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Role of the Credit Risk Database in developing SMEs in Japan: Lessons for the rest of Asia

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ADB Working Paper Series

**Role of the Credit Risk Database in
Developing SMEs in Japan:
Lessons for the Rest of Asia**

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Abstract

Small and medium-sized enterprises (SMEs) play a significant role in Asian economies as they contribute to high shares of employment and output. However, SMEs generally have limited access to finance compared to large enterprises. Given the bank-dominated financial systems in Asia, banks are the main source of financing for SMEs. For financial institutions, it is crucial to distinguish sound SMEs from non-healthy ones in order to avoid the accumulation of non-performing loans. Information asymmetry in this sector can be reduced by using accumulated data on SMEs and by employing credit analysis techniques, allowing lending institutions to recognize healthy SMEs. It is crucial for governments to collect SME data and prepare rich databases, such as the Credit Risk Database (CRD) of Japan. This will also help governments to formulate economic policies. In this paper we define and describe in detail the role and characteristics of Japan's CRD in SME development and explain how it can be an example for other Asian economies to establish similar soft infrastructure that can make important contributions to SME development and boost economic growth.

JEL Classification: G21, G24, G32

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1. INTRODUCTION

Small and medium-sized enterprises (SMEs) are the backbone of the Japanese economy and other Asian economies. More than 99% of all businesses in Japan are SMEs, and they employ almost 70% of the working population and account for a large proportion of economic output (Yoshino and Taghizadeh-Hesary 2015).¹ In Asia during the period 2007–2012, SMEs accounted for 98% of all enterprises and 38% of gross domestic product (GDP) on average, employing 66% of the national labor force (ADB 2014). SMEs also influence trade. Thirty percent of total export value was accounted for by SMEs in Asia on average during the same period. In the People's Republic of China, SMEs accounted for 41.5% of the total export value in 2012, up 6.8% year-on-year, while in Thailand, they accounted for 28.8% of the total export value, growing 3.7% year-on-year. SMEs that are part of global supply chains have the potential to promote international trade and mobilize domestic demand.

Due to the significance of SMEs for Asian economies, it is important to find ways to provide them with stable finance. Asian economies are often characterized as having bank-dominated financial systems and capital markets that are not well developed, particularly in the area of venture capital. Consequently, banks are the main source of financing. Although the soundness of the banking system has improved significantly since the 1996 Asian crisis, banks have been cautious about lending to SMEs, even though such enterprises account for a large share of economic activity. Start-up companies, in particular, are finding it increasingly difficult to borrow money from banks because of strict Basel capital requirements and asymmetry of information in the SME sector. Riskier SMEs also face difficulties in borrowing money from banks (Yoshino 2012). One of the ways to ease financing through banks to SMEs is to construct a rich, nationwide SME database in order to reduce information asymmetry and to provide a credit rating service on SMEs for lending agencies, through which banks can recognize healthy SMEs from non-healthy ones in order to facilitate lending.

There is a successful example of such a database in Japan, the Credit Risk Database (CRD) of the CRD Association. The CRD Association is a membership system whose members maintain the database by offering SME financial statements. Maehara (2013) explains the involvement of the public sector at the establishment of the CRD. The Small and Medium Enterprise Agency of the Ministry of Economy, Trade and Industry earmarked a total of just over ¥1.3 billion in supplementary budgets for FY1999 and FY2000 for the development and demonstration of the systems required for the CRD. In addition to funds, the public sector also offered human resources to establish the CRD. Following the establishment of the CRD, members and data have increased and CRD management has established a footing apart from the funds from the public sector.

The purpose of the CRD is to improve the efficiency of credit supply to SMEs from financial institutions by accumulating and analyzing credit risk information on SMEs and providing this information to CRD members. Intrinsic information asymmetry exists between borrowers and lenders, and must be mitigated. This is the reason for the establishment of the CRD.

Similar systems are in place in some East Asian countries, such as Malaysia, Indonesia, and Thailand. These are called public credit registries (Maehara 2013). The

¹ One of the growth strategies in Abenomics is to support SMEs by making their access to finance easier. For more information, see Yoshino and Taghizadeh-Hesary (2014a, 2014b). For more information on the new methods of financing SMEs see Yoshino (2013) and Yoshino and Taghizadeh-Hesary (2014c).

main difference between the CRD and public credit registries is that public registries are managed by the respective country's finance ministry, which collects the credit information data forcibly. However, as far as we know, the items collected are limited. In this paper, we explain the credit information database of Japan. Its framework, characteristics, and services for members can be very useful for other East Asian countries for creating a large, high-quality database like the CRD.

2. WHAT IS THE CREDIT RISK DATABASE?

2.1 Membership System

The CRD Association is a membership system that is composed of the nationwide Credit Guarantee Corporations (CGCs), financial institutions, and others. The number of members was 58 at the time of establishment in 2001,² but has now expanded to 180 (Table 1).

Table 1: Membership Composition

Category	Number of Members
Credit guarantee corporations	51
Government-affiliated financial institutions	3
Private financial institutions	116
Credit-rating agencies, etc.	5
Government institutions	5
Total	180

Note: Numbers are as of 1 August 2015.

Source: CRD.

First, CGCs throughout Japan became the core of the membership system. Then, many financial institutions followed in joining. There are now 51 CGCs in Japan. When SMEs borrow money from financial institutions, they often utilize a credit insurance system. By contracting with CGCs and paying a credit guarantee fee to them, they will be guaranteed in the case of default. CGCs decide to guarantee taking into account mainly the financial statements of SMEs. Therefore CGCs accumulate many financial statements of SMEs and information about SMEs' default.

From the beginning, the CRD Association could accumulate many and nationwide financial statements and default information by getting all of CGCs of each area to be a member of CRD Association.

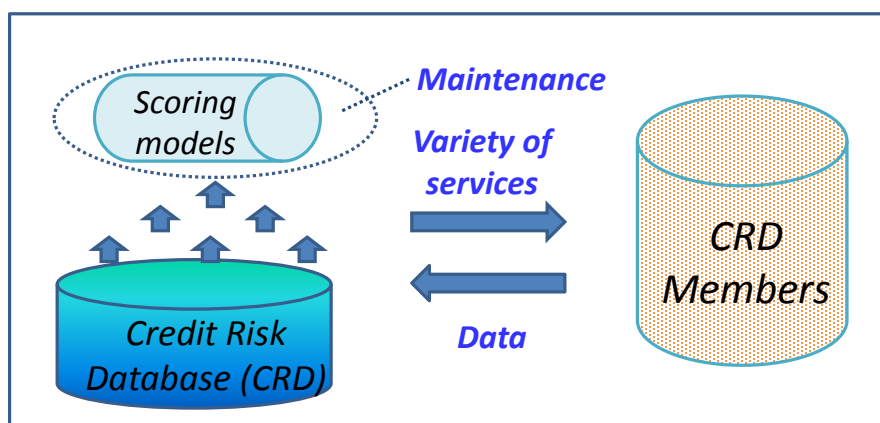
There are cases where SMEs borrow money from financial institutions with no guarantee, also. Financial institutions request SMEs to submit financial statements not only at the time of borrowing, but also all the time of borrowing to monitoring SMEs. Therefore, due to the increase of financial institutions, the CRD database became to hold wider range and more lasting SMEs data. At present, CRD database is most massive database in Japan.

