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Credit Scoring Application at Banks: Mapping to Basel II

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Abstract

Credit scoring is a process to find out the numerical assessment that mainly relied on an analysis borrower' profile. A credit score is primarily based on a credit report information commonly sourced from customer files and independent sources. Lenders, such as banks use credit scores to evaluate the potential risk posed by lending money to consumers and to mitigate losses due to bad debt. Hence, credit scoring is a powerful tool. By examining knowledge in Credit scoring as well as Basel II fundamentals, the author proposed a mapping process to match Credit score application at banks in accordance with Basel II.

Keywords: Outsourcing Policy, Discrimination, Fear to Associate, Employment Encertainty, Karawang

1. Introduction

Credit risk is one of the oldest and most widespread types of risk in the financial market (FSI, 2010), which frequently occurs and causes severe consequences for the banking business. Credit risk assessment is the first step, which is the prerequisite before the bank decides to lend to customers, and one of the most widely used credit risk assessment techniques of commercial banks is using credit scoring analysis tools to rank customers, therefore, credit scoring is a powerful tool, not only in credit risk management, but also in business development such as identifying target customers, enhancing customer experience, minimizing processing time… However, there are many methodological and technical challenges in building, using and applying such a tool effectively to business practice. Thus, the author aims to map credit scoring to Basel II at banks.

2. Credit scoring foundation

The idea of a credit scoring tool, begun in the 1970s, as banks realize that there is a rapidly growing market for smaller loans to small and medium businesses, this requires a radical shift in the way customer reviews are analyzed, instead of relying solely on the subjective judgment of the lender. The idea is that a statistically based tool could do a better assessing a customer: it's cheaper, faster and more reliable. With a slow start, the pace at which these techniques are being applied has increased significantly, as the advantages of credit scoring compared to traditional credit rating techniques become apparent. In developed markets, traditional risk assessment techniques have been completely replaced in the retail banking segment and in many SME portfolios. Today, many financial institutions, especially large ones, rely on a number of credit scoring systems

to help manage every aspect of their customers and customer relationship. There are several definitions of the credit scoring system: Credit scoring, according to Naeem Siddiqi (2017): "Credit risk scoring, as with other predictive models, is a tool used to evaluate the level of credit risk associated with applicants or customers". Credit scoring is a statistical technology that quantifies the credit risk posed by a prospective or current borrower and seeks to rank them so that those with poorer scores are expected to perform worse on their credit obligations than those with better scores (Aveny, Brevoort & Canner, 2009). According to Standards & Poor's (S&P's), credit scoring is the current assessment of credit risk, credit quality, ability and willingness of borrowers to meet their full and timely financial obligations. According to Moody's, credit scoring is an assessment of the credit quality and debt repayment capacity of borrowers based on fundamental credit analysis and expression through the Aaa to C ranking system (which now becomes the standard all over the world). Thus, it is possible to define credit scoring as a process that evaluates the ability of a customer to perform one's financial obligations to a bank such as interest payments and debt repayments when due, or other credit obligations to assess and identify risks in the bank's credit operations. Credit risk varies from customer to customer and is determined through a point-of-sale process, based on the customer's financial and non-financial information.

The scorecard format: The credit scoring model has many possible formats, but the scorecard is the most well-known and commonly used in the world. According to Siddiqi, N. (2017), the reasons this format is preferred because it has several advantages:

Example Scorecard Criteria	Range	Points
Business Stability	0-1 Year	0
	0-2 Years	10
	0-3 Years	20
	3+ Years	25
Bureau Score	0	0
	600-650	0
	700-750	30
	750+	50
Bank Account Stability	0-1 Year	0
	0-2 Years	10
	0-3 Years	20
	3+ Years	25
Total Score	XXX	

Table 1.1. The credit scorecard format sample

Source: eflglobal.com

This format is simple to interpreted, to understand, deployed and used. The increase or decrease in scores for each attribute is intuitive, consistent with business experience, and therefore applicable for risk managers and decision makers with little statistical knowledge.

Reasons for refusal of credit application, low scores, or high scores may be explained to customers, auditors and all stakeholders in simple business terms.

