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The Role of Credit Scoring in Small Business Lending^{*}

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Abstract

This paper discusses the role of credit scoring in small business lending, based upon survey evidence in the United States and Japan. Credit scoring has four potential benefits in small business lending, namely, (i) reducing screening and monitoring costs of small business loans, (ii) enhancing competition among banks in local markets, (iii) adjusting lending interest rates commensurate with borrowers' credit risks, and (iv) increasing the availability of credit for risky marginal firms. Which of these benefits are actually realized depends on the financial structure of individual country (including lending infrastructure such as credit bureaus) and management strategies of banks adopting small business credit scoring. We should also note that a trade-off among potential benefits may arise, such as the trade-off between increasing the availability of credit and adjusting interest rates commensurate with credit risks. A clear policy strategy is thus important in order to achieve the potential benefits of credit scoring. In the case of Japan, most banks use small business credit scoring in order to make lending procedures prompt and cost-efficient and to set contract terms more accurately and proportionately to small firms' credit risks.

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1. Introduction

In recent years, credit scoring has been rising in popularity among banks in developed countries as a lending technique toward small and medium enterprises (SMEs). Credit scoring is a technique lenders use to determine whether or not to approve a loan application as well as the terms and conditions of a loan on the basis of a “credit score” of a prospective borrower. The credit score is computed by a quantitative model on the basis of various explanatory variables deemed closely linked to credit risk of a borrower (such as attributes and financial conditions of the owner and the firm).

This paper discusses the role of credit scoring in small business lending, based upon survey evidence in the United States and Japan. The paper begins with a brief review of the characteristics of small business credit scoring, in comparison with other lending technologies to SMEs. After discussing potential benefits and pitfalls of small business credit scoring, the paper then draws some lessons from the experiences in the United States and Japan. The emphasis is put on the current status in Japan based upon the bank survey evidence in Ono (2005), because the expansion of small business credit scoring is relatively a new phenomenon in Japan and thus its experience may provide insights for emerging Asian economies.

2. The Characteristics of Small Business Credit Scoring

2.1 Small business financing and lending technologies

Small businesses are widely viewed as the fountainhead of job creation and the engine of economic growth. Nonetheless, small businesses have faced financing difficulties in many developed and developing countries due to the following two reasons.

First, it is difficult for creditors to access the creditworthiness of small business borrowers due to the lack of credible information about them. Small firms are typically more opaque in terms of information than large firms because they do not have audited financial statements to verify their financial conditions. The asymmetric information problem between lenders and borrowers then yields a concern for the *adverse selection* problem before loans are provided, under which riskier firms are much more willing to borrow because creditors cannot differentiate the terms of loan contracts based on the riskiness of borrowers. There is also a concern for the *moral hazard* problem after loans are made, under which borrowers invest funds to the riskier project or weighs more on increasing costs or dividends rather than repaying the debts. These sorts of “agency costs” are inherent in any form of debt contract, but are particularly acute in lending to small businesses whose information opacity is most severe.

Financial intermediaries are producing relevant information regarding borrowers’ prospects of debt repayment via screening and monitoring, thus mitigating the adverse selection problem and moral hazard problem. The financing difficulties arise, however, in the realm of small business lending because screening and monitoring costs are essentially fixed and thus create economies of scale in the borrowing amount.

To address these difficulties that small businesses encounter, financial institutions use a number of different lending technologies. For one, *relationship lending* (sometimes referred to as *relationship banking*) has been developed as a traditional type of lending technology for small businesses. Although it is not particularly sharply defined in the literature, Boot (2000), for example, defines relationship lending (banking) as the provision of financial services by a financial intermediary that (i) invests in obtaining customer-specific information, often

proprietary in nature; and (ii) evaluates the profitability of these investments through multiple interactions with the same customer over time and/or across products. On the other hand, *transactions-based lending* has also been developed. According to Berger and Udell (2002), there are three forms of transactions-based lending for small businesses¹.

The first is “financial statement lending.” This type of lending is best suited for firms with a high degree of transparency with certified audited financial statements. Because these types of loans require the provision of financial condition clauses (financial conditions which the borrower must maintain during the period of the loan in order to protect creditors, such as the maintenance of certain financial ratios) in advance, borrowers must have strong financial conditions as reflected in the financial ratios calculated from these statements.

The second is “asset-based lending,” a form of lending which establishes credit lines on the basis of the collateral value of assets for firms which are slightly sub-par in terms of cash flow but nevertheless have collateral such as high quality accounts receivable and inventories. Note, however, that the distinction between asset-based lending and, for example, relationship lending doesn’t rest on the use of collateral itself. Rather, they are distinguished by the primary foundations of the lending decisions: the collateral value in asset-based lending and the overall creditworthiness of the borrowing firm in relationship lending.

