 to 2015.

Literature review

Most studies are focused on the factors related to corporations' credit ratings. The analyses of banks' notes are usually based on financial determinants. Existing papers in bank rating phenomenon rely mainly on one rating agency only (e.g., Poon *et al.*, 1999 — Moody; Poon, 2003b — S&P; Poon, 2003a — Fitch; Van Roy, 2006 — Fitch). The literature review of current

research is presented in Table 1.

Country risk is measured by some factors only. Leare *et al.* (2012) take into consideration the loan growth and the sovereign countries credit ratings proposed by Moody and S&P. They emphasized the impact of countries' credit ratings on banks' note assessment. Hau *et al.* (2012) consider credit growth as a macroeconomic factor. Hassan and Barrell (2013) and Shen *et al.* (2012) analysed only financial factors. Bissoondoyal-Bheenick and Treepongkaruna (2011) measure the impact of GDP and inflation. Ötoker-Robe and Podpiera (2010) verify a macro-profile, using GDP and inflation.

The literature research suggests that in the previous analysis the influence of macroeconomic determinants was not verified. The analysis of the impact of countries' credit risk on banks' notes is not checked.

Methodology of estimating the impact of macroeconomic factors on banks' credit ratings

Moody's Investors Service

One of the biggest credit rating agencies is Moody's Investors Service. The notes given by this institution are either "stand-alone" or "all-in" ratings (Packer & Tarashev, 2011, p. 42). While preparing analysis, Moody combine the following points to generate ratings for each debt/creditor class:

- assessment of a bank's standalone creditworthiness results in a baseline credit assessment (BCA);
- assessment of support from affiliates to determine our Adjusted BCA;
- analysis of a "Loss Given Failure" (LGF).;
- appraisal of the potential for government support being provided if needed, specific to each instrument class, to determine the final credit rating for each rated instrument as well as Counterparty Risk Assessment (Moody's, 2016a).

Information about historical performance is taken to an analytic process based on core credit metrics and analyzed future trends in these credit metrics and quantitative adjustment. To verify the banks' credit risk, three components are taken into account: macro-profile, financial ratios and quantitative factors. The basic goal of the analysis is to present the impact of macroeconomic determinants on banks' credit rating assessment. During the analytic process the factors presented in figure 1 are taken into account.

In the assessment methodology of a bank's credit rating risk Moody takes into consideration 25 weights of impact of the macro-profile on the

final note. The first point of the analysis verifies the banking country risk. In the mentioned group of factors the following can be distinguished:

- economic strength,
- institutional strength,
- susceptibility to event risk.

The mentioned factors and weight of particular determinants with the indicators are presented in Table 2.

The next group of factors taken are “credit conditions” factors, to which two sub-factors belong: the level of private sector credit/GDP and growth in private sector credit/GDP. Funding conditions are measured by market funding measures and the balance sheets of a central bank. The industry structure factor is defined by Herfindahl-Hirschman indices and the combined domestic market share of the system’s five largest banks.

Moody’s Investors Service, just as other credit rating agencies from the “Big Three”, uses the scoring methods to analyse the impact of the banking credit risk on particular banks’ credit ratings. To verify the mentioned phenomenon, 15 groups of risk are employed, from very high, through high, moderate, low to very low.

Standard & Poor’s Financial Services

The second credit rating agency that has been taken to the analysis is Standard&Poor’s Financial Services and its banks’ credit rating methodology. According to the previous studies (Chodnicka, 2014, 2015) financial markets strongly react to the changes in the S&P’s credit ratings. The strongest reaction is observed within 30 days before and after the change.

The previous bodies of research take into consideration the same factors of credit rating assessment for all types of credit rating. The analysis proposed by Standard & Poor’s Financial Services consists of the following steps:

- business risk assessment;
- overall financial risk assessment;
- overall enterprise risk management assessment.

In Table 3, determinants of the banking macro-profile are presented. They are completely different from those proposed by Moody for the assessment of the macro-profile.