² In 2014, two CGCs were consolidated. Therefore, the number of CGCs was 52 in 2001, but the current number is 51.

2.2 Mechanism of the Credit Risk Database

Next, we will explain the mechanism of the CRD as outlined in Figure 1. The CRD is a non-profit membership system operated by membership fees. CRD members offer their data, which the CRD Association stores in the CRD database after cleansing and consolidation. Based on such a database, the CRD builds up scoring models that calculate the credit risk of SMEs and maintains the quality of scoring models by periodically conducting validation works. CRD members can use such scoring models in their office. In addition, they can also use a variety of other services. These include statistical information services, sample data services, management consulting support system services, and consulting services.

Figure 1: Outline of the CRD Mechanism



CRD = Credit Risk Database.

Source: Authors.

2.3 Data Collection

The CRD database consists of incorporated SMEs and sole-proprietor SMEs. At present, the number of SMEs whose statements are collected in the database is more than 3 million (Table 2). Given that the number of SMEs in Japan is around 4 million, this is very large. Because a debtor usually has financial statements over several years, the number of financial statements is more than 20 million.

Table 2: Accumulated Data

	Number of Debtors	Number of Financial Statements
Incorporated SMEs (default information)	2,210,000 (340,000)	16,644,000 (2,365,000)
Sole-proprietor SMEs (default information)	1,099,000 (160,000)	4,519,000 (657,000)

Note: As of 31 March 2015.

Source: CRD.

The CRD has now adopted default concept composed of four categories: (i) 3 months or more in arrears; (ii) de facto bankruptcy; (iii) bankruptcy; and (iv) subrogation. However, the CRD started to accumulate data of six categories that added (v) substandard, and (vi) potentially bankruptcy from 2003 in response to bank members' requests.

The large amount of data can be divided into categories. Table 3 below shows the number of incorporated SMEs by type of business and region. Regions are divided into six groups and businesses are divided into 13 groups.

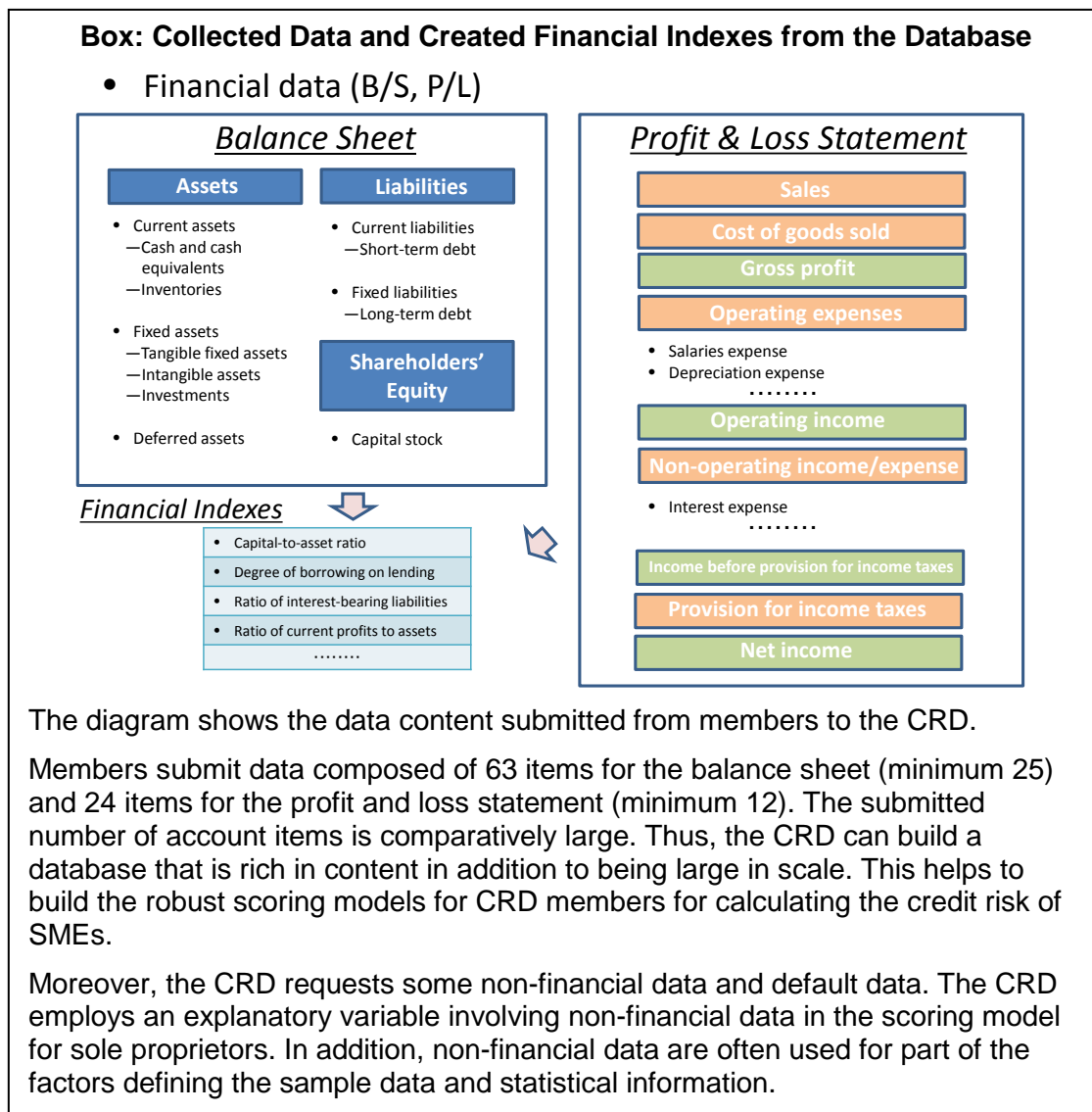
Table 3: Number of Incorporated SMEs by Type of Business and Region

('000)

