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Credit scoring system for small business loans

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Abstract

A requirement of a credit scoring decision support system for small business loans is that the embedded scoring model can be easily altered in accord with the change of business environment. To satisfy such a requirement, this study proposes an N-tier architecture integrated with the idea of Model-View-Controller. With this design, the system engineers can avoid frequently investing considerable time and effort in communicating with the model managers for finalizing the scoring models, and model managers can easily alter the embedded scoring models later at any time.

Keywords: Credit scoring system; Small business loans; N-tiers; XML

1. Introduction

Many banking institutions have stepped up their effort in developing relationships with small businesses. However, this lending involves high potential risks due to the information asymmetry and time-vary essentials of a small business. Unlike large firms that are easy to raise funds from public debt markets, small firms rely on lending from commercial banks. On the other hand, lending to small business is beneficial to commercial banks because the margins on small business lending are higher than on many other bank products [11]. But it is difficult for banks to obtain detailed information from small firms since the financial reports of small firms are mainly for tax purposes [1,5]. For managing this asymmetric information problem, banks tend to gather more information through the credit records of small business from the credit information center. In addition, small firms are more subject to economic cycles, and they might be seriously affected by an economic downturn. The credit risk of small business alters because of the change of business environment. Hence, important features for small business lending are to reduce information asymmetry and to avoid the credit risk from lending to small firms.

Accordingly, it is better for a banking institute to accumulate timely information to create a small business credit-scoring model for identifying desirable small business borrowers. Furthermore, the credit-scoring model should allow for being altered easily and timely when it is necessary in accord with incorporating the most recent credit record and rapid change of business environment.

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In literature, many studies focus on large business credit scoring. For example, Katz et al. [8] use discriminatory analysis. But discriminatory analysis fails to capture the sensitivity of small business environment. Ou and Penman [10] adopt Probit model to predict the bankruptcy risk, and Tam and Kiang [12] use a neural network to evaluate the operating performance of credit customers, respectively. Unfortunately, credit-scoring models developed for large business loans are also not suitable for small business loans because, as mentioned above, small business loans have associated risks involved with information asymmetry. Till now, only studies like Refs. [3,4] center on the role of discrimination in credit markets for small business.[1] To our best knowledge, there are barely few studies exploring the credit scoring for small business.

It is helpful for a financial institution to have a credit scoring system where small business credit scoring models are embedded. This system can be used as a decision support system for managing small business loan applications. Current small business loan applications are managed mainly via man, in a less efficient, less effective, and subjective manner. A small business scoring system will benefit banks and small business by supporting the examination and evaluation of small business loans, and rendering the process objectively and well time controlling. In accordance with the evaluation score, credit officers then decide whether it is worth giving loan to the small business applicants. By improving the efficiency and managing its essential risk through decision support system, small business loans can become a high potential business for commercial banks. The problem is, as far as we know, no academic study investigates the credit scoring decision support system for small business loans.

There are more advantages with a credit scoring system for small business loans. For instance, a small business scoring system can eventually make an online application of small business loan possible. Moreover, based upon the updated information of current business environment, such small business credit scoring system can automatically review in batch a large amount of client samples of bank. With the reviewing results, more proper scoring models can be re-built in accord with the change of business environment.

A key issue of such a small business credit scoring system is how to provide a mechanism to render model managers[2] to easily alter the embedded scoring models correspondingly with the change of business environment. This study focuses on such a credit scoring system.

Our proposal is as follows. At the stage of system design, the tasks of model-developing, model-installing, and loan-evaluating are processed in parallel and as independently as possible. Scoring models, the final product of the model-developing task, are the shared components of the model-installing and loan-evaluating subsystem. After reasoning out all scoring models, model managers define all scoring models via the graphic user interfaces (GUIs) provided from the model-installing subsystem. The model-installing subsystem then implements all scoring models via transforming them into XML files. Scoring models are transformed into a set of defined variables and put into the database back-end. Then, account officers or credit officers can use the GUIs provided from the loan-evaluating subsystem to create new loan applications and evaluate them. Within the evaluation process, the loan-evaluating subsystem parses associated XML files. At the end of evaluation, the corresponding evaluation score is stored and can be retrieved for credit officers whenever needed.

With such a design, the system engineers can avoid considerable time and effort in frequently communicating with the model managers for finalizing the scoring models, and model managers can

[1] Cavalluzzo [3] examines the relationship between market structure and discrimination. Cavalluzzo et al. [4] analyze credit applications, loan denials, and interest rates paid across gender, race, and ethnicity of small business owners and demographic groups to better understand the sources of observed differentials in the small business credit market.

[2] There are two groups of end-users who manage two kinds of tasks (loan management and scoring model management) via small business credit scoring system: (1) account officers and credit officers who manage small business loans, including their creating, evaluating, modifying, querying, and crediting. (2) Model managers who format and define the scoring models, regularly monitor them, and modify them if necessary. In principle, account officers or credit officers will not be model managers. Financial and economical professionals are model managers who set up reasonable and suitable rules that consist of scoring models.