

Microeconomic Determinants of Bank Credit Risk: An Assessment

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Abstract

Motivated by the absence of a specific measure to bank credit risk, This paper applies stepwise linear regression to analyze the effect of using different proxies of credit risk on its bank-specific determinants in UK banks during the period of 2004-2014, and to find out the most significant indicators of such a risk. The outcomes show that using different proxies will result in different determinants of credit risk. The study also found that bank Liquidity and bank size are the most important determinants of credit risk. These results highlighted the necessity of more research to obtain a specific measure of bank credit risk.

Key words: Credit risk, Determinants, Banks.

Introduction

In doing their work banks, by nature, face various sorts of risks, among those risks what so-called credit risk which proved to induce an effect on banks' financial condition which could affect the overall economic system. Scholars such as Cole and Wu (2009), Foos et al., (2010), Li (2013), Cox & Wang (2014), Imbierowicz and Rauch (2014) and Farruggio & Uhde, (2015) among others provide the evidence that credit risk is a reason of bank failure. Other scholars such as Mileris (2012) and Louzis et al., (2012) confirmed the effect of such risk on bank performance. Zhang et al., (2013) provided the evidence that credit risk leads to bank default. In brief, credit risk could affect overall bank risk. Hence, this risk need to be assessed to make them at acceptable level (Mileris, 2012). Analysing and measuring credit risk is also important to reduce the loss. According to Derelioglu and Gürgen (2011) the purpose of analysing credit risk is to reduce possible loss in the future. This done by estimating the probable risk and avoiding the credit proposal that contain a higher risk. Many researchers have used Non-Performing Loans (NPLs), Non-Performing assets, loan growth and loan loss provisions as proxies for Measure credit risk and find out its determinants. However, the researchers come to different results. It could the reason behind that the absence of a specific measurement of credit risk which lead scholars to use different proxies to reflect the risk. Accordingly, this research aims to assess the determinants of banks credit risk using different proxies of credit risk to clarify the effect of using each proxy on the determinants of such a risk. The article will contribute to the literature in different ways; First, it will provide a comprehensive assessment of the microeconomic determinants of credit risk, and hence, provide the evidence about the most important indicator among the variable used. Second, it enriched the body of research regarding the determinants of credit risk. Finally, it will open the door for the researchers to conduct deep research to develop a specific measurement of credit risk.

Related literature:

Finding the determinants of credit risk has drawn the attention of Many researchers at an early stage. An early study by Berger and DeYoung (1997) examined the link between problem loans and cost efficiency in US banks during the period 1985–1994. Three bank specific factors used in this study, namely loan quality, cost efficiency, and bank capital. By analysing credit risk and its relationship of banking efficiency and capital adequacy from different situations. Berger and DeYoung (1997) found that highly leveraged capital likely to affect credit risk and thinly capitalized banks generally takes riskier loans, which possibly could result in higher NPLs. Berger and DeYoung (1997) concluded that cost efficiency may be an important indicator of future problem loans.

Salas and Saurina (2002) used macroeconomic and microeconomic bank variables to clarify the determinants of credit risk in Spanish commercial and savings banks during the period 1985–1997. They found that credit risk can be described by many factors such as credit growth, real GDP growth, capital ratio, bank size, net interest margin, portfolio composition and market power. They also found that the changing in non-performing loans in the future can be predicted by using bank specific factors such as loan growth rates, the decrease in capital as well as the decrease in net interest margin (Salas and Saurina, 2002). Another comparable study has done by (Pain, 2003). Pain (2003) investigated microeconomics and bank specific factors that could lead to an increase in loan loss provision in UK banks during 1987 - 1991. the findings indicated that macroeconomic and bank specific factors such as the growth in GDP, interest rates growth, lending growth and the increased lending to riskier sectors will result in higher loan loss provisions (Pain, 2003).

Ahmad and Ariff (2007) examine bank specific factors as determinants of credit risk. The study compared such determinants across developed and developing country's banks. Variables such as management efficiency, loan-loss provision, loan over deposit ratio, leverage, regulatory capital, funding costs, liquidity, spread and total assets are used as banks specific factors. As a proxy for credit risk, the ratio of non-performing loan was used. Ahmad and Ariff (2007) found that the crucial and significant

factors relates to credit risk are regulatory capital and management quality. They also found that the increase in loan loss provision an important determinant of credit risk. In contrast with (Salas and Saurina, 2002, Pain, 2003), Ahmad and Ariff (2007) do not find any correlation between leverage and credit risk in their test period.

