CRD Credit Risk Database

The Outline of the Credit Risk Database Association in Japan

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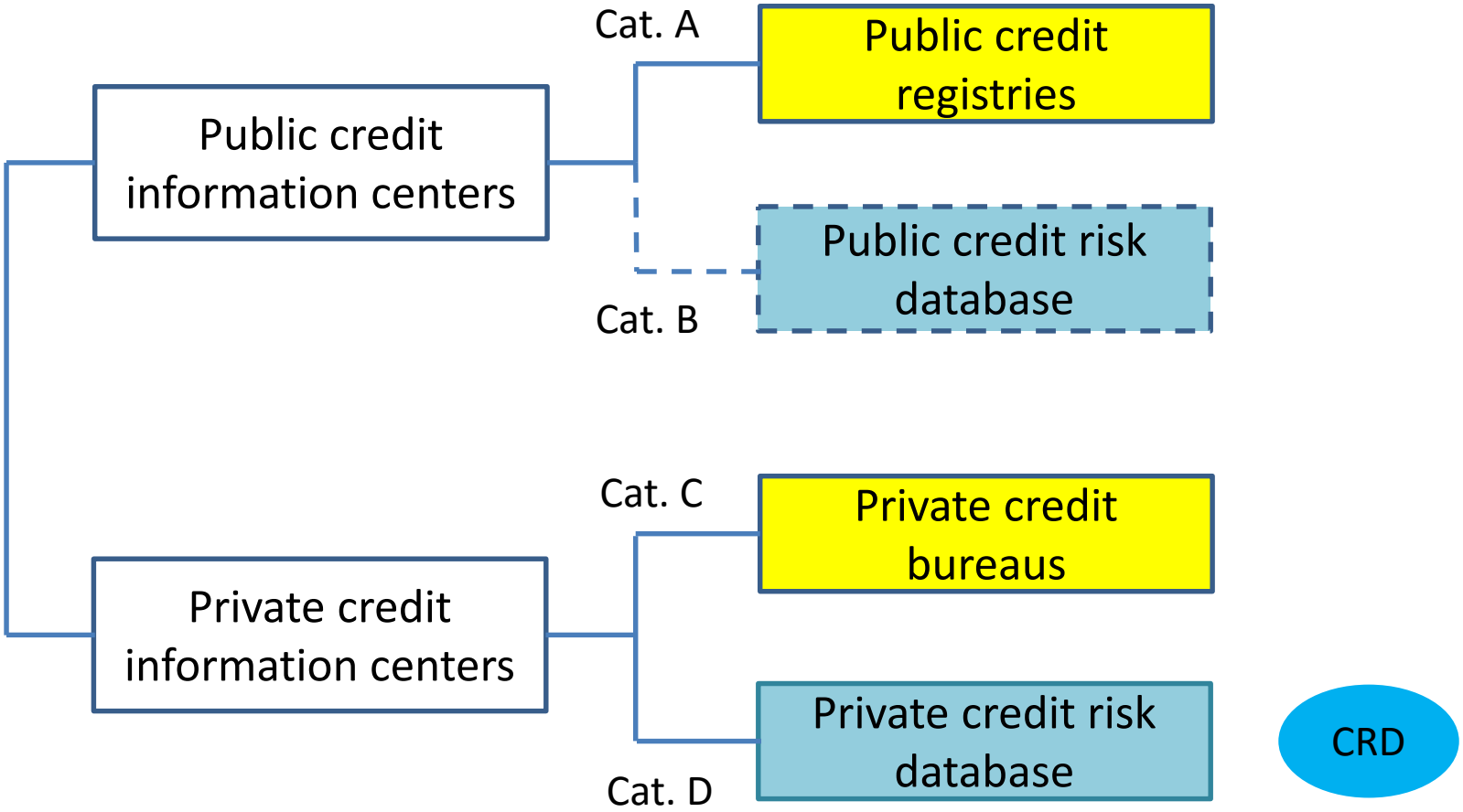
1. Credit Risk Database vs. Credit Bureaus (1/7)

(1) Categories of credit information centers for Business Loans



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1. Credit Risk Database vs. Credit Bureau (2/7)

(2) The overview of global credit information centers

Cat.A: Private credit bureaus

A big presence in US, UK and Japan

Dun&Bradstreet (US, Established in1841)
TransUnion (US, Established in 1968)
Experian (UK, Established in 1970)
Tokyo Shoko Research (TSR) (Japan, Established in 1892)
Teikoku Databank (TDB) (Japan, Established in 1900)

Cat.C: Public credit registries

A big presence in many of European, Asian and Latin American counytries

Germany in 1934,France in 1946, Spain in 1962, Italy in 1962, Belgium in 1967, Portugal in 1978, Austria in 1986
13 European countries
15 Latin American countries
9 Asian countries

Cat.D: Private credit risk database

Unique to Japan

CRD Association (Established in 2001)
Risk Data Bank of Japan (RDB) (Established in 2000)
Credit Risk Information Total Service of Regional Bank Association of Japan (CRITS) (Established in 2004)
Sinkin Database of Shinkin Central Bank (SDB) (Established in 2004)

Cat.B: Public credit risk database

Not Existing

(1) The number of countries and the established years in Cat.C is partly according to World Bank Policy Research Working Paper 3443 (Nov.2004)

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Credit Risk Database vs. Credit Bureau (3/7)

(3) Basic Architecture

There are two types of organization that deal with ***credit risk information***.

❶ Credit information centers designed to collect the personally identifiable credit information (PICI) and having individual information reference function (Credit Registry or Credit Bureaus)

→Sharing borrowers' (or potential borrowers') individual credit information as materials for judging their creditworthiness

Primary driving force-----***Bank supervision for reducing non-performing loan***

❷ Credit information centers designed to collect anonymous financial information and having no individual information reference function (Credit Risk Database)

→Showing an average borrowers in the group with same attributes and more accurate prediction of the credit risk based on a large database

Primary driving force-----***Mitigating the constraint on SME finance***

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1. Credit Risk Database vs. Credit Bureau (4/7)

(4) Data Collection

Credit Bureau

・No required minimum number of data

(Each individual data is a point.)