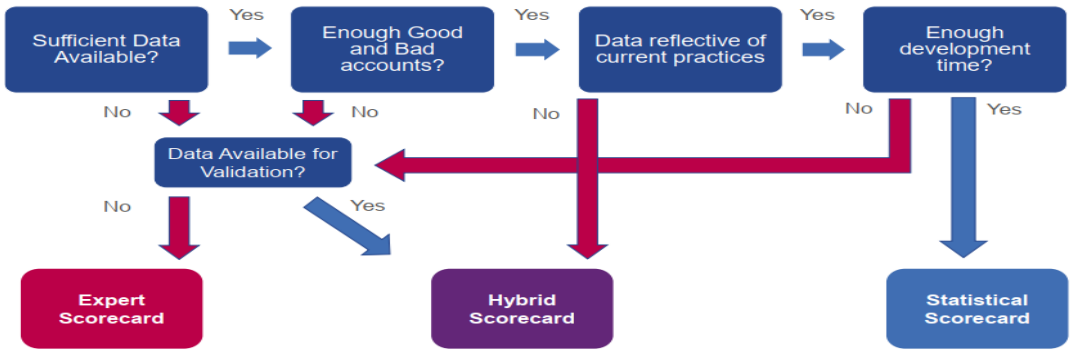
The development process for these scorecards is transparent, and is broadly understood. It can easily meet any validation or audit requirement.

The scorecard is easy to diagnose, maintain and monitor. The scorecard structure makes that analysts without comprehensive statistical or programming skill can implement these actions. This helps the scorecard to be an effective tool.

The type of model: after select the format, banks will decide the type of the scorecard model based on data available. Three types of scorecard models included: ***i) Expert method:*** also known as a judgmental method, the models built based on developer's judgment and industry experience: this is the traditional method of assessing a customer in a bank. This method is applied when the bank has little data available in the targeted portfolio; ***ii)***

Statistical: statistical method is applicable when the bank has a large set of historical data, maybe thousands of customers' record in the targeted portfolio or sector. The base idea of this methodology is the "discriminant analysis" which is using a statistical method to identify and separate between the "good" and the "bad" accounts. The techniques vary, but some of them commonly used are: Logistic Regression, Decision trees, Artificial Neural networks; ***iii) Hybrid:*** as in the name of the method already mentioned, this methodology is the combination between the Expert and the Statistical method. This method is usually used to build the scorecard models for relatively large companies because it needs both the good understanding of current business practices from banks and also use the statistical tool to do the discriminant analysis. This is a critical step because it determines the method of model building, and the structure, result and application of the models in the business. In general, the steps to be analyzed and the questions to be answered for decision making are presented as in Figure 1.1.

Figure 1.1. Credit scorecard format sample



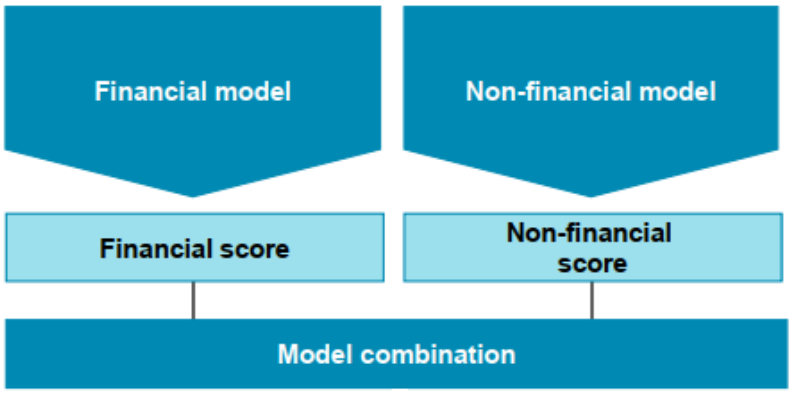
Source: Compiled by the author

The structure of hybrid scorecards in banks

Based on the analysis, it is understandable that hybrid models are adopted by many banks and chosen as the methodology for credit score modeling, because of the advantages of this model out weighted the disadvantages. At the same time, financial factors and other quantifiable factors, the indicators such as: management ability, the strategy of enterprises, the impact of macro factors… are factors that have a great impact on business operations, but they are difficult to quantify, as is heterogeneity between cases and requires an understanding of the lender in making assessments.

