MEASURING MODEL FOR BAD LOANS IN BANKS. THE DEFAULT PROBABILITY MODEL

Iuga Iulia
Universitatea „1 Decembrie 1918" Alba Iulia
Facultatea de Ştiinţe

Socol Adela
Universitatea „1 Decembrie 1918" Alba Iulia
Facultatea de Ştiinţe

The banking sectors of the transition countries have progressed remarkably in the last 20 years. In fact, banking in most transition countries has largely shaken off the traumas of the transition eraAt the start of the 21st century banks in these countries look very much like banks elsewhere. That is, they are by no means problem free but they are struggling with the same issues as banks in other emerging market countries during the financial crises conditions. The institutional environment differs considerably among the countries. The goal we set with this article is to examine in terms of methodology the most important assessment criteria of a measuring model for bad loans.

Keywords: assessment criteria, „Default" model, collateral, Basel II Accord

JEL code: G21

1. Introduction

The role of financial intermediaries such as banks is to channel savings to investors. In a modern economy, banks do this by maintaining a delicate balance between risk taking and managing risk.Bankers face information asymmetries when they engage in lending since only the borrowers know about the 'true' risk of their investment projects. However, there are several covenants that bankers can include in their credit contracts to overcome information asymmetries. Bester (1985) showed that collateral can serve as a signalling device, so that borrowers reveal their true riskiness by the amount of collateral they are willing to offer. To ensure that devices like collateral can be effective, laws that define collateral relationships and adequate institutions for enforcement are essential. More reliable collateral laws and arrangements could result in greater use of collateral to overcome asymmetric information and an overall reduction of risk. In a poor legal environment, a borrower might use the same asset as collateral in several lending agreements or might refuse to surrender the collateral in case of default. In this view, a better institutional environment will be associated with a greater willingness to use collateralised loans and more lending. This is consistent with results in the law and finance literature that show a positive relationship between good creditor rights and credit market development (La Porta, *et al.*, 1997, 1998).

Focusing more on individual banks, Kager (2002) shows that the problem of bad loans persisted in many banks in transition economies.

EU banks have smaller solvency ratios and loan loss reserves but they maintain more liquid assets. The use of contingent liabilities is rare except for EU region banks. Finally, there are some differences by bank size or share. There is clearly an inverse relationship between the solvency ratio and bank size or market share. Also, the very large banks and those with shares over 10% make fewer short-term loans than others.

Banks with greater confidence in the banking environment or in countries with an objectively better legal environment for banking might be willing to take on more risk.

Interestingly, there is no clear pattern between estimated default probability and the institutional environment (Rainer Haselmann and Paul Wachtel, 2007). When bankers have better perceptions

of the quality of law and when the laws are objectively better, their default probability is higher. This suggests that bankers are willing to take on risky lending when the legal environment for dealing with bad loans is better. However, better perceptions of the courts and better law enforcement are associated with lower default probabilities. Also no clear pattern could be detected for the relationship between bank risk and credit risk.

2. Measuring model for bad loans

Regarding the design decision and the economic efficiency of implementing a measuring model, the general framework for its assessment must be taken into account. The most important assessment criteria are:

a) the expected value of the model shows how valuable the model is expected to be in certain situations, having as sub-criteria the instructive value of the model, as well as the economies resulting from decisions that are made faster and better on the basis of the model;
b) the initial costs show how expensive is the implementation of the model in a given situation considering the cost of adaptation and the costs for collecting the initial data;
c) the structure of the model has as sub-criteria: adaptability, completeness, ease of testing, ease of understanding and the model robustness. *The completeness of the model* shows the extent to which the representative users of the model consider that the model explicitly or implicitly allows the treatment of all phenomena important and relevant for the investigated problem.
The understanding ease of the model shows how well and fast the user can understand the general logic of the model.
The adaptability of the model shows the ease with which you can change the value of the patterns and the structure of the model as response to the new conditions in which the model is used.
The ease of testing refers to the existent opportunities for validating the model for current applications.
The robustness of the model shows the extent to which it is possible to obtain correct results when the input data of the model exceed a certain order.
d) the use features show how easy it is to use the model and has as sub-criteria the following: the ease of communication and control, the volume of the data input and the time of response;
e) the context of use shows the extension to which the specific conditions where the models is used favour its acceptance by the managers and takes into account: the field of the analyzed problem, the considered decision type and the use frequency;
f) the validity of the model represents the major assessment criteria for the model. An invalid model is not consistent with reality and leads to erroneous conclusions regarding the performance of the system.
g) the consistency of the model reflects the extent to which the component elements of the process modelled by the relations between them were presented;
h) the quality of the model is given by following the next main criteria: coherence, precision, efficiency, completeness and the efficient use of the model.