・The inaccuracy of each individual data could bring fatal problems.

There are incentives to narrow the range of data collected due to database collection and maintenance cost.

・Focused on loan performance data (The amount of outstanding loans, past delinquencies and defaults, and positive data)

・Minimum loan size cut-off for reporting

・Small number of items of BS and P&L

Credit Risk Database

・Required minimum number of data for building econometric models

(Not Each individual data but statistical characters attributed to the database is a point.)

・Overall database accuracy is more important rather than the accuracy of each individual data.

There are incentives to widen the range of data collected due to the enhancement of econometric models in terms of accuracy and advancement.

・Putting emphasis on BS and P&L

・Large number of items of BS and P&L

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1. Credit Risk Database vs. Credit Bureau (5/7)

(5) Impacts on the financial markets

Credit Bureau

Discipline on the borrowers

・Highly motivated to avoid of being blacklisted and acquire good financial record (“Reputation Collateral”).

Promoting competition in financial market and increase financial opportunities for borrowers

・Increasing opportunities of better loan conditions for borrowers having good loan performance by sharing their information.

・Effective only for registered borrowers.

Improving risk management

・To reduce the future possibility of delinquencies and defaults by sharing borrowers’ past loan performance.

・To reduce newly generated non-performing loans

Credit Risk Database

Discipline on the borrowers

・Motivated to improve account figures for getting better loan conditions.

Promoting competition in financial market and increase financial opportunities for borrowers

・ To reduce overestimated risk premium on borrowers by making clear the financial data distribution of the group having same attributes.

・Effective for all borrowers.

Improving risk management

・To improve portfolio risk management over pooled loans.

・To support the securitization of loans.

・To enable to introduce the stochastic risk control

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1. Credit Risk Database vs. Credit Bureau (6/7)

(6) Privacy problems

Credit Bureau

Credit bureaus usually collect individual personal data in addition to corporate data. They have to introduce appropriate security safeguard measures for their protection.

・Ensuring the right to access their own information and dispute inaccurate information.

・Restriction on collecting data like religion, race, sex, marital status and so on.

・Restriction on the period of holding data like delinquency, default and so on.

Credit Risk Database

As far as collecting anonymous data, there never happen privacy problems.

・It is comparatively easy to accumulate wide range and long term of data, which enable more advanced value added services.

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1. Credit Risk Database vs. Credit Bureau (7/7)

(7)Benefits of Credit Risk Database (compared to Credit Bureau)

- Appropriate lending rates in line with credit risk
  - Less dependence on loans with collateral
  - Low cost and efficient evaluation tool of SME credit risk compared to Credit Bureau
- Standard methods for SME credit risk evaluation in Capital markets
  - Securitization of various SME-related assets, including loan assets
  - Indispensable for securitization unlike Credit Bureau
- Appropriate evaluation of SME loan portfolio
  - Own assessment and BIS capital requirements
  - More suitable for SME loan portfolio management than Credit Bureau
- Low cost and appropriate measure for transaction-based lending
  - enabling efficient processing of loan decision
  - Prompt evaluation more than Credit Bureaus
- Promoting the facilitation of the fund provision to SME
  - The precise prediction of default risk over collective SME loans reduces the overestimated risk premium in the fund provision side, which encourage the fund provision to SMEs
  - Applicable for wide range of SME finance including non-registered SMEs unlike Credit Bureau

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2. The outline of CRD Association (1/5)

(1) Data Collection (p.11)

Collecting anonymous data from CRD members

(2) Creating Database & Model building (p.14)

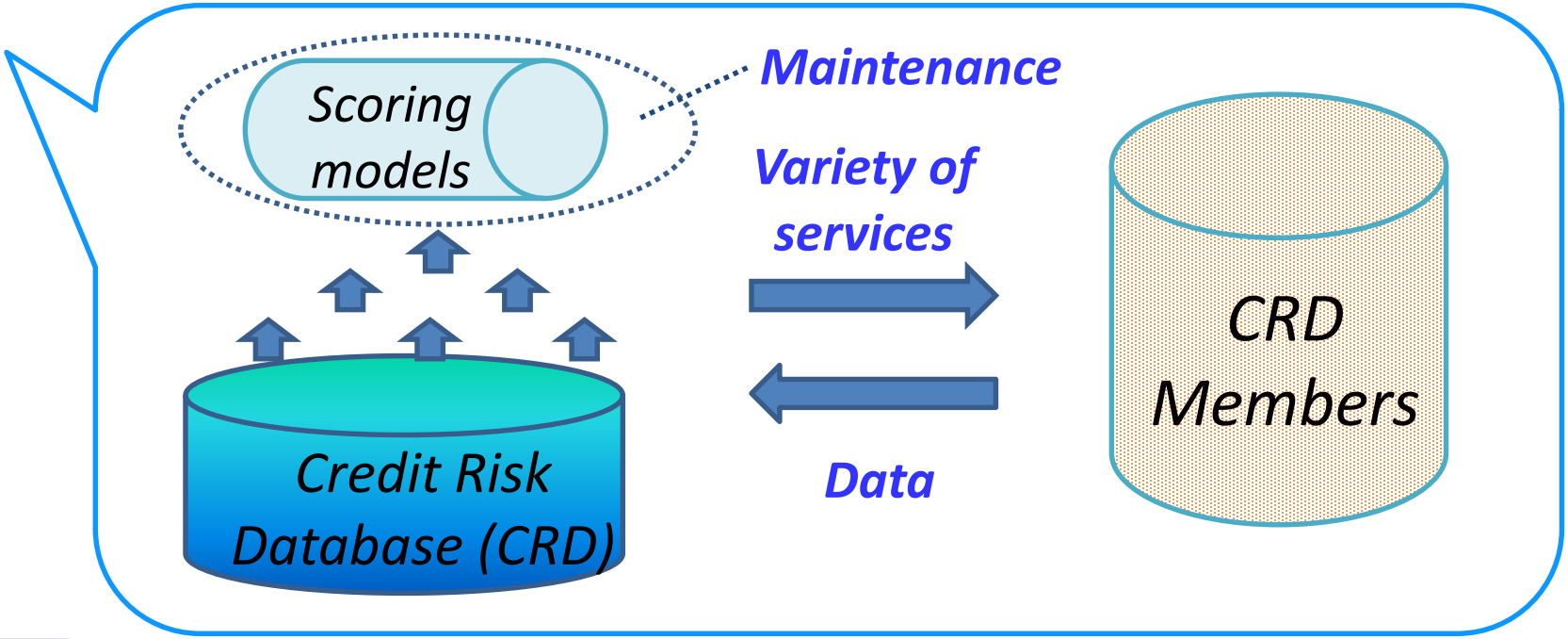
Creating database and Building CRD models based on the large database