S&P uses also the scoring method to verify the banking credit rating risk. Each factor is scored on a numerical scale from 1 (very low risk) to 6 (extremely high risk). For an analytical process, each factor receives from 1 to 10 points. The points are then added and counted on the economic risk or

industry. If the risk is the highest, the risk score rises, and if the risk is the lowest, the risk score is declined.

In all the presented methodologies for banks' credit rating, the impact of the macroeconomic condition of countries on credit risk assessment is presented. In the presented methodologies, credit rating agencies do not take into consideration the country credit rating. The analysis presented above suggests that banks' and countries' credit ratings are strictly connected.

Conceptual framework

Rating agencies convey macroeconomic and political information to the markets through their rating. Agencies have been heavily criticised for not being able to correctly predict the current situations and bankruptcies (Delko, 2002) 29 in the case of Enron or Kaserer (1995), especially after the financial crisis in 2007. They are accused of not anticipating, but merely mirroring what the markets have already priced in the securities of a given reference entity. Up to 70–90 percent of credit ratings can be explained by models using only publicly available accounting information (Cantor & Packer, 1996; Chodnicka, 2013; 2014; 2015). The changes in countries' credit ratings should have an impact on banks' credit ratings.

Hypothesis 1: Changes in countries' credit ratings convey new information and influence the banks' environment condition.

According to the analysis of credit ratings' methodologies, the size of the banking market and the economy condition should have an impact on banks' credit ratings. The condition of the economy matters because banks are highly exposed to, and their performance closely correlated with, macroeconomic factors, such as a business cycle, asset quality and more volatile earnings, posing a greater risk to solvency. Larger, wealthier and more diversified economies with better growth prospects also help underpin the banking system strength. As a result, the following hypothesis has been put:

Hypothesis 2: A highly developed, stable economy with an advanced financial market has a positive influence on the banks' credit rating assessment.

Data description and methodology

The research involves two steps. An analysis of the influence of countries' credit ratings on banks' notes is presented here. The most important macro-economic determinants likely to affect the banks' credit ratings assessment have been distinguished.

Short- and long-term issuer credit ratings published by S&P and Moody's are collected from Thomson Reuters database. Countries' and banks' ratings over 2005–2015 on a yearly basis have been taken into consideration. The decision is motivated by the limited availability of macro-economic determinants for all countries and small changes in credit rating assessment. Macroeconomic variables used in research are obtained from the World Bank database. The final version of the model is given by the equation (1) below:

$$y_{i,t} = \sum_{k=0}^n \alpha_k x_{j,t-k} + \sum_{k=0}^n \beta_k z_{j,t-k} + \theta_t T_t + \mu_j + \varepsilon_{j,t}, \quad n = 0 \quad (1)$$

where:

$y_{i,t}$ is the i bank's credit rating assessment examined during the t period of time;
 $x_{j,t}$ is the j country's credit rating assessment examined during the t period of time;
 $z_{j,t}$ is a vector of explanatory variables, i.e. :

$$x_{j,t} = \left[GDPg_{j,t}, GDPp_{j,t}, GCI_{j,t}, WGE_{j,t}, RLI_{j,t}, CCI_{j,t}, VAI_{j,t}, \right. \\ \left. INF_{j,t}, RISK_{j,t}, CRE_{j,t}, CLA_{j,t}, DBA_{j,t}, BCD_{j,t}, CON_{j,t} \right], \quad (2)$$

where:

$GDPg_{j,t}$ is GDP growth, $GDPp_{j,t}$ is GDP per capita in constant prices (2005), $GCI_{j,t}$ is the Global Competitiveness Index, $WGE_{j,t}$ is the World Bank Government Effectiveness Index, $RLI_{j,t}$ is the World Bank Rule of Law Index, $CCI_{j,t}$ is the World Bank Control of Corruption Index, $VAI_{j,t}$ is the Worldwide Voice and Accountability Index, $INF_{j,t}$ is inflation, $RISK_{j,t}$ is the risk premium on lending (lending rate minus treasury bill rate, %), $CRE_{j,t}$ is the value of domestic credit provided by financial sector as a percent of GDP, $CLA_{j,t}$ are claims on central government as a percentage of GDP, $DBA_{j,t}$ is the value of banks assets as a percentage of GDP, $BCD_{j,t}$ is the ratio of banks' loans to deposits, $CON_{j,t}$ is the concentration index (ratio of five biggest banks assets to total banking sector assets). T_t is a vector of year-dummies; μ_j is an unobservable time-invariant country effect.