The third form of lending is credit scoring lending, the subject of this paper. As mentioned above, credit scoring is a technique used for “micro credits” toward SMEs. Decisions on matters such as whether or not to provide a loan and the terms and conditions of a loan are determined on the basis of a “credit score” calculated by a quantitative model on the basis of attributes linked closely to credit risks such as the characteristics of the owner and the financial conditions of the firm.

2.2 Small business credit scoring

The distinguishing characteristic of credit scoring lending, when compared with financial statement lending and asset-based lending, is that it recognizes loans as portfolio. In other words, while financial statement lending and asset-based lending judge credit risks with respect to each loan on a temporal basis, credit scoring determines creditworthiness on the basis of the average performance of the overall portfolio. This is illustrated symbolically by the following episode involving Lawrence Lindsey, former Assistant to the president for economic policy and director of the National Economic Council under the previous administration of US President George W. Bush (Mester, 1997).

In this particular case, Mr. Lindsey, then a Governor of the Federal Reserve System, applied for and was denied the issuance of a Toys ‘R’ Us credit card on the grounds of his credit score. His application was denied on the basis that he had frequently made voluntary credit bureau inquiries. According to the credit scoring model, applicants with seven to eight such inquiries are categorized as a group who are three times as risky as the average applicant. Hence, the model arrived at the conclusion that it would be better not to issue a credit card to Mr. Lindsey. Unlike the ordinary applicant who makes voluntary credit bureau inquiries because of his concerns regarding the deterioration of his creditworthiness (or some other guilty conscience), Mr. Lindsey’s actions stem most likely from his curiosity as an expert in the field of finance. If such were the case, perhaps it would have been better to consider the high reading as an outlier and let the application pass. However, screening costs would surge if the circumstances

¹ Additionally, Berger and Udell (2005) propose to include factoring, fixed-asset lending, leasing, and trade credit to have a more complete conceptual framework for the analysis of SME financing.

surrounding each and all of such outliers had to be checked. Thus, credit scoring dismisses such outliers and evaluates creditworthiness on the basis of the average performance of the overall group.

Several statistical methods are used to develop credit scoring systems, including linear probability models, logit models, probit models, and discriminant analysis models². To illustrate, consider the following simple logit model. The dependent (left-hand side) variable y_i is a binary dummy variable that takes the value of 1 if the small firm i defaults and takes the value of 0 otherwise. The vector of independent (right-hand side) variables X includes several quantitative and qualitative variables with the most predictive power. The approach of logit model is to analyze in the framework of probability models:

$$P(y_i = 1) = F(\beta' X)$$

where F is the logistic cumulative distribution function. As such, the estimates given by the logistic model is the conditional probability of default, which is the basis for a credit score. A lender sets a cutoff score based on the amount of risk it is willing to accept, and makes a credit decision.

3. Benefits and Pitfalls of Small Business Credit Scoring

3.1 Benefits of credit scoring

The advantages of small business credit scoring are three-fold.

First, small business credit scoring is a cost-efficient lending technology. By using statistical methods and recognizing loans as portfolio, it can automate the screening and monitoring activities by lenders to a certain degree. In the case of Hilbernia Corporation that implemented credit scoring in 1993, seven loan officers processed 100 loan applications per month before the implementation of credit scoring. By 1995, the same number of loan officers processed over 1000 applications per month. As a result, the business loan portfolio increased from \$100 million to \$600 million during the same period (Allen, Delong, and Saunders, 2004).

Secondly, even financial institutions with little physical presence (such as branches) in a local market can extend credits to small businesses via fax, internet, etc., because processing of loan applications for credit scoring are mostly automated. FRB (2002) argues that, in 2001, the nine large banking organizations made loans in more than 500 markets in which they did not have a branch office, which is presumably attributable to the wide use of credit scoring by large banks. Thus, the spread of credit scoring enhances the competition among banks in local markets.

Thirdly, credit scoring avoids uneven credit decisions by loan officers that are inherent in traditional relationship lending, and thus ensures the objectivity and consistency of the loan screening process. Because the credit scoring model seeks to evaluate creditworthiness of small businesses numerically and more accurately, it can also be applied to set loan contract terms, such as lending interest rates, proportionately to credit risks, and may increase the availability of credit for risky marginal firms. Moreover, credit scoring technology is useful in enhancing the securitization of small business loans that requires objective analysis of the credit risks of the small business loans portfolio.

² See Mester (1997), Allen, Delong, and Saunders (2004) for the discussions of statistical methods used in small business credit scoring.

3.2 Potential pitfalls of credit scoring

Despite the advantages of credit scoring for small business loans, there are certain drawbacks or potential pitfalls that should be addressed.