Type of Business	Region						Total
	Hokkaido and Tohoku	Kanto	Chubu	Kinki	Chugoku and Shikoku	Kyushu and Okinawa	
Construction	65	156	80	76	46	51	473
Manufacturing	31	122	78	79	30	22	363
Information and communications	3	32	5	7	2	3	52
Transport and postal activities	10	26	12	16	9	8	81
Wholesale	26	107	43	62	20	24	281
Retail trade	42	90	48	47	31	33	292
Real estate and goods rental and leasing	14	61	19	38	13	14	159
Scientific research, professional, and technical services	10	42	11	17	8	9	96
Accommodation, eating, and drinking services	13	39	19	16	9	10	105
Living-related and personal services and amusement services	7	21	9	9	5	6	56
Medical, health care and welfare	8	18	8	11	7	9	60
Services, not elsewhere classified	17	60	24	28	13	15	156
Others	5	10	5	4	4	5	33
Total	249	784	360	410	199	208	2,210

Note: Figures represent the number of debtors. Some debtors who changed region or business type are counted redundantly.

Source: CRD.



2.4 Creating the Database

The CRD holds a large-scale SME financial database in anonymous form. The quality and quantity of the database are fundamental to the quality and reliability of the CRD's services, such as its scoring models, and best efforts are made to collect accurate data and validate its services. For ensuring the accuracy of the data, the CRD checks the accounting consistency across figures in financial statements submitted from members, and carries out cleansing processes twice to eliminate any data problems.

After such processes, the CRD consolidates data from the same borrowers. Since the CRD collects data in an anonymous form, items such as the first Japanese character of company names, establishment dates, postal codes, and so on are used in consolidation process instead of company names themselves. These cleansing and consolidating processes enable the creation of a high-quality database where the quality of the data can be continuously monitored.

2.5 Model Building

The CRD Association builds statistical models with the accumulated CRD data. During the past 10 years, the CRD Association has built five scoring models and is now building a sixth scoring model. Model 3, which assesses the credit risk of incorporated SMEs and Model 4, which assesses those of sole-proprietor SMEs, have been in use in the Credit Insurance System from April 2006. First, we will explain the outlines of Model 3 and Model 4.

Estimations by Model 3 and Model 4 use logistic regression (Logit model). Logit models are common methods in building scoring models for the assessment of credit risk. Both models produce an estimated probability of default for each SME. Model 3 in particular produces multiyear, cumulative estimated probabilities of default, which give the probability of default occurring within 2 and 3 years, in accordance with determining the longer-term prospects of SMEs.

Model 3 and Model 4 were built using a large amount of data. Model 3, for incorporated SMEs, was built from data from about 2.93 million financial statements and about 40,000 defaults. Model 4, for sole-proprietor SMEs, was built from about 1.2 million financial statements and about 20,000 defaults. This enables models to be stable and robust.

Financial indexes, such as the capital-to-asset ratio, degree of borrowing on lending, ratio of interest bearing liabilities, and so on, were created from financial statements. Financial indexes that correlate with defaults were chosen and used to build scoring models. In building Model 4, the CRD Association utilized accumulated qualitative data also in order to supplement the financial indexes.

Because the financial statements of incorporated SMEs have less missing data and are more precise than those of sole-proprietor SMEs, the accuracy of Model 3 is higher than that of Model 4. However, both have been maintaining high performance since they were built.

The CRD Association conducts validation tests of scoring models annually and makes efforts to keep high accuracy ratios through the modification and construction of new models in response to the changes in the management environment of SME.

3. WHY WAS THE CREDIT RISK DATABASE ESTABLISHED?

3.1 Remedy for Asymmetric Information

Next we explain the background of the CRD Association's establishment. The financial industry deals with information intrinsically. However, there is an asymmetric information problem between suppliers and demanders of funds in general. Information infrastructures are necessary to remedy this problem. Many big enterprises list their shares on stock markets and issue securities in bond markets. Therefore, institutional information sharing schemes of capital markets can facilitate access to a wide range of information necessary to estimate the creditworthiness of big enterprises.

However, most SMEs have no connection with capital markets. Financial institutions can closely and continuously observe borrowers, but it is costly to do so for borrowers of small loans.

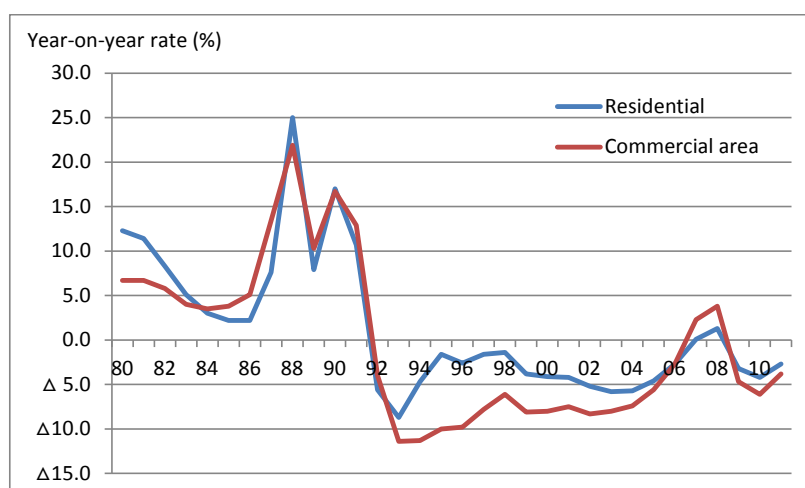
The lack of information infrastructure for SMEs exacerbates the information asymmetry problem.

In the time of the bubble economy, the provision of collateral was the simplest way for SMEs and financial institutions to reduce the risk premium in loan formulations

3.2 Collapse of the Japanese Bubble Economy and Changes in SME Finance

From 1986 to 1991, Japanese financial institutions pursued increases in loan amounts and the financial system became excessively reliant on land collateral rather than carrying out direct and prudent observation on borrowers. After the collapse of the bubble economy, loan schemes that relied heavily on collateral turned out to be unsustainable due to the continuous decline of land prices. Between 1992 and 2006, average land prices in Japan continued to decline (Figure 2).

Figure 2: Japanese Land Prices



Source: Ministry of Land, Infrastructure and Transport. Public Announcement of Land Prices. <http://tochi.mlit.go.jp/chika/kouji/2011/42.html>.

Concurrently with the collapse of the Japanese bubble, the revision work of Basel I started in 1998 and the final documents of Basel II were published in 2004. The Japanese government expanded policy-based finance for SMEs for mitigating the constraints on SME finance as an urgent countermeasure. Under such a situation, efficient and lower cost credit risk evaluation tools were necessary for SME financing, especially for transaction based lending.