To examine the link between the credit rating assessment and factors likely to influence the received assessment as well as the direction of the relationship, static panel data models with the Hausman and the Breusch — Pagan Lagrange Multiplier tests are employed (Greene, 2008). The linear method of decomposition proposed by Ferri *et.al.* (1999) and presented in Table 4, has been used.

Results

Before the analysis of the impact of macroeconomic factors on banks' credit ratings, a verification of the influence of the countries' credit ratings on banks' notes is prepared. The results are introduced in Table 5. The analysis of the methodology of banks' and countries' credit ratings suggests that an impact of countries' notes on banks' risk estimation should exist. The lowest influence is observed in the case of Moody's notes. If a country's credit rating rises to one note, banks' notes react on 0,6 point of scale. The strongest reaction is observed for S&P's.

The analysis of the impact of countries' credit ratings on banks' notes suggests that S&P's ratings are more correlated with the countries' risk estimation. Credit rating agencies in their methodology and analysis do not admit to apply the "golden rule of credit rating", according to which the country's credit rating cannot be higher than the rating of an institution established in the country.

The factors connected with the macroeconomic risk are divided into five groups. The first one are determinants defined as "economic factors". All the presented factors are significant, but WEF Global Competitiveness Index and the GDP growth have the strongest impact. If the GDP growth rises by one percent, the bank's credit rating is increased by 0.5 points. The next group of determinants are "institutional strength" factors. Important for the analysis are the Worldwide Government Effectiveness Index and the Worldwide Control of Corruption Index. If the mentioned indexes rise by one point, the bank's credit rating is higher by two notes respectively.

The third group of determinants are "susceptibility to event risk" factors. The most important is the Worldwide Voice and Accountability Index. If the mentioned index is higher by one point, the credit rating given to banks by Moody rises by 6 notes. The claims on central government's annual growth as a percentage of broad money and the risk premium are rejected, because of too few observations. The last group of determinants are "banking sector" factors. For Moody's long-term issuer credit ratings for banks, the mentioned factors are statistically significant.

The analysis of the macroeconomic determinants of S&P's banks' issuer credit ratings is presented in Table 7. The group defined as economic factors is not as important as for banks' credit ratings proposed by Moody. The GDP growth is a statistically unimportant factor. The WEF Global Competitiveness Index and GDP per capita have a negligible impact. All "institutional strength" factors are important for the estimation process. The Worldwide Rule of Law Index has the highest impact here. If the mentioned index is increased by one point, credit ratings are higher by four notes. The impact of the susceptibility to event risk factors has got a different influence on the banks' notes. If the risk premium rises by one point, the banks' credit rating declines by 1.12 points of scale. The ascendancy of the Worldwide Voice and Accountability Index acts in the opposite direction. The rejection of the claims on central government's annual growth as a percentage of broad money and risk premium factors change in the negative direction. The last group of determinants taken into consideration are banking sector factors. For Moody's estimation process the mentioned variables are unimportant. The situation for S&P's method is completely different. If the value of banks' assets to GDP is higher by one percent, the credit rating is declined by 0.5. It can be strictly connected with the concentration of the banking sector, because the rise of the concentration index by one percent decreases the credit rating by 0.16 point. Large banks, especially in countries with a highly-developed banking sector, cause an increase of the risk of boom default. On the other hand, the high ratio of the bank's credit to GDP rises the bank's credit rating by 0.75 note. The high value of these determinants contributes to economic development, but in the long term it can lead to an increased risk of bankruptcy.