First, credit scoring models need to deal with the problem of *selection bias*. Because most scoring models use data drawn solely from extended loans and loans declined are excluded, inferences based on the censored sample may be biased (Kiefer and Larson, 2004). That is, we need to evaluate whether the relation between default and characteristics in the sample of loans made be extended to predicting the default probabilities for loans not made. For one, Crook and Banasik (2004) find that the actual effect of selection bias, and thus the potential gains in accuracy from using the full sample, is relatively small. We need to accumulate, however, more empirical results to determine whether selection bias is really a minor problem.

A related issue is whether the statistical relation between default and covariates found in loans currently or previously outstanding can be extended to current and future potential loans. In particular, because the probability of default (PD) and the loss given default (LGD) are pro-cyclical, sufficient historical data that contains both good and bad economic conditions is required in order to isolate the effects of business cycles, whereas most scoring models use past data during the most recent 2-3 year period. In such cases, the statistical relationship obtained from the credit scoring model may be diminished in the different stage of a business cycle.

4. Survey Evidence on the Use of Credit Scoring – U.S. Banks

In the United States of America, credit scoring has been used in underwriting consumer loans for a long time, but only since the early 1990s in small business lending. The main reason for the slower implementation of small business credit scoring is the heterogeneity of commercial credits. The lack of standardization of loan documentation also exacerbated the problem of heterogeneity as well as the establishment of a historical database.

Despite these difficulties, some large US banks that had sufficient historical loan data started small business credit scoring in the 1990s. At the same time, the outside vendors, most notably the Fair Isaac, developed credit scoring systems for the evaluation of small businesses. The development of the Fair Isaac scoring model was motivated by the practitioners' casual observations that repayment of small business loans depended less on the business itself than on the credit history of the founder. The model was built using a sample of more than 5000 small businesses loan applications from 17 US banks, and found that the most important indicators of small business loan performance were the characteristics of the business owner (Mester, 1997; Allen, Delong, and Saunders, 2004). This discovery is important for the wide spread of small business credit scoring because, first, the heterogeneity across commercial credits and loan documents becomes less relevant if personal credit history matters more, and second, personal credit data can be relatively easily obtained from national credit bureaus and other sources.

4.1 Where is credit scoring used?

There are two sources of information regarding the use of small business credit scoring by large US banks: a January 1997 survey conducted by the Board of Governors of the Federal Reserve System (FRB survey hereinafter) and a January 1998 survey conducted by the Federal Reserve Bank of Atlanta (Atlanta Fed survey). Table 1 summarizes some findings from these two surveys.

Table 1: Survey results for large US banks using small business credit scoring

(%)

	Atlanta Fed Survey (Jan. 1998)			FRB Survey (Jan. 1997)		
	All	Loans Less than \$100K	Loans \$100-\$250K	All	Bank Asset Size Less than \$150 billion	Bank Asset Size Over \$150 billion
No. of respondent banks	99	—	—	54	27	27
No. of banks adopting CS [ratio]	62 [62.6]	62 [62.6]	46 [46.5]	38 [70.4]	16 [59.3]	22 [81.5]
Size of loans using CS						
Loans under \$100K	100.0	—	—	82.9	78.6	85.9
Loans \$100-\$250K	74.2	—	—	57.1	50.0	61.9
Loans \$250K-\$1M	21.0	—	—	17.1	14.3	19.0
Automatic approval (Automatic rejection)	41.9	52.9	6.1	43.2 (43.2)	33.3 (40.0)	50.0 (45.5)
Using to set loan terms	32.3	34.3	22.4	13.5	20.0	9.1
Using own internal model (Purchasing model)	12.9 —	— (82.9)	— (89.8)	18.4 (65.8)	12.5 (81.3)	22.7 (54.5)

Note: Other than “No. of banks,” the figures are percentages to the number of all respondents.

Source: FRB, “Senior Loan Officer Opinion Survey on Bank Lending Practices,” Jan. 1997, Frame, Srivivasan, and Woosley (2001), Berger, Frame, and Miller (2005)

The ratio of banks using small business credit scoring is 70.4% in FRB survey and 62.6% in Atlanta Fed survey. 29.7% of respondent banks in Atlanta Fed survey, however, said that although they were not using the credit scoring model now, they were planning to use it within a year and a half, suggesting more than 90% of the US large banks use credit scoring by now. According to Allen, Delong, and Saunders (2004), the number of financial institutions using the Fair Isaac’s small business credit scoring model was more than 350 in 2002. Because the number of US commercial banks in the same year was 77 for banks whose asset sizes were over \$10 billion, 311 for banks with asset sizes \$1-10 billion, 353 for banks with asset sizes \$500 million-\$1 billion, 2839 for banks with asset sizes \$100-500 million, and 4369 for banks whose asset sizes were under \$100 million, we can infer that the small business credit scoring has been spread among the large banks whose asset size is more than \$1 billion. On the other hand, small community banks seem to rely on traditional relationship lending.