(3) Variety of services (p.15)

Providing CRD members with variety of services

(4) Maintenance for the quality of CRD scoring models (p.16)

Creating the system that evaluated CRD scoring models objectively



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2. The outline of CRD Association (2/5)

(1) Data Collection

CRD Association collects financial data on SMEs from members --- credit guarantee corporations throughout Japan, and government-affiliated or private financial institutions.

【Membership Composition & Accumulated data】

Credit guarantee corporations	51
Government-affiliated financial institutions	3
Private financial institutions	116
Credit-rating agencies, etc.	5
Total	175
The governmental institutions	5

※ as of Aug 1, 2015

(Unit: 1,000)

	Number of debtor	Number of financial statements
Incorporated SMEs (default information)	2,210 (340)	16,644 (2,365)
Sole-proprietor SMEs (default information)	1,099 (160)	4,519 (657)

※ ※ as of March 31, 2015

Please refer to the next page:
(Reference) Collected data & Created Financial Indexes from database

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(Reference) Collected data & Created Financial Indexes from database ①

- Financial data (B/S, P/L)

Balance Sheet

Assets

- Current assets
  - —Cash and cash equivalents
  - —Inventories
- Fixed assets
  - —Tangible fixed assets
  - —Intangible assets
  - —Investments
- Deferred assets

Liabilities

- Current liabilities
  - —Short-term debt
- Fixed liabilities
  - —Long-term debt

Shareholders' Equity

- Capital stock

Financial Indexes

- Capital-to-asset ratio
- Degree of borrowing on lending
- Ratio of interest-bearing liabilities
- Ratio of current profits to assets

. . . . . .

Profit & Loss Statement

Sales

Cost of goods sold

Gross profit

Operating expenses

- Salaries expense
- Depreciation expense

. . . . . .

Operating income

Non-operating income/expense

- Interest expense

. . . . . .

Income before provision for income taxes

Provision for income taxes

Net income

CRD Credit Risk Database

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(Reference) Collected data & Created Financial Indexes from database ②

- Non-financial data (Qualitative items)
  - (a) Owning or not owning real estate; (b) Successor or no successor; and (c) Birth year of CEO.

- Default data
  - (a) 3 months or more arrears; (b) de facto bankruptcy; (c) bankruptcy; and (d) subrogation (applicable for credit guarantee corporations).
  - (e) substandard and (f) potentially bankruptcy were added as correspondence to Basel Ⅱ since April 2003.

* Attributes (for consolidation purpose)
(a) First Japanese character of company's name; (b) Date of establishment; and (c) Postal code.

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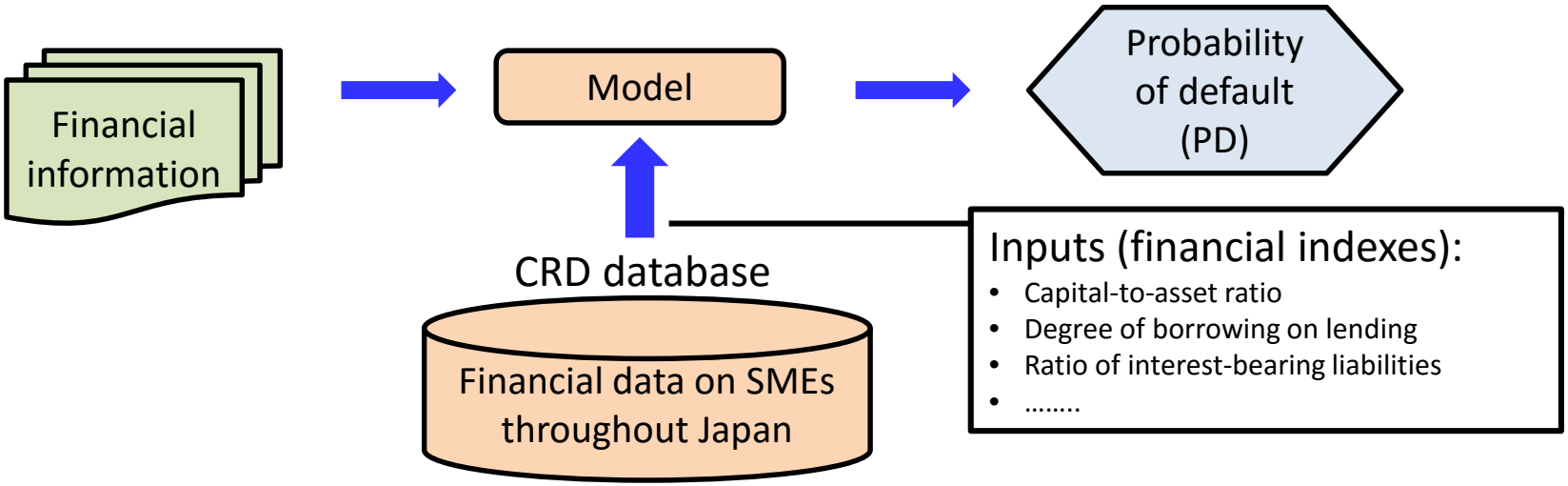
2. The outline of CRD Association (3/5)

(2) Creating Database & Model building

- Collecting SME financial data are stored in anonymous form.
- The submitted data are cleansed and consolidated. These process enable to create high quality database and we monitor the quality of data continuously.
- We create scoring models for members with high quality and incomparable big database. We validate scoring models in order to maintain the quality of those.