Hess et al. (2009) examine determinants of credit losses in Australasian banks during the period 1980–2005. To perform the study, they used a combination of micro and macroeconomic factors. In this study, factors such Size, share of system loans, Net interest margin, Cost-income ratio, Growth rate bank assets, the percent of Earnings before taxes and provisions to assets were used as a bank specific factor. Hess et al. (2009) found that banks with high cost-income-ratios have higher loan loss provisions. They also found that loan growth leads to higher credit losses with a lag of 2–4 years.

Samad (2012), conduct empirical study to investigate which important variable can be used as a determinant of credit risk. The focus was on five bank specific factors that used by us authority on an annual base, namely; net charge off of loans, credit loss provision to net charge off, loss allowance to loans, loan loss allowance to non-current loans and non-current loans to loans. Using a sample of US banks in 2009. Samad (2012) build five probit models to determine the most important variable. He found that credit loss provision to net charge off, loan loss allowance to non-current loans and non-current loans to loans are the most significant indicators of credit risk with accuracy arranging between 76.8% to 77.25%. According to the study these factors can be used to predict the failure in banks (Samad, 2012).

Louzis et al.(2012) use the dynamic data model to analyse the determinants of non-performing loans in nine Greek banks during the period of 2003–2009.the main objective of this research is to explore and examine which macroeconomic and bank-specific factors can be used as determinants of such loans. Louzis et al. (2012) find that most loan problems can be explained by using macroeconomic factors. In addition, bank specific factors that represent the performance and efficiency found to be significant indicators for predicting the future bad loans(Louzis et al., 2012). Louzis et al. (2012) stressed that bank specific factors doesn't only work as an indicator, they also lead to an increase in the explanatory power of their study model. Ideally, these findings recognize the importance of using bank specific factors.

Similarly, Makri and Papadatos (2014)use a dynamic regression method and quarterly data over the period 2001Q1 to 2012Q4 to investigate the ability of accounting and macroeconomic variables in explaining loan quality in Greek banks. The purpose, however, is to find the determinants of Credit risk. As for the accounting (bank specific) variable, the ratios of Bank capital and reserves to total assets, Loans to total assets ratio have used along with aggregate Loans Loss Provisions to total gross loans ratio which used as a proxy of credit risk measurement. Makri and Papadatos (2014) found that capital ratio, loan loss provision of previous quarter, unemployment and public debt have considerable effect on banks' asset quality. Hence, it can be arguing that this study confirmed the importance of using bank specific factors to measure the credit risk.

From the above discussion, it can be seen how important to measure the credit risk when assessing the banks' situation. And how found to be important the use of bank specific factors in explaining that risk. This is could be the reason that leads (BCBS, 2014) to focus on assessing such risk.

Research methodology

This research is concerned with the assessment of credit risk and its determinants in UK banks during the period of 2004 - 2014. To conduct the assessment, bank-specific data were extracted from bankskope database and published financial reports. The study variables come in two groups, the first group contains three dependent variables as proxies of credit risk. The second group contains independent variables, some microeconomic indicators that used in previous research represent capital, assets quality, management, liquidity, business model, diversification, overall bank risk, as well as size, have considered. The calculation of these variables showed in the table (1).

As for the model, the study used a Linear regression stepwise procedure to find out the relationship between the independent variables and bank credit risk indicators represented by the following equation:

$$Cr = a + \beta_1x_1 + \beta_2x_2 + \dots + \beta_nx_n \quad \text{Eq.1}$$

Where Cr the dependent variable, a constant, β coefficient, and x independent variable.

table (1) the study variables

| Category | Code | Equation | Used by |
|------------------------------------|--------|------------------------------------|--|
| Dependent variables Credit risk | CR1 | Loan-loss-provisions/Loans | (Mare, 2015) |
| | CR2 | Growth of total loans and leases | (Cox and Wang, 2014) |
| | CR3 | Loan loss reserves / Gross loans | (Farruggio and Uhde, 2015) |
| Independent variables | | | |
| Capital | C | Shareholder's equity / total loans | (Boyacioglu et al., 2009, Alali and Romero, 2013) |
| Assets quality | A | Return on Assets | (Betz et al., 2014) |
| Management | M | Total loans/Total deposits | (Almanidis and Sickles, 2012, Betz et al., 2014) |
| Earnings | E | Return on Equity | (Betz et al., 2014) |
| Liquidity | L | Liquid assets/Total assets | (Arena, 2008, Boyacioglu et al., 2009, Poghosyan and Čihak, 2011, Cleary and Hebb, 2016) |
| Business model | B | Net loans / Earning assets | (Mergaerts and Vander Venet, 2016) |
| Diversification | D | Non-interest income / Total income | (Louzis et al., 2012) |
| Leverage | LEV | Total Liabilities/Total Assets | (Bhagat et al., 2015) |
| Size | Log TA | Natural logarithm of total assets | Salas and Saurina, 2002 |