The verification of the impact of all the mentioned groups of factors on S&P's banks' long-term issuer credit ratings suggests that only some variables are significant. The important factors include: Worldwide Government Effectiveness Index, Worldwide Control of Corruption Index, inflation, Worldwide Voice and Accountability Index, the value of assets as a percentage of GDP, the ratio of bank's credit to GDP, concentration index and the S&P's countries' long-term issuer credit rating. The same as in the case of Moody's banks' credit ratings estimation method, in the S&P's assessment process, the important variable is the countries' credit ratings values. There is a difference in the list of macroeconomic variables. S&P would rather take into consideration the condition during the estimation process. It can suggest that during the countries' credit ratings analysis different factors are taken.

The analysis of macroeconomic factors of short-term issuer rating received by banks gives different results. The GDP growth is important for

the estimation process prepared for a short period of time. If the presented factor rises by one percent, the credit rating adjusts by 0.23 points of scale. All institutional strength factors have got a positive impact on banks' credit ratings. The same as in the case of long-term issuer credit ratings presented by S&P's, the most important determinant is the Worldwide Rule of Law Index. The growth of the mentioned index by one point causes a rise of bank's credit rating by two notes. From the susceptibility to event risk factors the most important is the risk premium. The strength of the impact is comparable to determinants for the long-term issuer credit ratings. The last group of determinants are those connected with the banking sector conditions. The concentration index and the ratio of banks' credit as a percent of GDP have a significant impact. If the value of banks credit to GDP is higher, the bank's credit rating rises by 0.2 points. The mentioned influence is weaker for a short-term analysis than for a long period of time. If the concentration rises, it can increase the risk of boom default. As a result, the high concentration reduces bank's credit rating note by 0.13 points. This relationship seems similar as in the event of long-term assessment.

The analysis of the impact of all the mentioned macroeconomic factors suggests that the following determinants have a significant impact on banks' credit ratings: Global Competitiveness Index, Worldwide Government Effectiveness Index, Worldwide Rule of Law Index, inflation and countries' credit ratings proposed for a short term by Standard & Poor's Investor Service. Just as in the previous cases, there is a strong relationship between these two groups of credit ratings.

Conclusions

Credit rating agencies and their risk assessment play an important role in the financial system of the economy. The previous studies focused their attention on some aspects. One of them is the study of the determinants' influence on banks' credit ratings. In previous analyses researchers usually took into consideration financial factors of the banks' credit ratings methodology. This article analyses the impact of macroeconomic factors on the banks' credit ratings. In Moody's and S&P's guidelines the impact of countries' credit ratings on those received by banks is not indicated. The analysis of the influence of macroeconomic factors suggest that the types of banks' credit ratings exists the strong impact of countries risk assessment, but the analysed influence is measured by received before countries' credit ratings. Of all the variables presented by Moody's Investor Service only some; I mean: WEF Global Competitiveness Index, GDP per capita,

Worldwide Control of Corruption Index and countries' credit ratings; have significant impact on the banks' notes. It can be the influence of strong correlation of the list of factors taken into consideration during the banks' and countries' credit assessment process. On the other hand, the short list of determinant suggests that the "golden credit rating rule" has strong, significant impact on the notes received by banks. The credit rating agencies in their announcements indicate that the ratings of banks are not determined by notes given for countries. The same situation is observed for risk assessment proposed by S&P. The list of significant variables is wider, because apart from the mentioned factors the following indicators are included: Worldwide Government Effectiveness Index, Worldwide Control of Corruption Index, inflation, Worldwide Voice and Accountability Index, the value of assets as a percent of GDP, the ratio of bank's credit to GDP, concentration index and the S&P's countries' long term issuer credit rating. During the analysis of the probability of default, in the S&P's banks' long term issuer credit ratings, not only economic factors are taken into consideration, but also indicators connected with the condition of the banking sector. For the short time of the analysis, the significant determinants are: Global Competitiveness Index, Worldwide Government Effectiveness Index, Worldwide Rule of Law Index, inflation and countries' credit ratings proposed for the short term by Standard & Poor's Investor Service.