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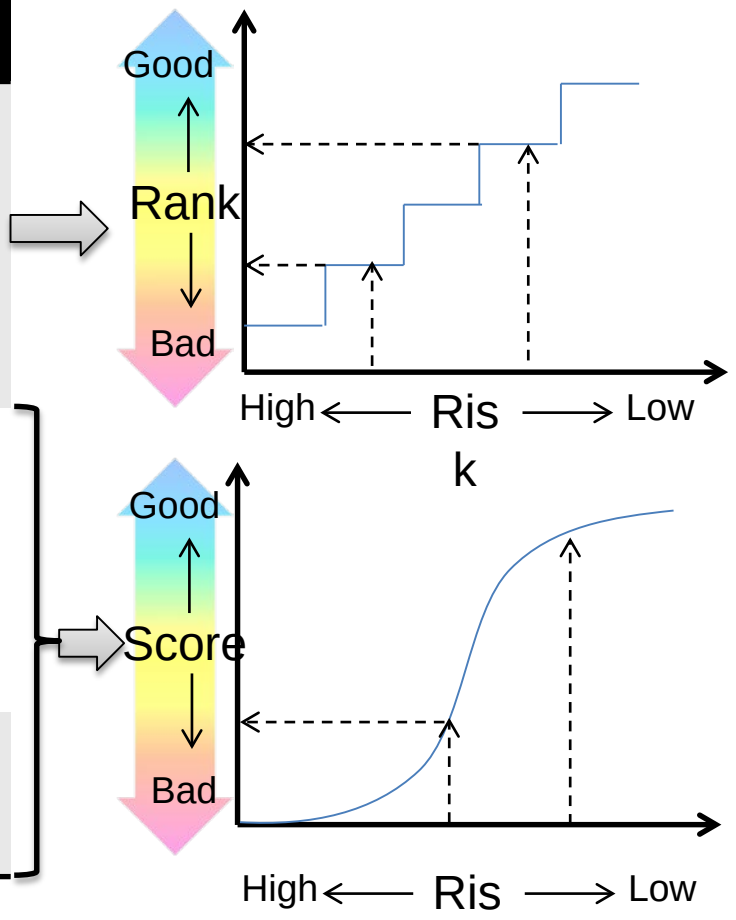
(Reference) Three Types of Model Structures ①

Model type	Based information	Analytical method
Type-A	a. Macroeconomic environment Market environment b. Historical data of payment, transaction c. Financial Statements	Expert Judgment
Type-B	a. Historical data of payment, transaction (Main) b. Financial Statements (Sub)	Statistical model analysis and event driven evaluation
Type-C	• Financial Statements	Statistical model analysis



- Type-A models are comparatively easy to introduce, but do not reflect characteristics of the mother population scored samples belong to.
- Type-B models can be constructed with a small number of data items compared to Type-C models, but do not fully reflect the ongoing business performance of scored samples.
- Type-C models require a large number and wide range of financial statements data for their construction and the risk evaluations, but fully reflect ongoing business performance of scored samples.

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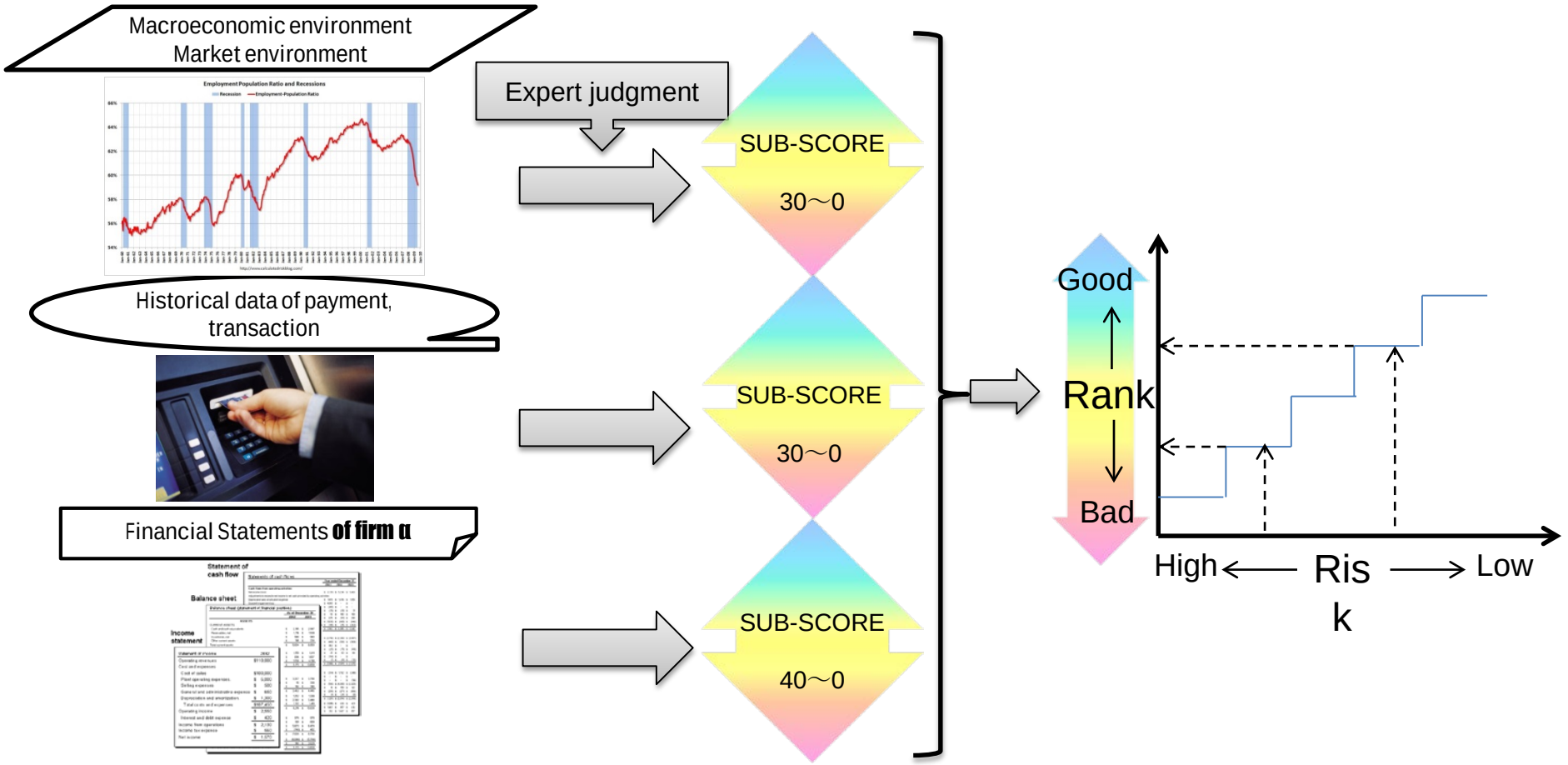
(Reference) Model Structures ②