The banking activity balances risk taking and risk management. In general, the loss owed to the credit risk of a portfolio is defined as being the difference between the current value of the portfolio and its future value at the end of a given time horizon. Therefore, estimating the probability density function of the current portfolio losses implies the current value of the portfolio and the probability distribution of future values at the end of the planned time horizon.
However, there is no single ideal method to measure the losses owed to credit risk. Two models for the loss owed to credit risk are used in practice:
1. default model (DM)

2. mark-to-market model (MTM).

„Default" model

To prevent the occurrence of bad loans, the Basel Committee on Banking Supervision elaborated an assessment model of credit risk (default model), which is recommended for all banks.
In general, the bad loans portfolio is defined as being the difference between: the current value of the portfolio and its future value at maturity.
In the case of this model, a credit loss occurs only when the borrower doesn't keep the day of maturity, meaning that he didn't reimburse the loan until maturity. In case the business fails, the loss of the credit would reflect the difference between the exposure of the loan and the present value of the future net recoveries. For this model, a bank must impose or estimate the possibility of risk distribution for each granted loan by taking into account three variables:
1. the associated exposure of the credit bank;
2. an indicator that shows the "default" possibility during the unfolding of the credit;
3. in the event of failure, the loss rate will be calculated. The lower the rate, the bigger the recovering rate of the credit.
The current and future value of credit instruments are defined for two states: *default* versus *non-default*. For a term loan, the current value is measured as bank exposure (accounting value). The future (uncertain) credit value depends on the whether the borrower will become unable to pay within the planned time horizon. If the borrower isn't insolvent, the future value of the credit will be measured as bank exposure at the end of the planned time horizon, adjusted so that it includes any payment of principal made during the planned time. Instead, if the debtor becomes insolvent, the future value of the credit (calculated as percentage of the credit value at the beginning of the time horizon) as will measured as:

1 – LGD,

where *LGD* presents the loss if the debtor becomes insolvent (*loss given default*). The lower *LGD* is, the bigger the retrieval rate of the credit will be.
There are expected losses of the credit portfolio and unexpected losses. An expected loss of the credit portfolio (μ) in the temporary assumed horizon is equal to the sum of expected losses for each type of credit (considered in its individuality) that forms the portfolio.

$$\mu = \Sigma \, Pi \times LEQi \times LGDi$$

where, for the type of credit i:

LGDi =loss in case of default; the expected loss rate in case of failure;
Pi = probability of default; unperformance probability (the expected "default" frequency);
LEQi = exposure to default risk; expected exposure of the loan.
The lower *LGD* is, the bigger the retrieval rate of the credit will be.

The standard deviation of the credit portfolio loss (σ) can be decomposed through the contribution brought by each type of individual credit:

$$\sigma = \Sigma \, \sigma i \times Pi$$

where:
σi = the standard deviation of the losses of the type of credit i;
Pi = the correlation between losses of the type of credit i and the ones of the total portfolio.

The Pi parameter holds the effects of the correlation of the type of credit i with the other types included in the credit portfolio of a bank. The higher Pi is, the bigger is the standard deviation of the credit losses in the portfolio.
After the assumptions that:
1. exposure of a certain type of credit is known with certainty;
2. the failures of the client and the expected loss rates in case of failure are independent of each other;
3. the expected loss rates in case of failure are independent of the borrowers, the standard deviation of the credit losses for a certin type of credit i can be expressed as:

$$\sigma i = LEQi \times \sqrt{Pi\,(1 - Pi) \times LGDi^2 + Pi \times VOLi^2}$$

where VOLi is the standard deviation of the expected loss rate in case of failure for the type of credit i.

These equations provide a conventional method to sum the risk of the total credit portfolio (within "default" mode) regarding the correlation between the losses of the i credit and the ones of the total portfolio, the expected loss rate in case of failure, the standard deviation of the expected rate in case of failure for the i type of credit and the expected exposure of the loan. They are also used to highlight those aspects of the credit risk estimation process that establish total trust in a credit risk model, namely:
a) the accuracy of the parameter estimations as representations of the future;
b) the validity of the presumptions of independence between variables (the presumption that certain variables are known without certainty) and the distributional presumption that introduces unexpected losses.

Regarding the aspect of the design decision and the economic efficiency, we found the "default" model elaborated by Basel Committee on Banking Supervision as being efficient.
In this model, for each granted credit, a bank must impose or estimate the possibility of risk distribution by taking into account three variables: the associated exposure of the bank credit; an indicator that will show the "default" possibility during the unfolding of the credit; the loss rate will be calculated in case of failure. The lower this rate is, the bigger is the retrieval rate of the credit.
The Basel II Accord acknowledges the techniques to reduce credit risk through collateral, securities and contracts derived on credit risk.
Regarding collateral, two methods to treat it are allowed:

- The simplest approach is similar to the one given by Basel I, according to which the risk weighting of the credit is replaced by the risk weighting of the collateral, which can be lower than 20%.
- The other approach to protect the bank against volatility of the collateral price is more advanced and relies on the adjusting of the collateral's market price by introducing *haircuts*, which are either supplied by the supervisor (based on quantitative and/or qualitative criteria), or are calculated internally. Then, the value of the collateral adjusted by the market is deducted from the gross value of the given loan, thereby obtaining the adjusted exposure, which is afterwards multiplied with the associated risk weighting.