To address the serious credit constraints on SMEs after the collapse of the bubble and to conform to Basel II requirements on risk management, the SME Agency and the Bank of Japan offered support by introducing a new credit risk evaluation tool. The Japanese SME Agency organized leading user meetings. Leading users, consisting of five credit guarantee corporations, three government-affiliated financial institutions, and three private financial institutions, held meetings regularly to discuss the basic concepts and ideas for the CRD.

The CRD management council was founded as a non-profit membership organization in March 2001 and 58 members attended.³ At that time, scoring model CRD Model 1

³ Fifty-two members throughout Japan were CGCs.

version 1 was released. In April 2005, the CRD Management Council obtained corporate status and renamed itself as the CRD Association.

3.3 Mission of the Credit Risk Database

The primary objectives of CRD are “soundly facilitating the fund provision to SMEs” and “improving the quality of risk management in finance.” Compared with other countries’ credit information centers, the Japanese CRD is unique that its primary objectives include facilitating the provision of funds to SMEs.

In many countries, financial crises triggered the establishment of credit information centers. The Asian financial crisis in Southeast Asia as well as the Tequila crisis in Central America triggered the establishing of credit information centers and the introduction of the necessary legal frameworks. In almost all cases, bank supervisors played leading roles in establishing the centers, and the primary objective was the provision of support for bank supervision, namely reducing non-performing loans.

We suppose that the difference in primary objectives influenced the differences in database architecture.

4. CHARACTERISTICS OF THE CREDIT RISK DATABASE

4.1 Two Types of Credit Information Center

There are two types of credit information center. One handles individual information and the other anonymous information. In order to avoid confusion, we define a credit bureau as a public or private credit information center collecting personally identifiable credit information (PICl) and having an individual information reference function. On the other hand, a credit database is defined as a public or private credit information center collecting anonymous financial information and having no individual information reference function. This definition is not very common. Credit bureaus and credit registries usually collect and share personally identifiable credit information, but a credit database is not necessarily supposed to collect anonymous information.

Credit bureaus should share information on the creditworthiness of individual borrowers. They place emphasis on data regarding borrowers’ past loan performance rather than their ongoing business performance. The simplest design is a blacklist sharing scheme, which predicts borrowers’ future behavior based on their past loan performance. It is closely related to individual risk management and the reduction of delinquency and non-performing loans.

Credit databases share information on the creditworthiness of the average borrower in the group having the same attributes. They place emphasis on data regarding borrowers’ present ongoing business performance rather than their past loan performance. This approach predicts borrowers’ future behavior based on their ongoing business performance measured by accounting statistical probability and is closely related to portfolio risk management over pooled loans and the reduction of overestimated risk premium caused by information asymmetry.

4.2 Information Center Characteristics

Table 4 shows a brief comparison of credit databases and credit bureaus. These two types of credit information center have different characteristics in their databases and different effects for the financial market regarding SMEs.

Table 4: Credit Bureaus versus Credit Databases

	Credit Bureaus (credit research companies and designated credit bureaus)	Credit Database
Information	Personally identifiable information Information of individual borrowers	Anonymous information - An average borrower in the group with the same attributes (statistical information)
Discipline for borrowers	Direct To acquire a good financial record ("reputation collateral") To avoid being blacklisted	Indirect To belong to a higher credit rating group To improve financial conditions
Promoting competition in the financial market	Direct To reduce information monopoly	Indirect To reduce overestimated risk premium by improving predictability
Constraints from privacy problems	Tight constraints - Content (depth of information) - Tight constraints affect the depth and length of the database - Preservation period - Accuracy of data - Need for correction of self-information	No constraints - Comparatively easy to develop deep and rich database enabling more value-added services

Source: Authors.

The essential function of credit bureaus is their reference function, and almost all are designed with the objective of reducing delinquency and non-performing loans. Therefore, the core data of credit bureaus are data concerning borrowers' loan performance, namely the current amount of outstanding loans and the record of past delinquencies and default. On the other hand, the essential function of credit databases is enabling the building of statistical models. Therefore, the core data of credit databases are accounting data for the construction of the models. It is theoretically possible to establish credit bureaus that have the same functions as credit databases in addition to their intrinsic functions. Some United States global private credit bureaus have extended their business to the field of credit databases, but they remain exceptional cases among the large number of credit bureaus in the world. Many of their databases are insufficient in variety and quantity for the construction of reliable statistical models. As far as we know, the number of account data items that are collected by public credit bureaus in Southeast Asia is less than 15, a very small number compared to the CRD, which collects data composed of around 90 account items. The narrow range of data accumulation by other information centers may be due in part to the necessity of reducing privacy risks, the manageability of databases, and

the difficulty of collecting precise account data for SMEs. This results in a very small number of databases that satisfy the requirements of both types of credit information center. In many cases, each type of credit information center has a different characteristic database responding to its essential functions.

For the discipline of borrowers, credit bureaus have more direct effects than credit databases. Being blacklisted is highly detrimental for borrowers so the possibility of being blacklisted acts as a strong deterrent. Credit databases, conversely, have indirect effects, and is advantageous for borrowers to show better financial data compared to that of the average borrower with the same attributes to achieve better loan conditions. Thus, borrowers are motivated to improve their account figures.

For promoting competition in the financial market, credit bureaus also have direct but limited effects. Sharing information prevents information monopolies, so borrowers can benefit from more opportunities for better loan conditions. However, this is effective only for the loan formation of registered borrowers. Borrowers whose data are not registered receive no benefit.

Credit databases have indirect effects but influence a wide range of SME financing. They reduce overestimated risk premiums by making clear the financial data distribution of groups with the same attributes. This enables more precise predictions of the default risk and expands credit opportunities for SMEs. It is also beneficial for borrowers whose data are not collected.

Regarding privacy problems, credit bureaus have to introduce appropriate security safeguards for the protection of borrowers. Considering that information inaccuracy can pose fatal problems, borrowers should have the right to access their own information and dispute inaccurate information.

Credit databases are almost free from these kinds of constraints. It is comparatively easy to develop comprehensive information databases that can enable more advanced value-added services.

We expect it will gradually become difficult to maintain and collect comprehensive data because of increasing concerns about privacy. But the more advanced services require deeper and longer databases. Therefore, we suppose that both types of credit information center are necessary and have a complementary relation.

4.3 Benefits from Collecting Anonymous Information

The CRD provides efficient evaluation tools that are useful for the setting of an appropriate lending interest rate in line with credit risk. Due to the information asymmetry and the lack of financial infrastructures for SMEs, the risk premium on SME finance is prone to be overestimated. The CRD contributes to rectifying this overestimated risk premium.