The presented analysis confirms the hypothesis that changes in countries' credit ratings convey new information and influence on the banks' environment condition. But the second hypothesis, which is as follows: the high developed, stable economy with the advanced financial market influence positive on the banks' credit rating assessment, has not been unequivocally confirmed. Only for the assessment given by S&P is the condition of banking sector an important group of factors. For all verified types of credit ratings, the risk of country is presented by countries' credit rating, not by particular factors. These analyses suggest that during the risk estimation process prepared by banks country risk presented by countries' credit ratings should be taken into consideration more often than particular macroeconomic factors.

References

- Auh, J. K. (2015). Procyclical credit rating policy. *Georgetown McDonough School of Business Research Paper*, 2581738. doi: 10.2139/ssrn.2581738.
- Barell, R., & Hassan, O. A. G. (2013). Accounting for the determinants of banks' credit ratings. *Economics and Finance Working Paper Series, Brunel University of London Working Paper*, 13-02.

- Bissoondoyal-Bheenick, E., & Treepongkaruna, S. (2011). An analysis of the determinants of bank ratings: comparison across ratings agencies. *Australian Journal of Management*, 36(3). doi:10.1177/0312896211426676.
- Bolton, P., Freixas, X., & Shapiro, J. (2012). The credit ratings game. *Journal of Finance*, 67(1). doi: 10.1111/j.1540-6261.2011.01708.
- White, L. (2010). Markets: the credit rating agencies. *Journal of Economic Perspectives*, 24(2). doi:10.1257/jep.24.2.211.
- Cesaroni, T. (2015). Procyclicality of credit rating systems: how to manage it? *Journal of Economics and Business*, 82(C).
- Chodnicka-Jaworska, P. (2015). Credit rating determinants for European countries. *Global Journal of Management and Business*, 15(9-C).
- Delko, K. (2002). Harte Kritik an den Rating-Agenturen. *Neue Zürcher Zeitung*, 3(29).
- Ferri, G., Liu, L. G., & Stiglitz, J. E. (2003). The procyclical role of rating agencies: evidence from the East Asian crisis. *Economic Notes*, 28(3). doi: 10.1111/1468-0300.00016.
- Freitag, L. (2015). Procyclicality and path dependence of sovereign credit ratings: the example of Europe. *Economic Notes*, 44(2). doi: 10.1111/ecno.12032.
- Gogas, P., Papadimitriou, T., & Agrapetidou, A. (2015). Forecasting bank credit ratings. *Journal of Risk Finance*, 15(2). doi: 10.1108/JRF-11-2013-0076.
- Hau, H., Langfield, S., & Marques-Ibanez, D. (2013). Bank ratings: what determines their quality? *Economic Policy*, 28(74). doi: 10.1111/1468-0327.12009.
- Hunt, J. (2009). Credit rating agencies and the 'worldwide credit crisis': the limits of reputation, the insufficiency of reform, and a proposal for improvement. *Columbia Business Law Review*, 1.
- Kraussl, R. (2001). Sovereign ratings and their impact on recent financial crises. *International Advances in Economic Research*, 7(2), doi: 10.1007/BF02296020.
- Kraussl, R. (2003). Sovereign risk, credit ratings and the recent financial crises in emerging markets: empirical analysis and policy implications. Fritz Knapp Verlag, Frankfurt/Main.
- Kräussl R. (2005). Do credit rating agencies add to the dynamics of emerging market crises? *Journal of Financial Stability*, 1(3). doi:10.1016/j.jfs.2005.02.005.
- Van Laere, E., Vantieghe, J., & Baesens, B. (2012). The difference between Moody's and S&P bank ratings: is discretion in the rating process causing a split? *RMI Working Paper*, 12/05.
- Livingston, M., Wei, J., & Zhou, L. (2010). Moody's and S&P ratings: are they equivalent? Conservative ratings and split rated bond yields. *Journal of Money Credit and Banking*, 42.
- Moody's investors service (2016). *Rating methodology. Banks*
- Moody's investors service (2015). *Rating methodology. Sovereign bond ratings*.
- Moody's investors service (2013). *Rating methodology. Sovereign bond ratings*.
- Ötler-Robe, I., & Podpiera, J. (2010). The fundamental determinants of credit default risk for European large complex financial institutions. *IMF Working Paper*, 10(153).