Many US banks use the small business credit scoring in evaluating the applications for “micro loans” under \$100,000 (\$100K) or \$250,000 (\$250K)³. In terms of the size of borrowing firms, typical annual gross sales of the firm receiving credit scoring loans is few millions.

4.2 The schemes of credit scoring

Except for some large banks developing their own proprietary models, many US banks use scoring models obtained from outside vendors. The use of scoring model mainly depends on the size of loans and whether banks use internal models or purchases model from outside vendors.

³ “Small business lending” usually refers to the business loan under \$1 million in the United States.

That is, roughly a half of respondent banks in the survey use credit scores for automatic approval for loans under \$100, but less than 10% of banks for loans between \$100K and \$250K. The use of scoring model in setting loan terms is also prevalent for loans under \$100K, suggesting that the credit scoring has a fairly larger role in credit evaluations for loans under \$100K. Table 1 also suggests that larger banks are more likely to develop their own internal scoring models, but do not apply them for setting loan terms. Based on these findings, Berger, Frame, and Miller (2005) argue that there is a bipolarization on the use of small business credit scoring among US banks: “rules” – automated decisions for approval/rejection and interest rates based on externally produced credit scores, versus “discretion” – banks developing their own scoring models and using other inputs in credit decisions⁴.

4.3 The effects of credit scoring on credit availability and interest rates

Several empirical studies using the Atlanta Fed survey examine the effects of small business credit scoring on credit availability and lending interest rates. Most studies find that the adoption of credit scoring contributes to the increase in credit availability of the borrowing firms.

Frame, Srinivasan, and Woosley (2001) find that the adoption of small business credit scoring is associated with an 8.4% increase in the portfolio share of small-business loans under \$100K.

Berger, Frame, and Miller (2005) argue that the effects of credit scoring differ depending on the size of loans (under \$100K versus \$100K-250K) and the type of banks (“rule” banks versus “discretion” banks). For loans under \$100K, small business credit scoring is associated with expanded quantities, higher average interest rates, and greater average risk levels. The increase in quantity is particularly large for “rule” banks but insignificant for “discretion” banks. At the same time, small business credit scoring is associated with greater loan risk for “rule” banks, but less loan risk for “discretion” banks, suggesting that “rule” banks expand credits to riskier marginal small businesses. As for the loan interest rates, “rule” banks increase its average rate by 37 basis points, whereas the increase in average rates for “discretion” banks is 200 basis points. This suggests that the main object of adopting credit scoring models for “discretion” banks is to set contract terms more accurately and proportionately to credit risks. For loans of \$100K-\$250K, credit scoring is associated with little difference in lending behavior. It is thus likely that banks use the scores as a part of inputs for credit decisions for loans over \$100K.

5. Survey Evidence on the Use of Credit Scoring – Japanese Banks

In Japan, Tokyo Tomim Bank began to use credit scoring in 1998, setting off a rapid proliferation of the lending technique through its usage by major banks and other regional banks. In particular, ever since the Financial Services Agency (FSA) released the *Action Program Concerning Enhancement of Relationship Banking Functions* in March 2003, urging regional financial institutions to “utilize methods such as the credit scoring model (...) from the perspective of promoting lending activities placing emphasis upon cash flow from business operations and avoiding an excessive dependence upon collateral and guarantees,” credit scoring loans have basked in the limelight as a key financial product with the selling point that they require neither collateral nor guarantee (third party guarantee).

Despite the rapid spread of credit scoring in Japan, there is virtually no information from which

⁴ We should note, however, that this is only a general trend and there is an outlier such as Wells Fargo which develops its internal model and makes credit decisions mostly based on “rules.”

we can form a systematic and detailed picture of how Japanese banks are using credit scoring techniques. The only concrete information available is the FSA's twice-yearly report, the *Progress Report on the Action Program Concerning Enhancement of Relationship Banking Functions* which discloses the number of regional banking institutions adopting credit scoring technology, the number of actual loans and the amount of loans originated (Table 2⁵).

Table 2: Regional financial institutions adopting credit scoring technology

	Regional financial institutions					Number of transactions	Amount of loans originated (billion yen)
		Regional banks	Second tier regional banks	Shinkin banks	Credit cooperatives		
Number of banks in each category	602	65	50	306	181		
FY2002 (ratio)	117 (19%)	34 (52%)	26 (52%)	47 (15%)	10 (6%)	58,621	392.1
FY2003 (ratio)	188 (31%)	43 (66%)	36 (72%)	88 (29%)	21 (12%)	136,015	1,088.5
FY2004 (ratio)	269 (45%)	58 (89%)	43 (86%)	136 (44%)	32 (18%)	191,682	1,886.6

Notes: The figures in parenthesis indicate the ratio of the number of banks conducting credit scoring to the number of total banks in each category.

Source: Financial Services Agency, *Progress Report on the Action Program Concerning Enhancement of Relationship Banking Functions*.