The CRD also provides indispensable tools for promoting the securitization of various SME related assets and helps to connect SMEs with capital markets. It also contributes to improving risk management over pooled SME loans in financial institutions.

Finally, the CRD provides low cost and prompt evaluation tools that are suitable for transaction based lending. This is particularly useful when costly evaluation tools are not viable for small loan amounts.

In this way, the CRD contributes more to the facilitation of fund provision to SMEs than to the reduction of non-performing loans. The most essential function of credit risk

databases is the precise prediction of default risk over collective SME loans in segmented groups and the reduction of overestimated risk premium for fund provision.

5. HOW IS THE CREDIT RISK DATABASE USED IN PRACTICE?

5.1 Variety of Services

The CRD Association offers members various services. The basic services are (a) a scoring service, (b) sample data provision, and (c) statistical information provision.

Scoring Service

Members can use the CRD's scoring models and evaluate the credit risk of borrowers and potential borrowers in following ways:

- By installing the model program directly onto members' internal rating systems or by installing the model application to computers in members' offices
- By accessing the CRD member website via the internet or by requesting data with scoring results

Sample Data Provision

CRD provides random sampling data, such as financial data and scoring data, to members. Members can utilize the sampling data for various purposes:

- To complete insufficient data for creating internal scoring models
- To validate the member's internal scoring model
- To develop financial products in new areas

Members can extract the sampling data for standard segments by indicating the attributes of the segment, such as the type of industry, business scale, and region.

Statistical Information Provision

A wide range of statistical information by region and industry is available from the CRD. Members can utilize the provided data in several ways:

- To compare financial statistics based on each member's customers with those of the CRD database for improving credit risk management
- To develop customer oriented marketing strategies and new financing services

The CRD also provides members with other valued-added services, such as the Management Consulting Support System Service and consulting services.

Management Consulting Support System Service

The CRD provides its members with a consulting tool, the Management Consulting Supporting System. The system indicates the comparative position of each borrower in various aspects and is useful for members to give advice to borrowers for the improvements in management and their financial situation.

Consulting Services

Besides these services, the CRD Association provides consulting services, such as the validation and reconstruction of internal rating systems, credit risk measurement, a

housing loan database, apartment loan database, and educational services. Some services are provided with to members for additional fees.

5.2 Using Same Scoring Models

Since April 2006, CRD models have been used to decide credit guarantee fee rate classifications in the Credit Insurance System (Table 5). This allows CGCs and member financial institutions from all over Japan to evaluate SME borrowers using the same scoring models.

Table 5: Credit Guarantee Fee Rate Classification
(annual rate, %)

Classification	1	2	3	4	5	6	7	8	9
Credit guarantee fee rate	2.20	2.00	1.80	1.60	1.35	1.10	0.90	0.70	0.50

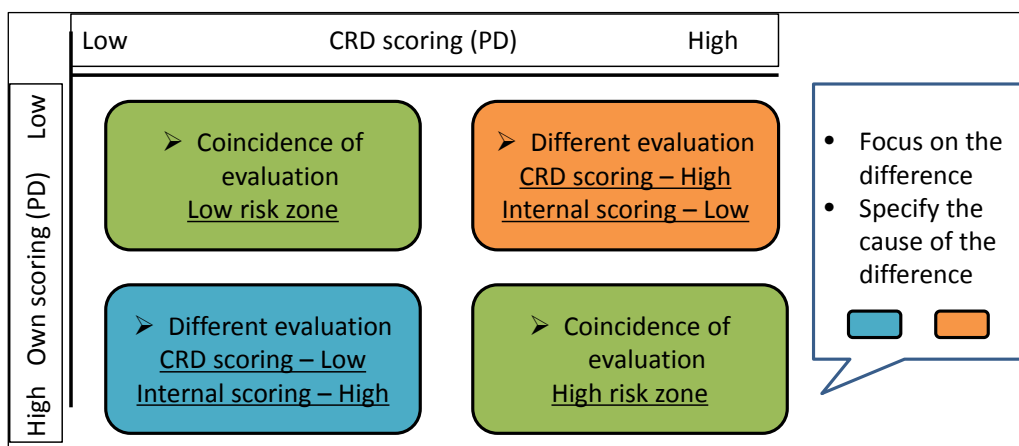
Source: Credit Guarantee Corporation.

5.3 Validating Own Scoring Models

Members can employ CRD scoring for the validation of their own internal credit rating systems. Financial institutions can choose to build their own credit scoring models and internal credit rating systems based on their internal databases, however the size of a single financial institution’s database is usually limited and far smaller than CRD’s database. Furthermore, database attributes like the region, industry, and scale of companies are often biased. These factors make scoring models unstable and vulnerable to changes in the economic situation. Though such models make have high accuracy rations in the early stages of practice, they are often prone to becoming unstable over time. Therefore, it is important to validate internal rating systems through comparison with those of the third party.

Figure 3 shows a matrix sheet. This is the simplest style quartering distribution. The vertical scale indicates the rating assignment of the internal credit rating systems, and the horizontal scale indicates that of the CRD.

Figure 3: Image of Validation



CRD = Credit Risk Database, PD = probability of default.

Source: Authors.

In the green areas of the matrix sheet, the results of both systems have similar rating assignments. However, in the blue and orange areas the results are conflicting. The discrepancy of evaluations does not immediately mean either side inaccurate. Financial institutions' rating systems usually involve qualitative items or data outside of account figures that CRD models do not consider. The financial institution must scrutinize the factors generating the difference in evaluations and decide whether to maintain their current system, modify it, or reconstruct a new system.