- Packer, F., & Tarashev, N. (2011). Rating methodologies for banks. *BIS Quarterly Review*, June.
- Poon, W. (2003a). Are unsolicited bank ratings lower after controlling for financial and sovereign risk? Unpublished working paper. Lingnan University, Hong Kong.
- Poon, W. (2003b). Are unsolicited credit ratings biased downward. *Journal of Banking & Finance*, 27. doi: 10.1016/S0378-4266(01)00253-9.
- Poon, W., Firth, M., & Fung, H. G. (1999). A multivariate analysis of the determinants of Moody's bank financial strength ratings. *Journal of International Financial Markets, Institutions and Money*, 9.
- Shen, C. H., Huang, Y. L., & Hasan, I. (2012). Asymmetric benchmarking in bank credit rating. *Journal of International Financial Markets, Institutions and Money*, 22(1). doi: 10.1016/j.intfin.2011.08.004.
- Standard & Poor's rating services. (2011). *Banking industry country risk assessment methodology and assumptions*.
- Sy, A. (2009). The systemic regulation of credit rating agencies and rated markets. *IMF Working Paper*, 09(129). doi: 10.5089/9781451872767.001.
- White, L. J. (2010). Credit rating agencies and the financial crisis: less regulation of CRAs is a better response. *Journal of International Banking Law and Regulation*, 25(4).

Annex

Table 1. Literature review of the determinants of banks' credit ratings

Research	Factors of banks' credit ratings
Hassan& Barrell (2013)	size (assets; assets to business volume), leverage (long-term funding minus total equity all to assets), interest-bearing liabilities to earning assets), profitability (net interest margin, net interest income less loan impairment charges all to earning assets), efficiency (cost to income, non-interest expenses to assets), liquidity (net loans to total assets, loans to customer deposits), risk (net charge off or the written-off from loan loss reserves less recoveries to gross loans, a growth of gross loans of a bank to growth of gross loans), capital adequacy (equity to assets, subordinated borrowing to assets).
Laere, et al. (2012)	capital adequacy (common equity to assets), assets quality (loan loss provisions to loans), management quality (operating costs to operating income), earning performance (ROE), liquidity (loans to deposits and liquid assets to assets), size (assets), diversification in income (non-interest income to net income), bank risk (z-score), country risk.
Hau et al.(2012)	size (assets), profitability (ROA), capital structure (assets to equity), asset structure (loans to assets, net profits on trading and derivatives to assets), funding structure (deposits and short-term funding to assets), country risk (credit growth)
Bissoondoyal-Bheenick & Treepongkaruna (2011)	asset quality ratio (non-performing loan and leases / loan and leases; charges-off / loan and leases), market risk (non-interest income to gross operating income), funding, liquidity, interest rate risk (loans to core deposit, liquid assets to assets), capital adequacy (Tier I, other regulatory ratios), macro (GDP, inflation)
Shen et al. (2012)	profitability (net income to assets), liquidity (liquid assets to deposits and short-term funding), capital (capital adequacy ratio), efficiency (cost to income), quality (loan loss provisions to net interest revenues), size (assets)
Gogas et al. (2015)	total employees, interest expense, yield on earning assets, loss allowance to loans, assets, provision for loan and lease losses, net interest margin, net loans and leases to deposits, cash and due from depository institutions, noninterest income, net operating income to assets, net loans and leases to deposits, net loans & leases, service charges on deposit accounts, ROA, equity capital to assets, loan loss allowance, trading account gains & fees, ROE, leverage ratio, goodwill and other intangibles, additional noninterest income, assets per employee, total deposits, total noninterest expense, total risk-based capital ratio, interest-bearing deposits, salaries and employee benefits, trading liabilities, pre-tax net operating income, subordinated debt, securities gains, total bank equity capital, net income attributable to bank, long-term assets, cash dividends, average assets, net operating income, volatile liabilities, loans and leases held for sale, unused loan commitments, Tier 1, Tier 2, total unused commitments, derivatives.
Ötker-Robe & Podpiera (2010)	capital adequacy (Tier 1, Tier 2, leverage ratio, z-score), quality (loan-loss provisions to loans, non-performing loans to loans, loan-loss reserves to nonperforming loans), quality of management (management flexibility, long-term rating), profitability (net interest income, ROE, ROA), funding position (loan to deposit ratio, share of wholesale funds to liabilities, short-term borrowing to liabilities, liquid assets to assets), market risk (effective GDP growth, GDP volatility).