The model building methodology is the combination between the statistical and expert method, and the structure of the model is as below:

Figure 1.3. Structure of hybrid credit scorecard



Source: Compiled by the author

Modeling steps can be as simple as: Creating two distinct models: a model based on financial factors (quantitative statistical methods) and a model based on Non-financial factors (by expert method), then combine them on the basis of careful weighing to get the final model. Building the financial model using quantitative statistical analysis: These are quantitative indicators, taken directly or calculated based on financial statements of enterprises. Usually they come from 4 groups: Group of solvency indices: Liquidity ratio (current ratio, quick ratio, acid test…). Group of performance criteria: Working capital turnover; Inventory turnover; Turnover of total assets; Round of payables; Turnover of receivables…. Group of indicators on financial structure: Debt gearing ratio; Self-financing coefficient; Self-financing rate of fixed assets (long-term assets); Equity debt ratio; Coefficient of asset structure; Coefficient of capital structure. Group of profitability indices: Gross profit margin; Return on assets (ROA); Return on Equity (ROE).

The approach of this step is performed "discriminant analysis" which is using a statistical method to identify and separate between the previously defined "good" and the "bad" accounts. The common methods used are: Logistic Regression, Decision trees, Artificial Neural networks.

Building the non-financial model using expert judgment: These are mostly qualitative indicators. The experts of the bank will decide which factor to include in this model. To identify these criteria accurately, requires the modelers must have the level, knowledgeable about the business and sector of the business that the enterprise is operating. Non-financial indicators include: indicators on the management level and internal environment of enterprises, prestige indicators in relation to credit institutions, indicators on business activities, Factors affecting the operation of enterprises. Based on the expertise of the bank's specialists and risk appetites, each indicator will be given acceptable thresholds and assigned points depending on their value.

The challenge of this phase is mostly from assigning points and weight for each factor, how to decide how much this component should weight to contribute to the whole model? There're several ways to achieve this: like equal weighting (which is assigning equal points and weight for every factor), committee consensus (forming a committee to debate and finally reach consensus in assigning points and weight) … but whichever the method, the outcome still depends on the perception and risk appetite of each bank.

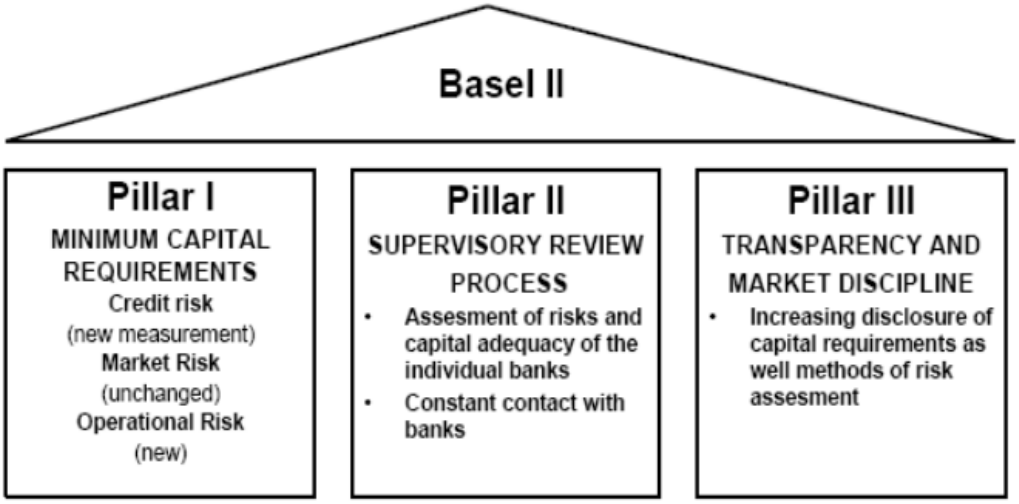
The final is combining those two models: typically, scores of the financial models account for 60% the total scores of rating, and scores of non-financial part account for 40% of the total scores of rating. Or in some banks, they choose to perform combining work by doing the regression between the "bad" ratio and the result of the financial and non-financial model to statistically best reflect each model' contribution to the final one.

3. Mapping Credit Scores to Basel II

Basel Committee on Banking Supervision - BCBS is a committee consisting of banking supervision experts, established in 1974 by a group of central banks and supervisory authorities often developing countries (G10) in the city of Basel, Switzerland. The Commission was born after a series of international currency and banking crises.