5.4 Credit Risk Database Models in Members' Own Internal Rating Systems

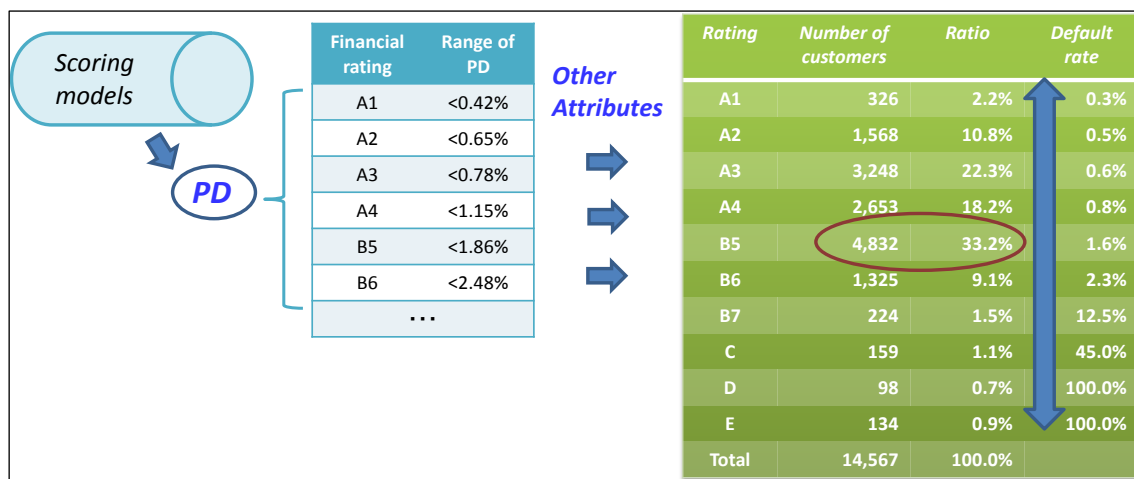
Another option is for members to employ CRD scoring for developing their own internal credit rating systems. For more information on other credit rating models for SMEs, see inter alia, Yoshino and Taghizadeh-Hesary (2014d, 2015) and Yoshino et al. (2015).

For small-scale financial institutions with a comparatively small number of extending loans, it is difficult to build scoring models based on their own databases. Some have internal rating systems that are highly dependent on the qualitative aspects of borrowers and use simple scoring methods. As such, they face the necessity of improving the quality of their risk management.

CRD scoring models enable members to develop internal credit rating systems based on a large-scale database, reflecting qualitative items they have employed for their loan decisions (Figure 4).

First, the member must calculate the scores of their customers by employing the CRD scoring models and setting up categories reflecting the distribution of scores. Then, they can modify the category structure reflecting qualitative items. And finally, they can re-assign a category to each customer.

Figure 4: Image of the Internal Rating System



PD = probability of default.

Source: Authors.

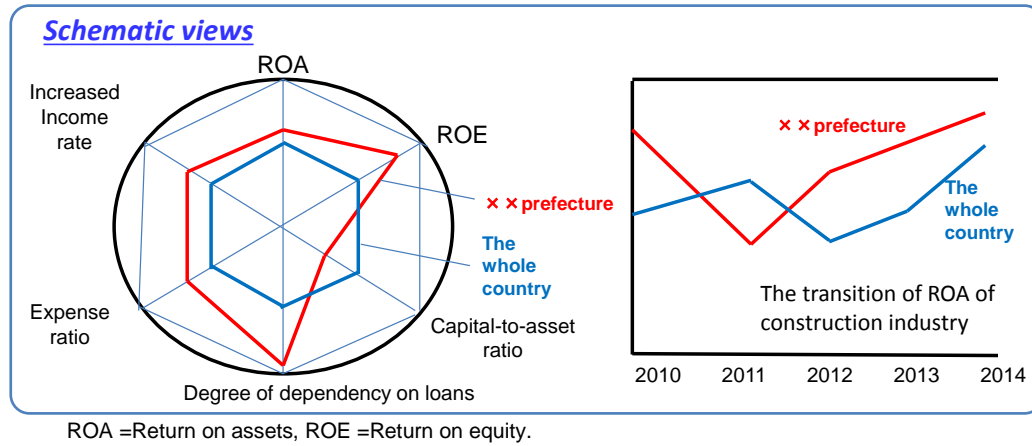
5.5 Using the Financial Indexes of the Credit Risk Database in a Regional Comprehensive Strategy

Japan's Abe administration established the Regional Revitalization Headquarter Office (RRHO) and asked local governments to establish the Regional Comprehensive

Strategy (RCS). The RCS aims to prevent depopulation and revitalize local areas. Regional governments are asked to set 5-year targets as part of the strategy. They are required to choose Key Performance Indicators (KPI) that allow the targets to be verified. Regional governments have to promote the RCS by utilizing the PDCA cycle.

The CRD provides statistical indexes concerning SME management as KPI candidates (Figure 5).

Figure 5: Schematic Views



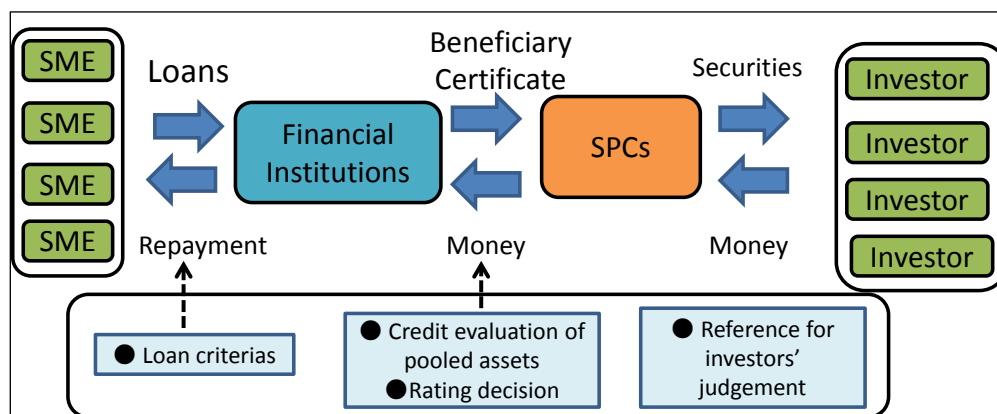
5.6 Securitization

The collateralized loan obligation (CLO) system was an example of practical usage of a scoring model. The CLO system securitized loans held by financial institutions. The Japan Finance Corporation (JFC) and others played the main part in composing the CLO system using loans for SMEs in Japan. The JFC composed CLOs 20 times together with 161 other financial institutions. In total, they offered ¥218.9 billion to 7,439 SMEs⁴.

Figure 6 shows an image of the CLO system. The scoring model is used to select the loans, evaluate pooled assets, and assign ratings. It is also used as a reference for judgments on investors. However, the securitization environment deteriorated after the Lehman shock and CLOs have not been issued in recent years. The latest issuing was by the JFC in March 2011.

⁴ For further details, see the Japan Finance Corporation website: Report of Workshop for Aiming to Promote New Securitization of SME Loans (Japan Finance Corporation 2015).

Figure 6: Securitization of SME Loans



SME = small and medium-sized enterprise, SPC =Special purpose company.

Source: Authors.

However, securitization using scoring models makes it easier to raise funds. If the environment improves, it is likely the situation will change again.

5.7 Other Uses of Credit Risk Database Services

Other uses of CRD services are as follows. The SME Agency uses the CRD data and scoring results of the CRD model. The CRD database covers all data on SMEs that use the Credit Guarantee Program, accounting for most SMEs in Japan. The SME Agency uses the CRD data and scoring results of the CRD model when they make a policy decision to validate the policy effects of programs in the Credit Guarantee System.