Results and discussion

The results of the empirical analysis of the determinants of credit risk for each dependent variable are summarized in the table (2).

table (2) the regression results

| Variables | Model1 | | Model2 | | Model3 | |
|-----------|----------------|-------|----------------|-------|----------------|-------|
| | Dependent= CR1 | | Dependent= CR2 | | Dependent= CR3 | |
| | coefficients | Sig. | coefficients | Sig. | coefficients | Sig. |
| constant | -1.388 | 0.000 | -3.989 | 0.280 | 4.166 | 0.111 |
| C | Ec. | Ec. | 0.848 | 0.004 | Ec. | Ec. |
| A | 0.112 | 0.056 | Ec. | Ec. | 0.453 | 0.001 |
| M | Ec. | Ec. | Ec. | Ec. | -0.006 | 0.001 |
| E | Ec. | Ec. | 0.707 | 0.000 | -0.011 | 0.095 |
| L | 0.013 | 0.000 | -0.223 | 0.001 | 0.019 | 0.000 |
| B | 0.010 | 0.001 | Ec. | Ec. | 0.020 | 0.000 |
| D | Ec. | Ec. | -0.165 | 0.011 | Ec. | Ec. |
| Lev | Ec. | Ec. | Ec. | Ec. | -0.069 | 0.017 |
| Log TA | 0.173 | 0.000 | 2.702 | 0.003 | 0.398 | 0.000 |

Note: Ec. Refers to variables that excluded from the stepwise procedure as non-significant

We can observe from the table (2) that there are a number of differences between the determinants of credit risk between models. In **Model 1** were the CR1 is the independent variable, regression analysis results underline a positive and statistically significant link between the CR1 and four indicators, namely: A, L, B and log TA, which means that they are key drivers of banks' credit risk.

As for **Model 2**, where the CR2 is the dependent variable, the results suggest that C, E, and log TA have a positive and significant relationship with credit risk using CR2 as a proxy. In contrast with model 1, the L1 found to have a negative and significant relationship with Credit risk. The results also confirmed a negative relationship between B and credit risk.

In **Model 3** where CR3 used as a proxy of credit risk, the results show a positive and statistically significant link between A, L, B, and log TA and credit risk. They also show a negative and statistically significant relationship between credit risk and M, E, and Lev.

Moreover, the results also show a difference between variables in terms of their significance and signs. Some variables found to be significant in one or two models and non-significant in other ones such as C, A, M, B, D, and Lev. As for the signs, variables such as E and L found to have a negative sign in one model and a positive sign in other ones.

Accordingly, it can be argued that the results support the author's idea that using different proxies to credit risk will lead to different determinants of credit risk.

The second objective of this paper is to find out the most important indicator of credit risk in the UK banking industry. To fulfil that, the author ranked the variables in three categories according to their appearance in the three models as below:

The first category is the **most important variables**: variables belonging to this category have to be significant in the three models.

The second category is the **important indicators**: variables belonging to this category have to be significant in two models.

The third category is **less important variables**: : variables belonging to this category have to be significant in one model.

The results of this ranking are shown in table (3):

table (3) variables ranking

| Category | Variables |
|----------------|--|
| Most important | Liquidity (L) and Size (log Ta) |
| Important | Assets quality (A), Earnings (E) and Business model (B) |
| Less important | Capital (C) Management (M) ,Diversification (D) and Leverage (Lev) |

Conclusion:

This paper presented a comprehensive assessment of the determinants of credit risk in the UK banks during the period of 2004-2014. The main objectives of the study were to find out and compare those determinants as well as finding out the most important indicators among them when using different proxies of credit risk. Implementing stepwise linear regression on a set of bank-specific data, we found that the determinants differ in terms of their significance and sign for each proxy. Meaning that each proxy of credit risk has his own determinants. The results also confirmed that bank liquidity and bank size are the most important determinants of credit risk in the case of UK banks. Accordingly, the author suggests that scholars have to be careful when analysing and interpreting the determinants of credit risk. The author also advises scholars to conduct future research in order to reach a specific measure of bank credit risk.