Basel II was issued in June 2004 and came into effect in January 2007. Basel II classifies the risk and calculates the amount of capital that needs to be maintained to ensure that the bank has sufficient capital to cover the financial and operational risks faced by the bank in its lending activities and investment, ensuring liquidity and stability of the economy in general. The main objectives of Basel II include: Ensure that the allocation of funds is made on the basis of consideration of risk factors; Promoting information disclosure that allows market participants to measure an institution's capital adequacy; Credit Risk, Operational Risk and Market Risk are measured against standard data and techniques. The above objectives are reflected in Basel II through the concept of "Three Pillars", demonstrated in figure 1.2.

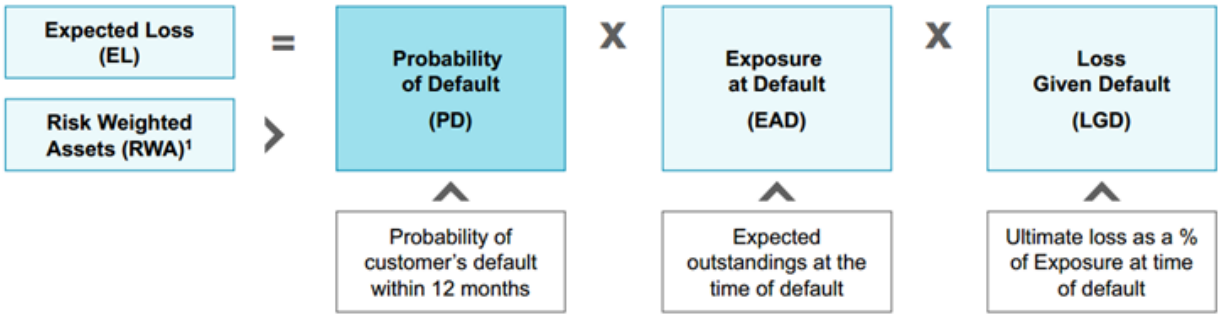
Figure 1.2. Three pillars of Basel II



Source: Derived from BCBS128 – Basel II

Credit risk: Calculated in three ways: (1) Standardized Approach (SA): Use rating results of independent external credit rating agencies to determine risk coefficients for different asset classes; (2) Foundation Internal Rating Based (FIRB): use internal data to model the probability of default (PD model), loss given default (LGD model) and exposure at default (EAD model) provided by the State Bank to calculate the capital; (3) Advanced Internal rating based (AIRB) method: banks develop internal PD, LGD, EAD models to calculate credit risk.