The Bank of Japan also uses the large database to analyze and examine the situation of SMEs. They check the distribution of credit risk and the financing situation of SMEs, and so on.

The Financial Services Agency recognizes the CRD scoring models as methods of third-party evaluation. They use the results of the CRD models to check the level of each financial institution’s credit risk rating. They use also CRD data to grasp the situation of SMEs in Japan.

6. MAINTAINING QUALITY

6.1 System for Maintaining Quality of Credit Risk Database Models

In order to maintain the quality of the CRD models, a system has been created to objectively evaluate the models.

In 2007, the CRD established the “model quality management guidelines,” relating to model development, model operation, and validation. In accordance with the guidelines, the CRD organized the Third-Party Evaluation Committee for scoring models. The committee is comprised of prominent scholar, bankers, and so on.

The CRD validates the CRD models annually in line with the regulations under the Small and Medium-sized Enterprise Credit Insurance Act and FSA notifications.

To ensure accurate scoring models, the CRD addresses the following points:

- Checks the transition of actual data compared with the data the current models are based on
- Checks the accuracy ratios of the models
- Compares the probability of default with actual the default rate
- Checks the stability of the models
- Checks the explanatory ability of the variables to detect defaults

The Third-Party Evaluation Committee for CRD scoring models assesses the result of the validation. Then the CRD makes decisions on the scoring models through suggestions from the committee.

For example, the database was affected by the Lehman shock after the establishment the committee, but the challenges were overcome and experience was gained through suggestions from the Third-Party Evaluation Committee. Additionally, an annual report by Third-Party Evaluation Committee is delivered to the members and the summary of the assessments are disclosed to the public on the CRD website.

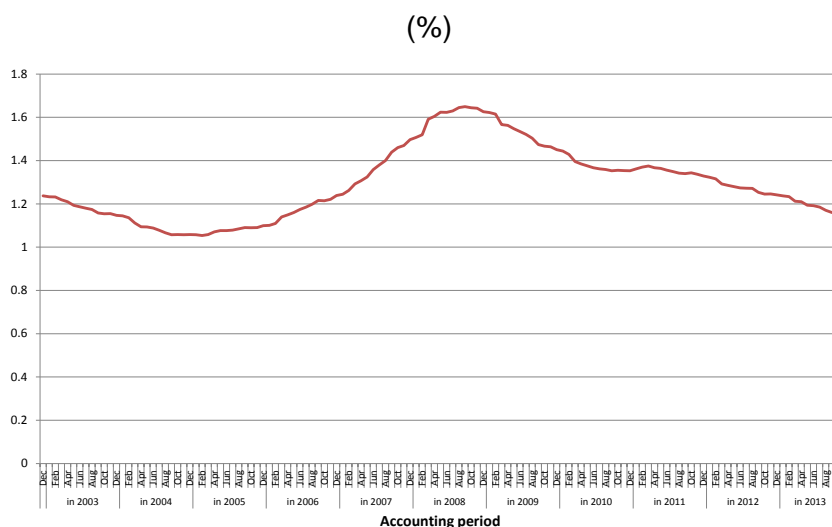
6.2 Importance of Validation

The accuracy of the scoring models tends to deteriorate with time. The scoring models must be validated in order to maintain their quality. Next, we discuss three cases of validation.

Case 1: After the Lehman Shock

The effects of the Lehman shock were felt worldwide. The scoring model was modified to correspond with the situation after the shock. Figure 7 shows the default rate in the CRD database. Many SMEs' bankruptcies were triggered by the Lehman shock, so the default rate (≡ bankruptcy ratio among SMEs) in the CRD database increased rapidly. The actual default rate was higher than the probability of default of the scoring model. The probability of SME bankruptcy heightened after the Lehman shock.

Figure 7: Default Rate in the CRD Database

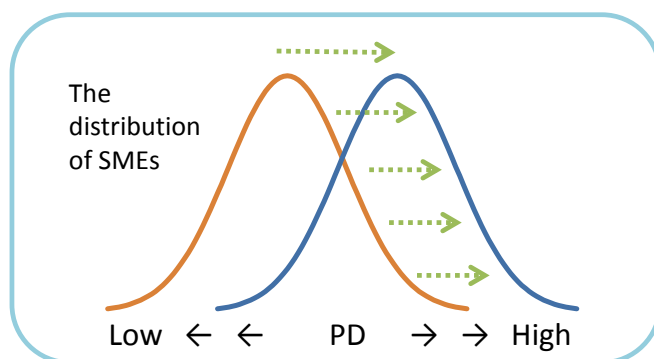


CRD= Credit Risk Database.

Source: CRD.

Figure 8 shows the distribution of SMEs' probability of default after the Lehman shock. The shape of the distribution curve was not drastically changed. The accuracy ratio remained high just by changing parameter values (α , β , and γ as below) of the scoring model.

Figure 8: Distribution of the Probability of Default of SMEs



PD = probability of default, SMEs = small and medium-sized enterprise.

Source: Authors.

As a result of the scoring model, the probability of default can be calculated from this equation.

$$PD = \frac{1}{1 + \exp(-Z)} \quad Z = \alpha + \beta \times X^\gamma$$

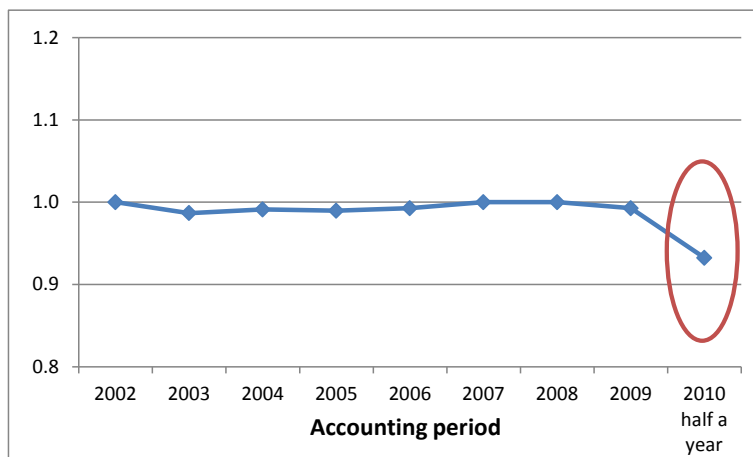
Adjusting α , mainly
 α, β, γ : parameters
X: general assessment of financial indexes

α , β , and γ are parameters and X is a general assessment of financial indexes. α is constant and depends on the level of probability of default. The CRD adjusts α mainly against the rise in actual default rate after Lehman Shock.