References:

- Ahmad, N. H. and Ariff, M. 2007. Multi-country study of bank credit risk determinants. **International Journal of Banking and Finance**, 5(1), pp.135-152.
- Alali, F. and Romero, S. 2013. Characteristics of failed U.S. Commercial banks: An exploratory study. **Accounting & Finance**, 53(4), pp.1149-1174.
- Almanidis, P. and Sickles, R. C. 2012. **Banking crises, early warning models, and efficiency**. Working Paper.
- Arena, M. 2008. Bank failures and bank fundamentals: A comparative analysis of Latin America and east Asia during the nineties using bank-level data. **Journal of Banking & Finance**, 32(2), pp.299-310.
- Bhagat, S., Bolton, B. and Lu, J. 2015. Size, leverage, and risk-taking of financial institutions. **Journal of Banking & Finance**, 59, pp.520-537.
- Basle committee on Banking Supervision -BCBS .2014. Supervisory guidelines for identifying and dealing with weak banks. **Bank for International Settlements Consultative document**, Consultative document
- Berger, A. N. and DeYoung, R. 1997. Problem loans and cost efficiency in commercial banks. **Journal of Banking & Finance**, 21(6), pp.849-870.

- Betz, F., Oprică, S., Peltonen, T. A. and Sarlin, P. 2014. Predicting distress in European banks. **Journal of Banking & Finance**, 45, pp.225-241.
- Boyacioglu, M. A., Kara, Y. and Baykan, Ö. K. 2009. Predicting bank financial failures using neural networks, support vector machines and multivariate statistical methods: A comparative analysis in the sample of savings deposit insurance fund (sdif) transferred banks in turkey. **Expert Systems with Applications**, 36(2), pp.3355-3366
- Clery, S. and Hebb, G. 2016. An efficient and functional model for predicting bank distress: In and out of sample evidence. **Journal of Banking & Finance**, 64, pp.101-111.
- Cole, R. A. and Wu, Q. .2009. Is hazard or probit more accurate in predicting financial distress? Evidence from us bank failures. **MPRA Pap. 24688**.
- Cox, R. A. and Wang, G. W.-Y. 2014. Predicting the us bank failure: A discriminant analysis. **Economic Analysis and Policy**, 44(2), pp.202-211.
- Derelioglu, G. and Gürgen, F. 2011. Knowledge discovery using neural approach for sme's credit risk analysis problem in turkey. **Expert Systems With Applications**, 38(8) pp.9313-9318.
- Farruggio, C. and Uhde, A. 2015. Determinants of loan securitization in European banking. **Journal of Banking & Finance**, (56), pp.12-27.
- Foos, D., Norden, L. and Weber, M. 2010. Loan growth and riskiness of banks. **Journal of Banking & Finance**, 34(12), pp.2929-2940.
- Hess, K., Grimes, A. and Holmes, M. 2009. Credit losses in Australasian banking. **Economic Record**, 85(270), pp.331-343
- Imbierowicz, B. and Rauch, C. 2014. The relationship between liquidity risk and credit risk in banks. **Journal of Banking & Finance**, 40(0) 3, pp.242-256.
- Li, Qingyu.2013. "What Causes Bank Failures During the Recent Economic Recession?". Honors Projects. Paper 28.
- Louzis, D. P., Vouldis, A. T. and Metaxas, V. L. 2012. Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. **Journal of Banking & Finance**, 36(4) , pp.1012-1027.
- Makri, V. and Papadatos, K. 2014. How accounting information and macroeconomic environment determine credit risk? Evidence from Greece. **International Journal of Economic Sciences and Applied Research**,(1), pp.129-143.
- Mare, D. S. 2015. Contribution of macroeconomic factors to the prediction of small bank failures. **Journal of International Financial Markets, Institutions and Money**, 392015/11, pp.25-39.
- Mergaerts, F. and Vander Vennet, R. 2016. Business models and bank performance: A long-term perspective. **Journal of Financial Stability**, 22, pp.57-75.
- Mileris, R. 2012. Macroeconomic determinants of loan portfolio credit risk in banks. **Bankų paskolų portfelio kredito rizikos makroekonominiai veiksniai.**, 23(5), pp.496-504.
- Pain, D. 2003. The provisioning experience of the major UK banks: A small panel investigation. Bank of England Working Paper No. 177.
- Poghosyan, T. and Čihak, M. 2011. Determinants of bank distress in Europe: Evidence from a new data set. **Journal of Financial Services Research**, 40(3), pp.163-184.
- Salas, V. and Saurina, J. 2002. Credit risk in two institutional regimes: Spanish commercial and savings banks. **Journal of Financial Services Research**, 22(3), pp.203-224.
- Samad, A. 2012. Credit risk determinants of bank failure: Evidence from us bank failure. **International Business Research**, 5(9), p.p10.
- Zhang, J., Jiang, C., Qu, B. and Wang, P. 2013. Market concentration, risk-taking, and bank performance: Evidence from emerging economies. **International Review of Financial Analysis**, 30. pp.149-157.