Thus, for a collateral transaction, the exposure after the *risk mitigation* procedure is calculated as follows:

$$\left(E^{*} = \max\left\{0,\left[E \cdot 1 + He\right) - C \cdot \left(1 - Hc - Hfx\right)\right]\right\},$$

where:
*E** represents the exposure value after the risk mitigation procedure;
E – the current value of exposure;
He – the *haircut* weighting applied to that exposure;
C – the current value of the received collateral;
Hc – the weighting applied to that collateral;
Hfx – the weighting applied to reduce *currency mismatch* owed to expressing exposure and the collateral in different currencies.
When the collateral consists of an assets cart, the weighting applied to the assets cart is:

$$H = \sum_{i} aiHi$$

where:
ai represents the assets cart weighting (measures in monetary units)
Hi – the weighting applied to those assets.

According to both approaches, acceptable collateral represents:
- money or deposits;
- debt securities with at least a BB- rating, issues by governments or public entities;
- debt securities issues by corporations, with a rating of at least BBB-;
- equities or convertible bonds included on a main index;
- gold.

In addition, the advanced approach accepts convertible bonds that are not on the main index, but are transacted on a recognised stock exchange market, bonds without rating issued by banking institutions, collective investment schemes and mutual funds.
To accept these types of collateral, a bank must met standards regarding:
- the legal certitude of the used documents;
- the requirement that the assets used for risk mitigation will have a reduced correlation with the credits whose risk they reduce;
- the robustness of the management policies for collateral.

3. Conclusion

Certain groups of banks differ in their riskiness; for example, foreign, EU and large banks show a lower probability of default compared to their competitors. Nevertheless, these differences are not large and generally not statistically significant. This suggests that banking markets are relatively homogenous and no clear groups of banks with excessive risk taking can be identified.

Bibliography:

1. Berger, AN and Udell, GF. (2002): Small business credit availability and relationship lending: The importance of bank organizational structure. Economic Journal 112(477)
2. Bester, H.: Screening versus raţionalizarea pe pieţele de credit cu informaţii imperfecte. Am Econ Rev 75 (4), 850-855 (1985)
3. Haselmann, R and Wachtel, P. (2006): Institutions and bank behavior. New York University, Stern School of Business, Working Paper EC06-16
4. Haas, R and van Lelyveld, I. (2006): Foreign banks and credit stability in central and eastern Europe: A panel data analysis. Journal of Banking and Finance 30: 1927–1952.
5. Haselmann, R. (2006): Strategies of foreign banks in transition economies. Emerging Market Review 7: 283–299.
6. Kager, M. (2002): The banking system in the accession countries on the eve of EU entry. Austrian Central Bank, Working Paper.

7. Haselmann, R., Wachtel P. (2006): Risk taking by banks in the transition countries. Comparative Economic Studies 49/2007.
8. La Porta, R, Lopez-de-Silanes, F, Shleifer, A and Vishny, R. (1997): Legal determinants of external finance. Journal of Finance 52: 1131–1150.
9. La Porta, R, Lopez-de-Silanes, F, Shleifer, A and Vishny, R. (1998): Law and finance. Journal of Political Economy 106(6): 1113–1155.
10. Deaconescu D., (2005), Abordarea riscului operational conform noului Acord de la Basel, Revista Economie teoretica si aplicata, nr. 439
11. Opritescu M., Spulbar C., Nanu R., Opritescu A., Berceanu O. (2006), Tratat de management a riscurilor bancare, Editura Universitaria, Craiova
12. Trenca I., (2006), Noi cerinte privind managementul riscului de creditare, Revista Economie teoretica si aplicata, nr. 3(498)
13. Iuga I., Socol A., Procesul de management al riscului operational in cadrul bancilor romanesti, Revista Finante, Banci, Asigurari, publicatie lunara editata de Tribuna economica, nr. 10, p. 51-54, 2006, ISSN 1453-7524.
14. Socol A., Iuga I., Measuring the operational risk – a challenge posed by the European Directives for adequating the capital in the Romanian banking system, 7th International Conference on Enterprise in Transition, 24-26 mai 2007, Universitatea din Split, Croatia, UDK 339(063), ISSN 1846-2618, p. 307-311.
15. Iuga I. (2004), Operatiuni preliminare acordarii creditelor bancare pentru agentii economici, Editura Aeternitas, Alba Iulia
16. Basel (June 2006), International Convergence of Capital Measurement and Capital Standards: a Revised Framework – Comprehensive Version (sau Acordul Basel II), Basel Comittee on Banking Supervision
17. Directiva 2006/49/EC privind adecvarea capitalului societatilor de investitii si institutiilor de credit