According to the FSA, 45% of regional financial institutions had started to use credit scoring technology by FY2004. The actual number of loans during FY2004 came to 192 thousand cases and the amount of loans originated stood at 1,886.6 billion yen (approximately US\$18.9 billion). The rate of credit scoring usage in terms of business categories was 89% among regional banks and 18% among credit cooperatives, revealing that the smaller the institution, the lower the rate of usage. These results are consistent with the nature of credit scoring technology which is well suited for large banks with a large number of loan applications and therefore compatible with the concept of managing loans as portfolio.

However, the FSA does not disclose the details regarding the status of credit scoring. Given these circumstances, the author and Yasuyoshi Masuda of Toyo University conducted a Questionnaire Survey on the Current Status of Credit Scoring Lending in June-July 2004 on a survey group of 130 Japanese banks which are the members of the Federation of Bankers Associations of Japan and received responses from 37 institutions. The breakdown of the respondents is as follows: three mega-banks (including long-term financial institutions), 14 regional banks, 16 regional banks which are members of the Second Association of Regional Banks ("second-tier regional banks," these are generally smaller than traditional regional banks) and four other banks. Despite limitations such as the small number of samples and in particular the small number of responses from large banks, to the best of our knowledge, this is the first systematic research of credit scoring in Japan.

⁵ The figures for mega-banks are not publicly available, but they are the most intensive suppliers of small business credit scoring loans. The Nikkei (May 14, 2005) reports that the 5 mega-banks originated 5660 billion yens credit scoring loans in FY2004.

5.1 Where is credit scoring used?

At the time of the survey, we found 59.5% of all responding banks “currently using credit scoring technology” and 10.8% of all responding banks “scheduled to start using credit scoring technology in the near future.” These results are consistent with the ratio of banks using credit scoring technology as of FY2003 in the FSA’s survey mentioned before (66% of regional banks, 72% of second tier regional banks, Table 2). Meanwhile, 24.3% responded that they are “interested, but do not have any scheduled plans on introduction.”

Looking closer at the 29 regional banks and second tier regional banks possessing similar business models, the average amount of outstanding loans of the 20 banks which are currently using credit scoring technology was 1,458.7 billion yen. In contrast, the average was 900.3 billion yen among the three banks scheduled to start credit scoring in the near future and 953.9 billion yen among the six banks with no plans for introduction. These figures also indicate that the larger the size of the bank, the more proactive they are in their efforts toward credit scoring technology (Table 3).

Table 3: Characteristics of regional financial institutions using credit scoring

	Banks using CS	Banks scheduled to use CS	Banks not using CS
No. of banks	20	3	6
Outstanding balance of loans (billion yen)	1,458.7	900.3	953.9
Of which are loans to SMEs (billion yen)	760.0 (52.1%)	493.6 (54.8%)	491.5 (51.5%)
No. of branches	101	81	79
No. of employees (persons)	1,488	1,137	1,086
No. of employees per branch (persons)	13.9	13.5	12.7
Outstanding balance of SME loans per branch (billion yen)	6.87	5.75	5.13

Notes: 1. The figures are averages as of the end of March 2004.

2. Loans to SMEs = “outstanding balance of loans to SMEs (including loans to individuals and others)” minus “loans to individuals and others.”

Source: Nikkei NEED S - Financial Quest database.

Motivations for lenders to use credit scoring

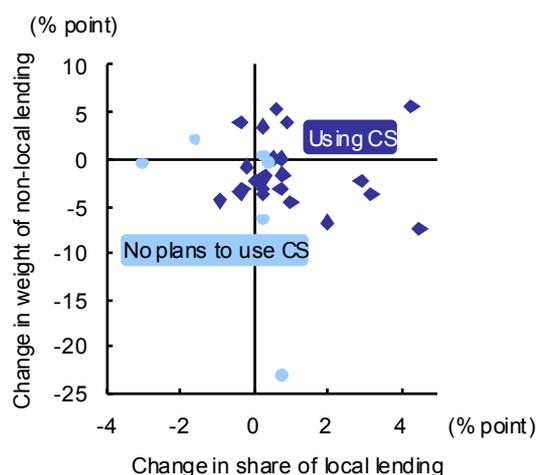
The respondents cited the following reasons for using (or being interested in) credit scoring technology⁶: “prompt screening and implementation of loans” (93.9%), “upgrade efficiency (cost reduction) of existing loans” (75.8%), “marketing tool to gain new borrowers” (48.5%), and “adjustment of lending conditions (such as lending interest rates) to appropriate levels” (39.4%). In the US, it is said that large banks started to use credit scoring as a marketing tool to tap the small business loan market traditionally dominated by community banks amid the abolishment of interstate branching regulations. In contrast, the motive behind Japanese banks’ use of credit scoring technology appears to lean more to the improvement of customer services through prompt and effective lending procedures to existing customers.