(Type-A)An image of the model based on expert judgement



- Firm α is scored by expert judgment based on the information of the macroeconomic environment and the market environment, the historical data of payment and transaction, and the financial statements.
- Merit : The model can be constructed without any data. / Demerit : The model structure does not reflect the characteristics of the specific population Firm α belongs to, so that the risk evaluation is not sufficiently accurate.

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(Reference) Model Structures ③

(Type-B)An image of the model based on historical loan performance data

Firm α's Probability of default

$$p_\alpha = \frac{1}{1 + e^{-\beta \mathbf{x}_\alpha}}$$

Logistic Model (Statistical model analysis)

Financial Statements of firm α

A few items

Statement of cash flow

Balance sheet

Income statement

Heavily weight

Event driven evaluation

Historical data of payment, transaction

Good

Score

Bad

High ← Risk → Low

- Firm α is scored by statistical model based on the historical data of payment and transaction, and the limited range of financial statements data.
- Merit : The model can be structured with a comparatively small number of financial statement data. Demerit : The model structure does not fully reflect the ongoing business performance of firm α. It is difficult to differentiate high performance firms from low performance firms if they have no delinquent record in past.

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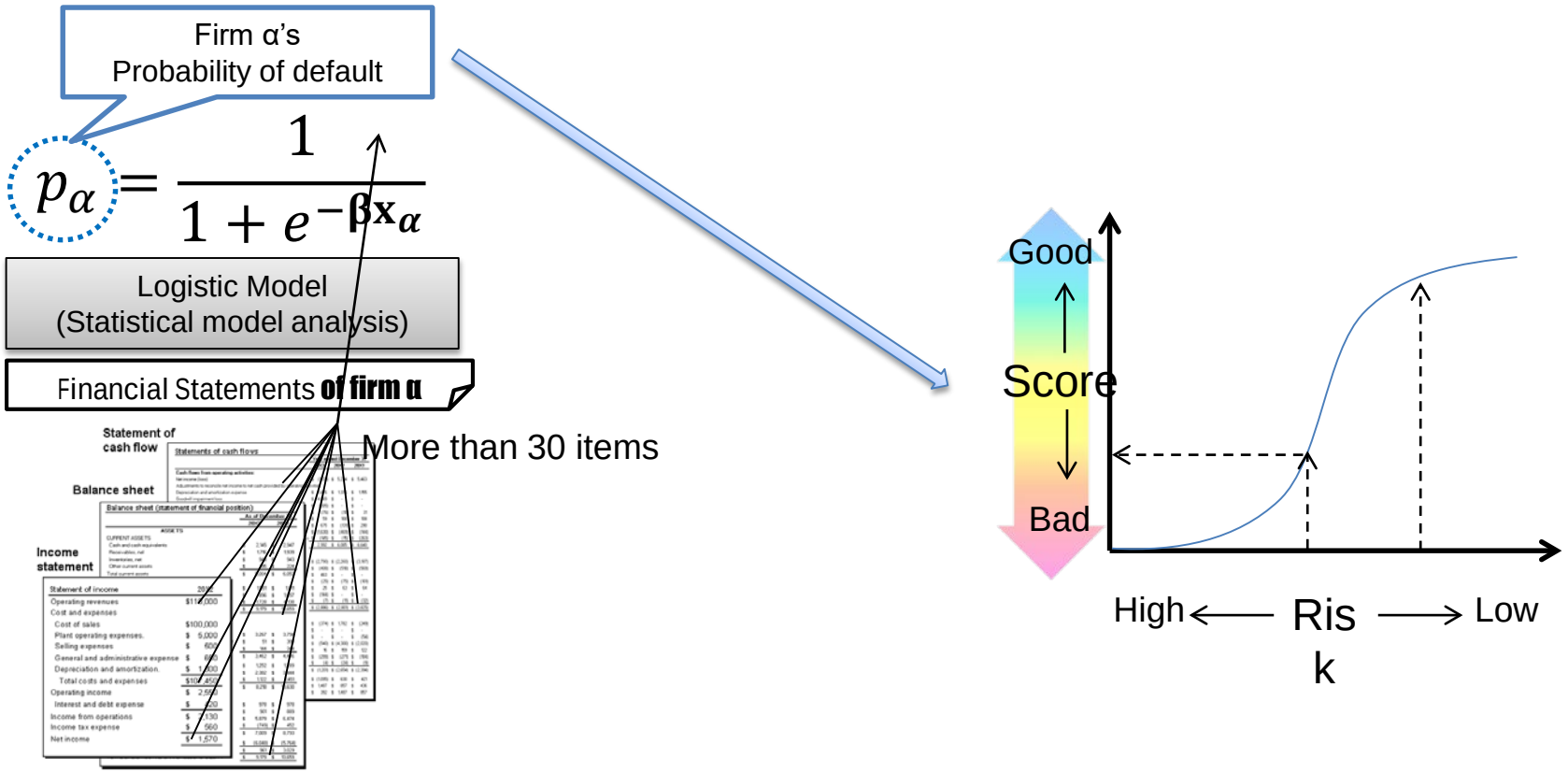
(Reference) Model Structures ④