Table 2. Macroeconomic factors used by Moody’s Investors Service to analyse banks’ credit ratings macro-profile

Broad Rating Factor	Rating sub-factor	Weight	Indicators
Economic Strength	Growth Dynamics	50%	Average Real GDP Growth
			Volatility in Real GDP
			WEF Global Competitiveness Index
	Scale of the Economy	25%	National GDP (in USD)
	National Income	25%	GDP per capita (PPP, in USD)
Institutional Strength	Adjustment Factors	1-6 scores	Diversification
			Credit Boom
			Worldwide Government Effectiveness Index
	Institutional Framework and Effectiveness	75%	Worldwide Rule of Law Index
			Worldwide Control of Corruption Index
Susceptibility to Event Risk	Policy Credibility and Effectiveness	25%	Inflation Level
			Inflation Volatility
	Adjustment Factor	1-6 scores	Track Record of Default
	Political Risk	Max Function	Domestic Political Risk
	Geopolitical Risk		
Susceptibility to Event Risk	Government Liquidity Risk	Max Function	Fundamental Metrics
			Market Funding Stress
	Banking Sector Risk	Max Function	Strength of Banking System
			Size of Banking System
	External Vulnerability Risk	Max Function	Funding Vulnerabilities
(Current Account Balance + FDI)/GDP			
External Vulnerability Indicator			
			Net International Investment Position/GDP

Source: own elaboration based on Moody’s (2016a, 2016b).

Table 3. Standard&Poor’s macroeconomic profile of banks’ credit ratings

Factor	Subfactor adjustments	Additional adjustments
	Economic Risk	
Economic resilience	Economic structure and stability Macroeconomic policy flexibility Political risk	GDP per capita
Economic imbalances	<i>Expansionary phase</i> Private sector credit growth Equity prices Current account balance and external debt position or <i>Correction phase</i> Expected impact on the banking sector	Atypical change in private sector credit growth or assets prices Commercial real estate prices

Table 3. Continued

Factor	Subfactor adjustments	Additional adjustments
	Economic Risk	
Credit risk in the economy	Private sector debt capacity and leverage Lending and underwriting standards Payment culture and rule of law Sovereign government credit stress	Currency movements or price volatility Country specific characteristics
Institutional framework	Banking regulation and supervision Regulatory track error Governance and transparency	
Competitive dynamics	Risk appetite Industry stability Market distortions	
System – wide funding	Core customer deposits External funding Domestic debt capital markets Government role	Non – loan assets

Source: S&P(2013).

Table 4. Decomposition of banks' credit ratings

Moody's Long-term Issuer Rating (Foreign)		S&P's Long-term Issuer Rating (Foreign)		S&P's Short-term Issuer Credit Rating (Foreign)	
Rating	Code	Rating	Code	Rating	Code
Aaa	100	AAA	100	A-1+	100
Aa1	95	AA+	95	A-1	83,33333
Aa2	90	AA	90	A-2	66,66667
Aa3	85	AA-	85	A-3	50
A1	80	A+	80	B	33,33333
A2	75	A	75	C	16,66667
A3	70	A-	70	NR	0
Baa1	65	BBB+	65	SD	-5
Baa2	60	BBB	60	NULL	0
Baa3	55	BBB-	55	D	-5
Ba1	50	BB+	50		
Ba2	45	BB	45		
Ba3	40	BB-	40		
B1	35	B+	35		
B2	30	B	30		
B3	25	B-	25		
Caa1	20	CCC+	20		
Caa2	15	CCC	15		
Caa3	10	CCC-	10		
Caa	5	CC	5		
C	0	NR	0		
WR	-5	SD	-5		
NULL	0	NULL	0		
		D	-5		