In Figure 1, we plotted the change in lending share of banking institutions in the local area

⁶ Note that respondents were allowed to cite multiple reasons.

(horizontal axis) and the change in weight of non-local lending in the overall portfolio (vertical axis) of both banks that use and banks that do not use credit scoring technology during the past five years (respondents were limited to regional and second tier regional banks). The results reveal that many of the banks using credit scoring technology are those banks which are gaining a greater local market share. This is consistent with the survey response that the main purpose of credit scoring is to raise the efficiency of existing loans.

Figure 1: Lending behavior of regional financial institutions



Notes: 1. "Share of local lending" refers to the change in lending share of the banking institution in the local area (prefecture where the head office is located) (1999-2004).
 2. "Weight in non-local lending" refers to the change in ratio of non-local lending in the banking institution's total lending (1999-2004).

Source: Nikkei NEEDS - Financial Quest database.

Our query on operational costs (including labor costs) per loan reveals that the average operational cost of credit scoring loans is approximately half of conventional loans (average 50%, median 55%). This underscores the cost-cutting impact of credit scoring. However, a note of mention is necessary that there is a wide disparity among banks – some banks said that costs were approximately 90% of conventional loans.

Borrowers eligible for credit scoring loans

Reflecting the foregoing motives, only 12% of the banks said that credit scoring loans are provided "only to new borrowers." The percentage of banks providing credit scoring loans to "both existing and new borrowers" was 76% and "only existing borrowers" was 12%. Furthermore, as for the percentage of existing to new borrowers, 60% of the responding banks said that more than half are existing borrowers.

It should be noted that not all SME loans are subject to credit scoring in Japan as well. Our query regarding actual lending schemes revealed that there are caps on loans per company. We also found that 65% of the banks establish some sort of limit regarding the size of eligible companies. More specifically, we found a wide gap in lending limit per company ranging from 5 million yen to 50 million yen (the median/mode was 30 million yen, approximately \$300K). As for the size of eligible companies, many set caps in terms of sales, such as, "sales volume of 300 million yen to 1 billion yen."

A comparison with US banks revealed a characteristic peculiar to Japan that some banks classify eligible borrowers in terms of the form of corporate organization. We found that 35% of the

banks do not consider proprietorships as eligible. In contrast, proprietorships are not excluded from eligible borrowers of credit scoring loans in the US, given the emphasis upon personal information such as past credit records of the owner in the credit scoring model. In the case of Japanese banks, many of the scoring models are not based upon personal information due in part to the shortage of data on personal credit history.

5.2 The schemes of credit scoring

The scoring model

Our survey revealed that 23% of the banks rely solely on self-made “in-house” models and that 69% used some form of “external” model (including its joint use with an internal model). Incidentally, we found that many of the banks adopting external models use the “Credit Risk Database (CRD) Model,” an SME risk database developed at the initiative of Small and Medium Enterprise Agency.

Screening items, application forms, and interviews

The number of screening items in “score cards” (check lists) was 29 on average and 86 at the maximum. Compared to the model of Fair Isaac which has 8-12 explanatory variables, there seems to be a relatively large number of items in Japanese models.

77% of the banks said that they have certain “minimum criteria (admission criteria).” To be more exact, many of the banks set forth criteria such as “absence of excessive debt,” “passage of more than two years since establishment,” “not classified as borrowers requiring special attention,” and “absence of history as tax defaulters.” The upside of setting numerous “minimum standards” is that the average default rate would decline if those standards are correct. However, because any statistical model is based on the law of large numbers, the downside is that it would narrow the range of loans falling within the purview of the scoring model and make it more difficult to manage portfolios from a statistical perspective. It is critically important to avoid setting unnecessary screening items and assess the balance between costs and benefits.

89% of the banks required “interviews with the representative.” This stems most likely from the popular belief among practitioners that “a proper assessment of SME credit risks is not possible only on the basis of objective quantitative information such as financial information.” However, if such case-by-case screenings are indeed necessary, conventional lending practices based upon relationships should be followed instead of credit scoring. It is necessary to keep in mind that an excessive dependence upon interviews would undermine the merits of credit scoring, namely cost reduction through the facilitation of screening processes.