(Type-C)An image of the CRD model



- Firm α is scored by statistical model fully based on the financial statements.
- Merit : The model structure fully reflects the ongoing business performance of firm α, so that the risk evaluation is comparatively accurate. / Demerit : A large number and wide range of financial statements data are required for the model construction and the risk evaluations.

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(Reference) Model structures ⑤

The difference of applied model structures in Japan and US & Europe

	Japan	US, Europe
Middle scale corporations	・models based on financial statements ・shared among financial institutions	・models based on financial statements ・not shared among financial institutions
Small scale corporations		
Sole proprietors		・models based on past loan performance ・shared among financial institutions
Consumers	・models based on past loan performance ・shared among financial institutions	
Card loan users		

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2. The outline of CRD Association (4/5)

(3) Variety of services

i. Scoring service

Members can use CRD scoring models and evaluate credit risk of borrowers and potential borrowers. Since April, 2006, CRD models has been using to decide Credit Guarantee Fee Rate Classification in the Credit Insurance System.

【Credit Guarantee Fee Rate Classification】

(Unit: 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

ii. Sample data provision

Members can use random sampling data from CRD database.

— To complete insufficient data for creating members' internal scoring model
— To validate members' internal scoring model
— To develop financial products in new area

iii. Statistical information provision

Member can use statistical information such as the financial indexes.

— To compare the financial statistics based on each member's customers with those of CRD database for improving the credit risk management

iv. Management consulting support System（McSS)

Member can use consulting tool constructed of CRD scoring model and CRD data analysis.

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2. The outline of CRD Association(5/5)

(4) Maintenance for the quality of CRD scoring models

(1) Model quality management guidelines

We established the guideline on the model development, model operation & validation and organized the Third-Party Evaluation Committee for CRD scoring models.

(2) Regular Validation & its Assessment

- We validate CRD models annually in line with the guideline and the regulation under the Small and Medium-sized Enterprise Credit Insurance Act and FSA notification.
  - To check the transition of actual data as compared with the data which the current models are based on
  - To check Accuracy ratio (AR) of the models
  - To compare PD with actual default rate
  - To check the stability of the model
  - To check the explanatory ability of the variables to detect default
- The Third-Party Evaluation Committee for CRD scoring models assesses the result of validation.

(3) Disclosure of assessment by the Third-Party Evaluation Committee

Annual Report by Third-Party Evaluation Committee is delivered to the members and the summary of the assessments are disclosed to public on CRD website.

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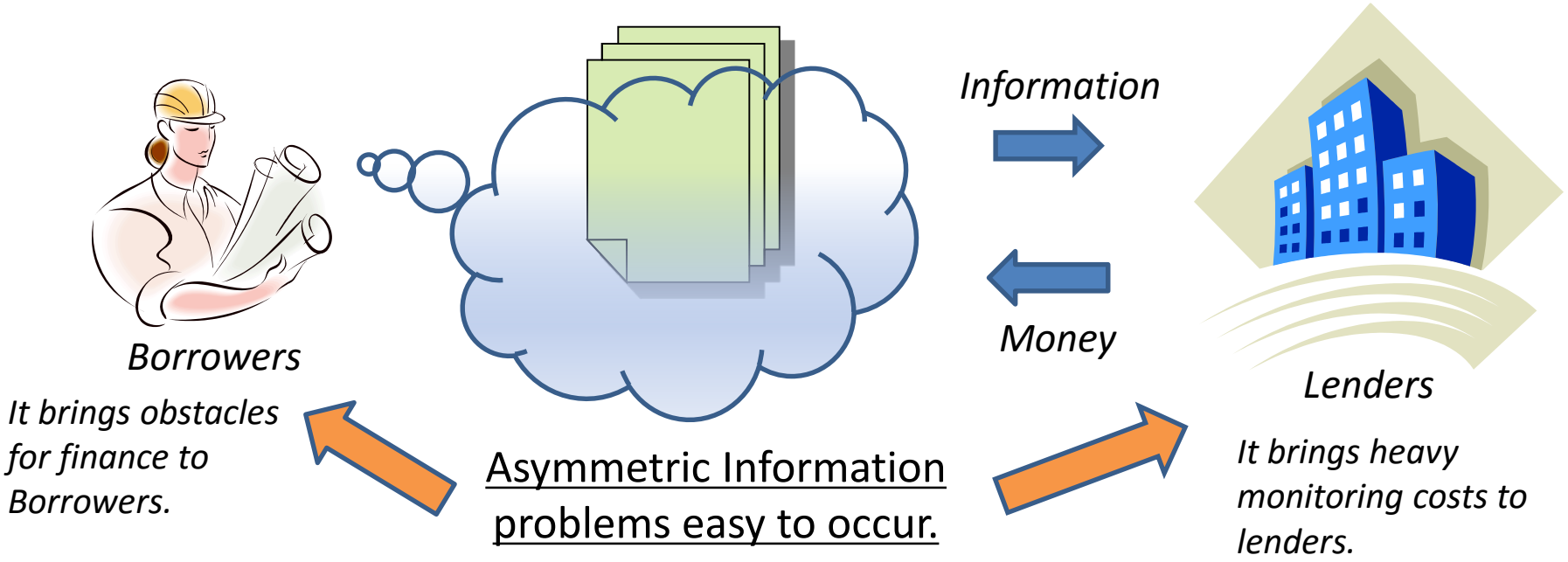
3. Background of CRD Association Establishment (1/3)

- Financial Business belongs to an information industry.