Case 2: Great East Japan Earthquake

The accuracy ratio of the scoring model, which was stable until 2009, suddenly declined in the first half of 2010 (Figure 9).

Figure 9: Accuracy Ration Index



AR = accuracy ratio.

Note: AR is indexed 2002=1.0.

Source: CRD.

The data on the first half of 2010 includes the default data affected by the Great East Japan Earthquake. We considered that the sudden decline in the accuracy ratio may have been due to the Great East Japan Earthquake, and so explored the background of the sudden decline through validation as follows:

We excluded data from the heavily affected areas (the prefectures of Fukushima, Miyagi, and Iwate), then calculated the accuracy ratio.

- We identified the badly damaged industries.
- We calculated the accuracy ratio from the dataset, shifting by increments of one month in order to identify when the ratio declined.

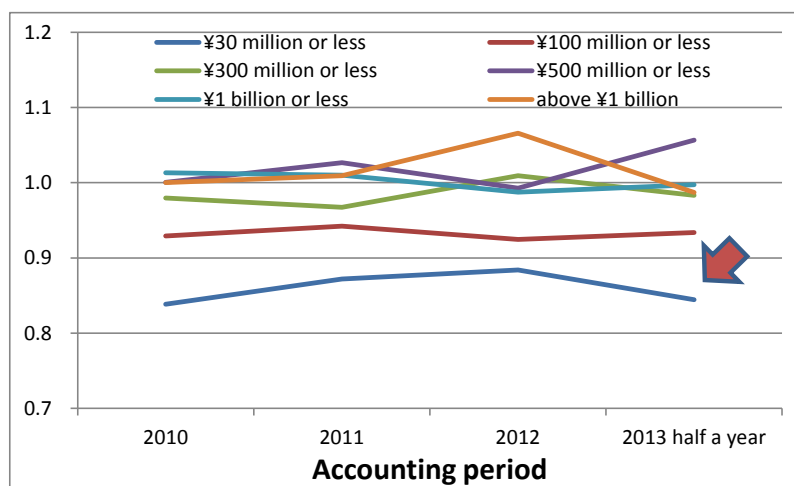
We determined that the decline of the accuracy ratio occurred at the same time as the earthquake, particularly in the areas devastated by the disaster and in the manufacturing industry through the supply chain and the electric power supply. We notified the CRD members that the sudden decline was brought about by specific areas and specific industries.

Case 3: Recent Validation

We next explore the factors that cause deterioration in the accuracy ratio through validation. We identified categories with particularly low accuracy ratios. One was sales volume and the other was the age of the SME.

We calculated the level of the accuracy ratio at each category of sales volume (Figure 10). For sales volumes less than ¥100 million, the level of the accuracy ratio is continuously low. The level of the accuracy ratio in the lowest category, “¥30 million or less,” is particularly low.

Figure 10: Accuracy Ratio Index for Each Category of Sales Volume

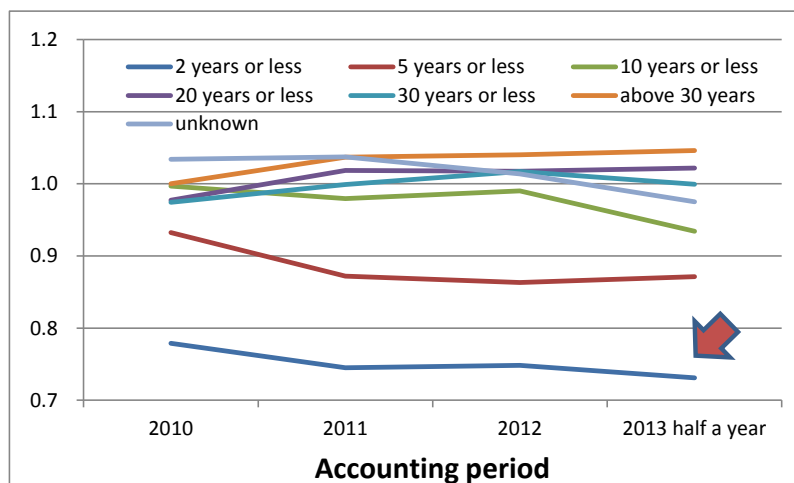


Note: Each level of the accuracy ratio is indexed as “above ¥1 billion” in 2010=1.0.

Source: CRD.

We calculated the level of the accuracy ratio at each age category for the SMEs (Figure 11). The accuracy ratio was continuously low for SMEs younger than 5 years. The ratio was especially low for the lowest category, “2 years or less.”

Figure 11: Accuracy Ratio Index at Each Category of the Period of Doing Business



Note: Each level of the accuracy ratio is indexed as “above 30 years” in 2010=1.0.

Source: CRD.

The categories with lower sales volumes and shorter periods show sustained low values of the accuracy ratio. However, it is often true that younger SMEs have lower sales volumes. We expect that the sales volume and the period of doing business are dependent on each other to some extent.

We conclude through the investigation of segmented group data that the length of the period of business practice is a fundamental factor. This information can be useful for members for designing new scoring models.

7. CONCLUDING REMARKS

Anonymous databases, such as the CRD, are uncommon in other countries. At first, CGCs throughout Japan formed the core members, and were then joined by a large number of financial institutions. Accordingly, the CRD grew to become an extensive database.

The CRD collects anonymous data. Because of this, it is free from the constraints caused by privacy problems and it is comparatively easy to develop a deep and rich database that enables more value-added services. Similarly, the anonymous data collection ensures that users cannot be identified or discriminated by others. Therefore, it is easy to encourage members to send data to the CRD. Due to the above data collecting system, the CRD is an incomparably large database and the CRD endeavors to maintain the high quality of data. This in turn allows the creation of reliable scoring models from the database. In addition, the CRD make an effort to maintain the quality of scoring models and continues to provide members with other new valued-add services. Thus, the CRD provides members with many services and can support the establishment and improvement of similar service provision systems in other Asian countries.

Considering the importance of SMEs in employment and the share of GDP, and the number of SMEs in Asian countries, further efforts need to be made to offer access to finance. Although banks are the main source of financing for SMEs, SMEs are difficult to evaluate since they often do not have solid accounting systems. Many SMEs in Asia borrow money by paying high rates of interest or offering costly collateral. If banks can

obtain better information on SMEs and mitigate asymmetric information problems, better SMEs can raise money more easily at much lower costs. Creating databases like the CRD in Japan will be one of the solutions for this. While the CRD is unique and uncommon in other countries, such a database has many benefits. We think that these benefits are possible in other countries. By introducing such a database, the efficiency of fund provision to SMEs can improve help to enable the expansion of economies.

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