Collateral and guarantees

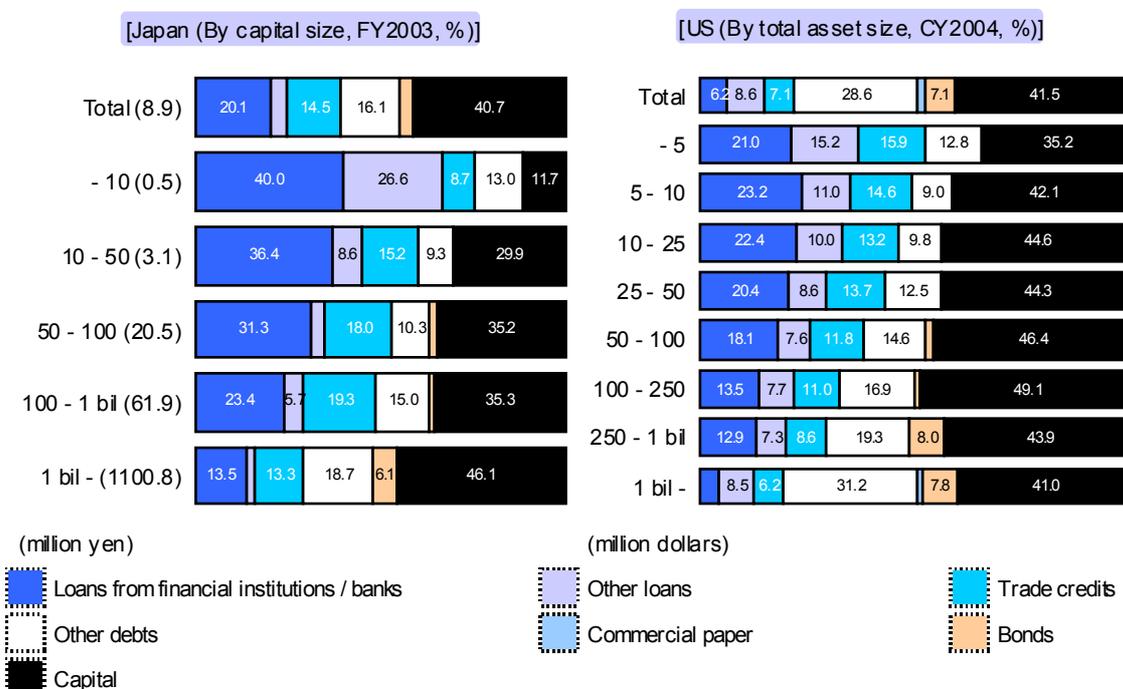
Credit scoring loans are often perceived in Japan as financial products that require neither collateral nor third-party guarantee. We actually found in our survey that 92% of the banks do not require collateral and that 96% of the banks do not require third-party guarantees. Meanwhile, 92% of the banks require a “personal guarantee by the representative.”

We should note, however, that credit scoring is only a technique to facilitate the prompt and efficient processing of loans and that it does not in any way reduce credit risks. Admittedly, even in the US, a higher percentage of loans using credit scoring technology are uncollateralized in comparison to conventional loans. However, this stems from the following aspects of small

business credit scoring in the US. First, credit scoring loans are akin to personal credits to the owner. Secondly, short-term credit lines (the bulk of credit scoring loans) in conventional loans would usually be collateralized by movable assets, such as accounts receivable and inventories. However, given the high costs required in registering and managing these assets as collateral, it would run counter to the purpose of credit scoring: to raise the efficiency of lending procedures.

In Japan, by contrast, the object of credit scoring loans is mainly limited to corporate entities. Furthermore, Japan is characterized by a direct proportion of corporate size to capital-asset ratios - the smaller the company, the lower its capital-asset ratio (Figure 2). This is quite contrary to the situation in the US, where the capital-asset ratios of small businesses are roughly the same as those of larger firms. Thus, it is likely that the role of collateral in small business lending is larger in Japan than in the US, because collateral is useful in mitigating the debtor moral hazard problem that is likely to arise especially among firms with little capital base⁷.

Figure 2: Financing Structure of Manufacturing Firms



Note: Japan's figures in parentheses are the average total assets (million yen).
Sources: Ministry of Finance "Financial Statements Statistics of Corporations by Industry"
U.S. Department of Commerce "Quarterly Financial Report"