- In financial and capital markets, information sharing system is well-developed as an infrastructure.
- SMEs that can't use such an infrastructure suffer from asymmetric information problem seriously.
- Previous resolution of the problems for SME financing is to utilize the land as collateral.

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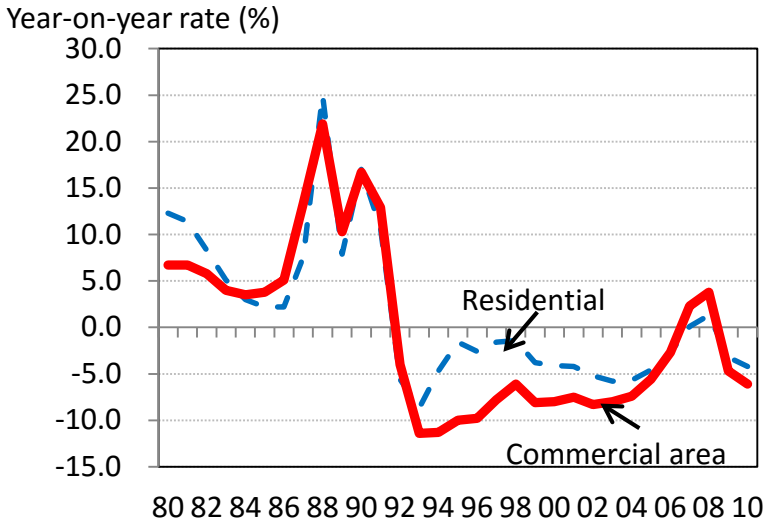
3. Background of CRD Association Establishment (2/3)



Source: Ministry of Land, Infrastructure and Transport

- In the 80's, the land prices rose drastically and the financial system relied heavily on the land as collateral more and more.
- However, Collapse of bubble economy had occurred.
- The excessive amount of collateral or heavy burden of guarantee was required for financing.

- Lenders need to improve the quality of risk management and borrowers(SMEs) hope to get better access to finance.
- Both of them hold an incentive for the introduction of more rigorous evaluation of credit risks.

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3. Background of CRD Association Establishment (3/3)

- To deal with the requirements of excessive collateral in SME financing (To cope with the collapse of the financial system relied heavily on the collaterals)
- To manage the requirements of sophisticated risk management corresponding to Basel Ⅱ

The Leading user conference was organized by SME Agency.

CRD management Council was founded in March,2001.

*CRD Management Council renamed itself CRD Association in April, 2005.

- 58members attended.
- Scoring Model (CRD Model 1 ver.1) was released.

【Missions of CRD】

a) Facilitating the fund provision to SMEs in Japan
b) Improving the quality of risk management in finance
c) Managing the database in a fair manner

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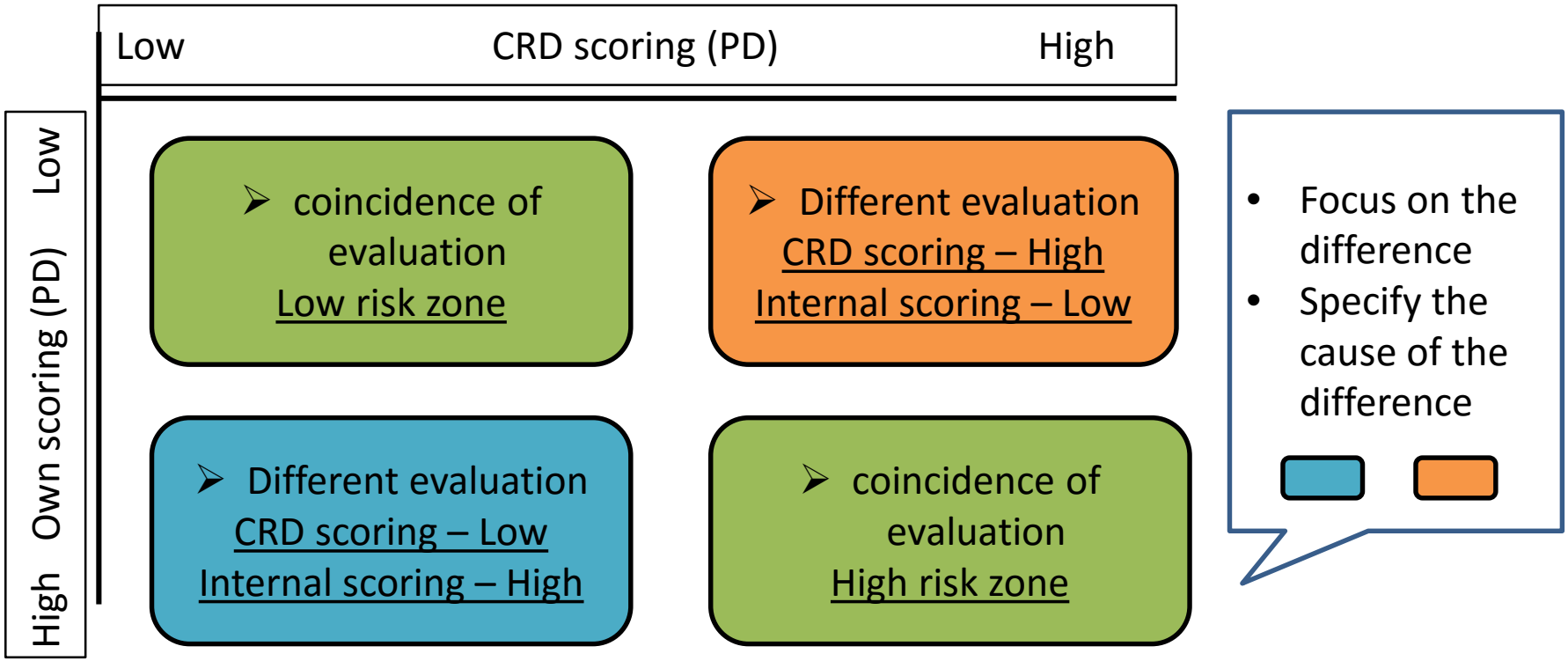
4.Concrete Images of Practical Usage（1/5）
(1) The validation of the internal scoring models

Many of CRD members employ CRD scoring models for validating their own scoring models.