Figure 1.3. The expected loss formula



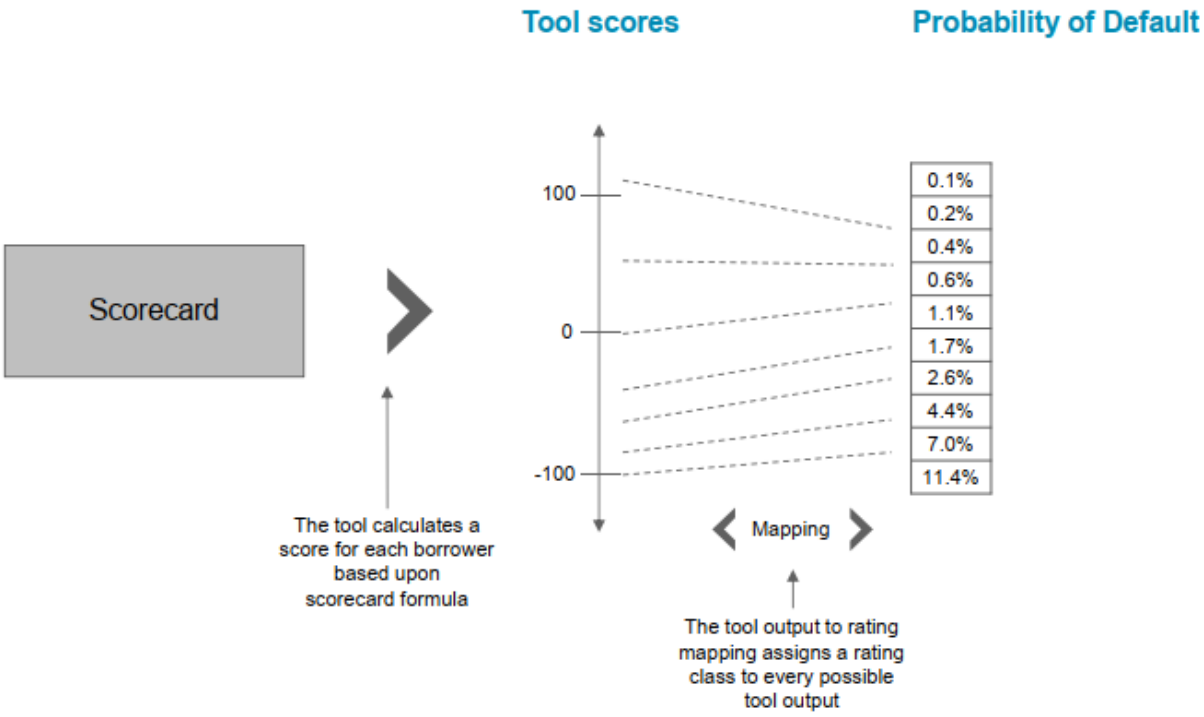
Source: Derived from BCBS128 – Basel II

As can be seen from preceding discussion, the scorecard was developed under the definition of "good" and "bad" accounts which may have a different definition with the "default" as required by Basel II standard.

Under the Internal Rating Based (FIRB & AIRB) approach, banks must develop internal Probability of default (PD) models together with Loss Given Default (LGD) and Exposure At Default (EAD) to calculate credit risk and make provision.

According to Javier Márquez (2008) "there is a direct relationship between scores (as obtained from a scorecard) and default probabilities. Thus, it is possible to determine the range of scores that correspond to a particular interval of default probabilities and the ratings they are associated with". Therefore, there's must be an additional step to align the scoring result to the PD. Figure 1.4 below that demonstrate the result of this step.

Figure 1.4. Mapping between Credit score to PD



Source: Compiled by the author

The final result will be a scorecard model for clients, along with the client's default rate corresponding to each point range. With this outcome, there're lots of possibilities in implementing this model.

4. Credit Scoring applications at Banks

According to Jamal E. Rahal and Grace Mungai (2015): "Credit scoring systems are used in a number of different ways and at different points in the customer life cycle. They have brought tremendous tangible and intangible benefits to most institutions that have embraced them". With such a powerful tool in hands, Banks could make lots of risk-based decision that can improve the performance of the bank. Some of them are listed below:

- To improve the selection of loan clients: Choosing a lender is always an important decision in the bank's credit operations. Making the wrong choice can lead to huge risks because customers can't pay their debts. Based on what basis to decide whether to lend or refuse the loan. When considering the decision to lend to a bank, it is usually based on collateral, business plan, financial situation, debt repayment capacity ... However, when there is a credit scoring system, banks can be based on the results of the rating to select customers with appropriate credit conditions.

- To limit credit risk: Banks seek to maximize profits by seeking the highest possible returns on loans and at the same time try to minimize the risks associated with lending activities to ensure safety for the whole system. In that trend credit scoring is an increasingly widespread technique to limit risks in credit activities of banks. The results show that the risk level of the borrowers, the lower the score, the higher the loan risk, which will help the bank to assess the quality of the loans, track the movement of risk items in the credit portfolio.

- To support loan classification and risk provisioning: The credit rating will be used as a basis for commercial banks to classify debts, calculate and make provisions for risks. Accordingly, the bank will classify the loans into appropriate groups of debt, assessing the necessary reserve level.

- Develop customer policies: Based on the results of the rating, the bank has a policy for each client group. Customer policy includes:

+ Credit granting policy: Depending on the ranking of the bank, the bank can provide customers with different credit products. Customers with a high credit rating will be offered a wide range of credit products such as short-term loans on a short-term basis, long-term loans, guarantees, trade finance…

+ Pricing policy: Based on the customer rating, banks will apply different rates and fees. Clients with high rankings will be offered lower interest rates and preferential rates than those with low ratings.

+ Loan security policies: Banks will issue different loan security policies such as fully / partial no collateral for low-risk customers, or the loan need to be securitized by real estate for high-risk customers.

Conclusion

Finalization of credit scoring in general and credit scoring are being paid more attention by commercial banks. This will help to reduce risks in the business and improve the credit quality of the banks. This is also advantageous for this subject to continue to develop research in the future.

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