Lending interest rates

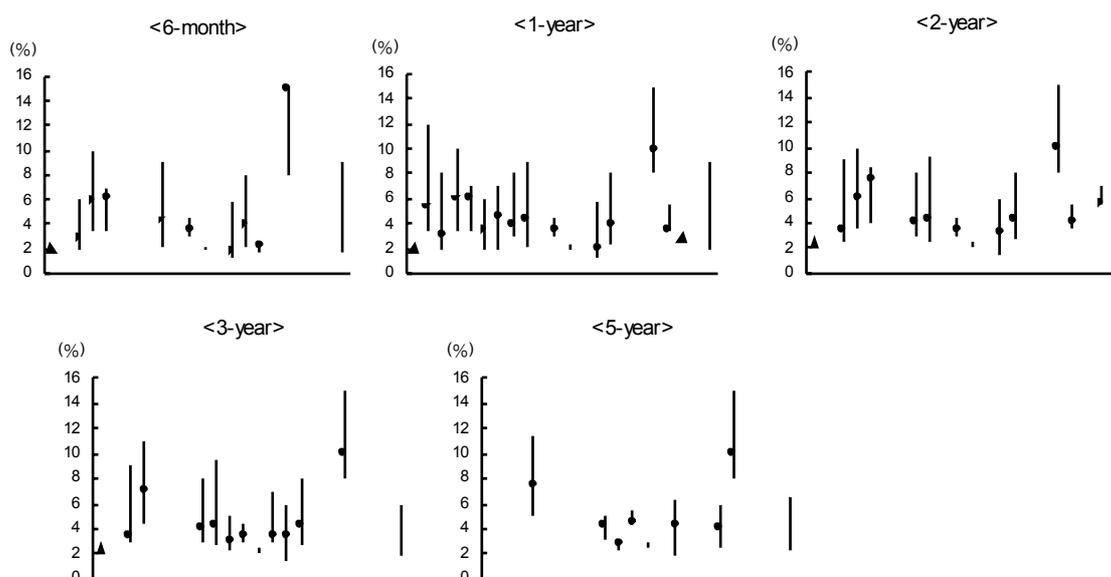
In most cases, interest rates on credit scoring loans are set within a range of 2-10% (Figure 3). Some of the respondents cited "psychological barriers" as a reason for the fact that interest rates above 10% are rare.

According to our survey, the mode values of lending rates (weighted by the number of credit scoring loans of each bank) are as follows: 6-month (4.37%), 1-year (4.53%), 2-year (4.73%),

⁷ Using the unique data set of Japan's small business loan market, Ono and Uesugi (2005) formally investigate the role of collateral and personal guarantees in small business lending and find that they are useful in mitigating the moral hazard problem.

3-year (4.41%), and 5-year (5.49%). The extremely small interest rate differential of different maturities probably reflects the flat yield curve of market interest rates (government bond yields). The average level of interest rates on credit scoring loans is around 4.5%, which is approximately 2.5% higher than the average lending rate (1.94% as of March 31, 2004, calculated by the lending interest rate divided by outstanding balance of loans, including conventional loans) of the banks providing responses to our survey.

Figure 3: Lending rates of credit scoring loans, by loan maturity



- Notes: 1. The vertical lines indicate the range of lending rates. The ● indicates the mode value and the ▲ indicates the lowest value.
 2. The vertical lines are shown from the left hand side of the graph in accordance to the number of credit scoring loans (the banks with the most CS loans on the left).

Responses regarding the interest rate differential with conventional loans (credit scoring lending rate minus conventional lending rate) reveal that interest rates on credit scoring loans are generally higher than conventional loans. However, we also find scattered evidence of credit scoring lending rates falling below conventional lending rates, suggesting that interest rates are set at inordinately low levels amid a rush among banks to explore new customers and increase the loans outstanding. To summarize, the effect of adopting small business credit scoring on interest rate depends on whether a bank uses credit scoring in order to access the credit risk of small business borrowers more accurately or to expand its customer-base by increasing loans to riskier marginal borrowers.

6. Conclusions

This paper discusses the role of credit scoring in small business lending, based upon survey evidence in the United States and Japan. Small business credit scoring is most useful for relatively large banks, due to economies of scale in setting up and managing models and in diversifying their small business loans portfolio. In emerging Asian economies, however, large banks tend to lend to relatively large enterprises, and thus may be reluctant to adopt this lending technology. In such a case, support by the government in building the necessary lending infrastructure, such as credit bureaus, may be useful. Even in Japan where commercial banks are aggressive in making loans to small businesses, the government played a role in developing the

“Credit Risk Database (CRD) Model,” an SME risk database.

The necessary lending infrastructure to encouraging the use of small business credit scoring depends on the characteristics of the model. In the US, personal credit bureaus are important, because the most powerful indicators of small business loan performance are the characteristics of the business owner. In Japan, however, due to the lack of widely used personal credit bureaus, banks tend to rely more on small businesses’ financial statements. The Japanese government is now on its way of reforming the accounting system for small businesses to improve the accuracy of small business financial statements. In facilitating small business credit scoring, the governments of Emerging Asian economies need to consider what type of lending infrastructure is most suitable under their own circumstances.

The paper argues that credit scoring has four potential benefits in small business lending, namely, (i) reducing screening and monitoring costs of small business loans, (ii) enhancing competition among banks in local markets, (iii) adjusting lending interest rates commensurate with borrowers’ credit risks, and (iv) increasing the availability of credit for risky marginal firms. Which of these benefits are actually realized depends on the financial structure of individual country and management strategies of banks adopting small business credit scoring. We should also note that a trade-off among potential benefits may arise, such as the trade-off between increasing the availability of credit and adjusting interest rates commensurate with credit risks. A clear policy strategy is thus important in order to achieve the potential benefits of credit scoring. In the case of Japan, most banks use small business credit scoring in order to make lending procedures prompt and cost-efficient and to set contract terms more accurately and proportionately to small firms’ credit risks.

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