Table 5. Impact of countries' credit ratings on banks' credit ratings

<i>Variable</i>	<i>Moody's long term issuer credit rating</i>				<i>S&P's long term issuer credit rating</i>				<i>S&P's short term issuer credit rating</i>			
	<i>FE</i>		<i>RE</i>		<i>FE</i>		<i>RE</i>		<i>FE</i>		<i>RE</i>	
	<i>Coef.</i>	<i>P>t</i>	<i>Coef.</i>	<i>P>t</i>	<i>Coef.</i>	<i>P>t</i>	<i>Coef.</i>	<i>P>t</i>	<i>Coef.</i>	<i>P>t</i>	<i>Coef.</i>	<i>P>t</i>
country rating	.58	0.00	.05	0.00	.73	0.00	.63	0.00	.68	0.00	.65	0.00
_cons	8.07	0.12	5.79	0.21	-5.09	0.14	2.45	0.39	.13	0.96	2.50	0.34
No obser	1287		1287		4081		4081		3630		3630	
No group	117		117		371		371		330		330	
F (prob)	0		0		0		0		0		0	
Hausman		0.4778				0.0010				0.1668		
xttest		0.0000				0.0000				0.0000		
correlation		0.5236				0.4083				0.4985		

Table 6. Macroeconomic determinants of Moody's credit ratings for banks

Variable	1		2		3		4		5		6		7		8		9	
	Coef	p	Coef	p	Coef	p	Coef	p	Coef	p	Coef	p	Coef	p	Coef	p	Coef	p
Economic factors																		
GDPg	-47	0.04			-69	0.00			-7	0.22	-68	0.00			-12	0.67	-07	0.80
GCI	35.3	0.00			35.36	0.00			10.23	0.64	36.39	0.00			28.85	0.00	24.31	0.00
GDPp	.00	0.00			.00	0.00			-.00	0.72	.00	0.00			.00	0.00	.00	0.00
Institutional strength																		
WGE			11.82	0.05	-4.44	0.55			-62.07	0.00	-1.61	0.83			7.22	0.49	5.76	0.57
RLI			-2.42	0.76	-7.65	0.40			50.79	0.02	-10.1	0.27			-1.05	0.94	-3.29	0.81
CCI			35.95	0.00	34.96	0.00			62.4	0.00	31.55	0.00			9.29	0.24	16.12	0.04
INF			-.18	0.43	-.09	0.72			-1.01	0.35	-.10	0.69			-.45	0.08	-.17	0.53
Susceptibility to event risk																		
VAI							33.20	0.00	-15.74	0.56	19.47	0.05			.02	0.40	3.60	0.82
CLA							.23	0.28	.10	0.69								
RISK							-.84	0.09	-.6	0.46								
Banking sector factors																		
DBA													-.03	0.86	-.18	0.33	.25	0.21
BCD													.02	0.17	.01	0.66	.01	0.54
CRE													.19	0.33	.24	0.31	-.15	0.55
CON													-.13	0.22	-.16	0.26	-.09	0.50
Country credit rating																		
CR																	.73	0.00
constant	-144.54	0.00	9.97	0.3	-167.22	0.00	37.6	0.00	-5.98	0.96	-181.67	0.00	45.4	0.00	-141.37	0.000	-185.8	0.00
No obs	982		1065		954		185		162		954		686		564		564	
No group	110		109		109		29		24		109		106		104		104	
Wald	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
Hausmann	0.0000		0.0021		0.0001		0.0001		0.0000		0.0000		0.0032		0.0000		0.0061	
xttest0	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
type	FE		FE		FE		RE		FE		FE		FE		FE		FE	

Figure 1. Macro profile construction

Source: own elaboration based on Moody's (2016).