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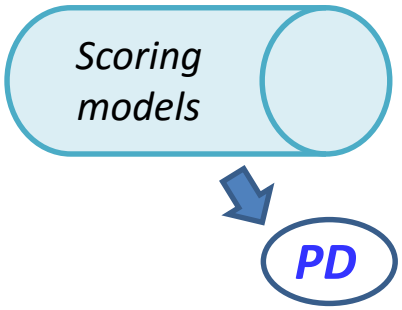
4.Concrete Images of Practical Usage （2/5）

(2) The introduction of CRD scoring models into the internal evaluation systems

Some of CRD members develop their internal rating systems by employing CRD scoring models. First, they group customers into the categories in accordance with the degree of estimated PD based on CRD scoring models. Then they develop their internal rating systems taking other attributes such as qualitative items into account.



financial rating	Range of PD
A1	<0.42%
A2	<0.65%
A3	<0.78%
A4	<1.15%
B5	<1.86%
B6	<2.48%
・・・	

Other Attributes

Rating	Number of customers	Ratio	Default rate
A1	326	2.2%	0.3%
A2	1,568	10.8%	0.5%
A3	3,248	22.3%	0.6%
A4	2,653	18.2%	0.8%
B5	4,832	33.2%	1.6%
B6	1,325	9.1%	2.3%
B7	224	1.5%	12.5%
C	159	1.1%	45.0%
D	98	0.7%	100.0%
E	134	0.9%	100.0%
Total	14,567	100.0%	

Check points:

1. *Is there homogeneity of credit risk in the same rating?*
2. *Is there distinction of credit risk between each rating?*
3. *Is there extreme concentration of customers or ratio in particular rating?*

Members can construct their internal rating systems reflecting statistical prediction of PD and qualitative items they have weighed for loan decision making, which contributes to the improvement of risk management.

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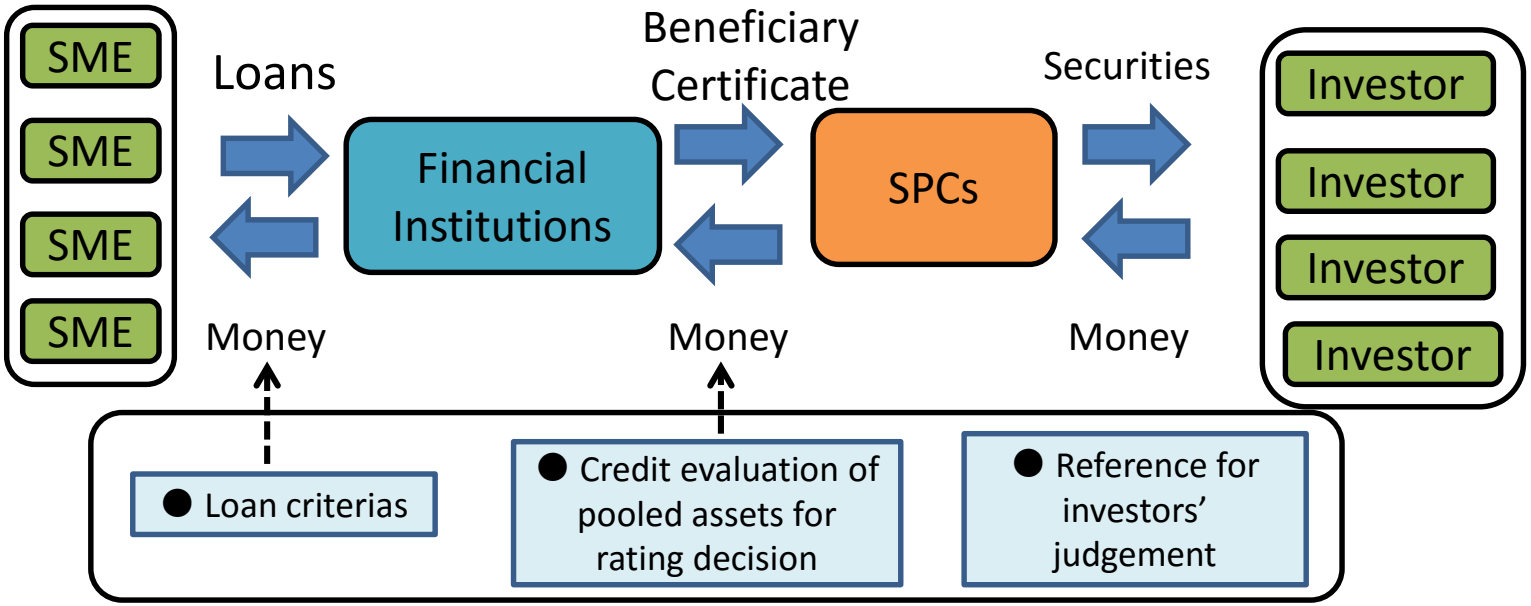
4.Concrete Images of Practical Usage （3/5）

(3) Securitization of SME Loan Obligations

The sketch of CLO Schemes



Use of Credit Risk Database

- What matters is not the creditworthiness of each loan, but the average risk of the portfolio.
- A large and deep credit information database is essential to estimate the average risk of pooled debt.
- Tokyo Metropolitan Government arranged the issuance of Collateralized Loan Obligations (CLO) using credit risk evaluation by CRD.

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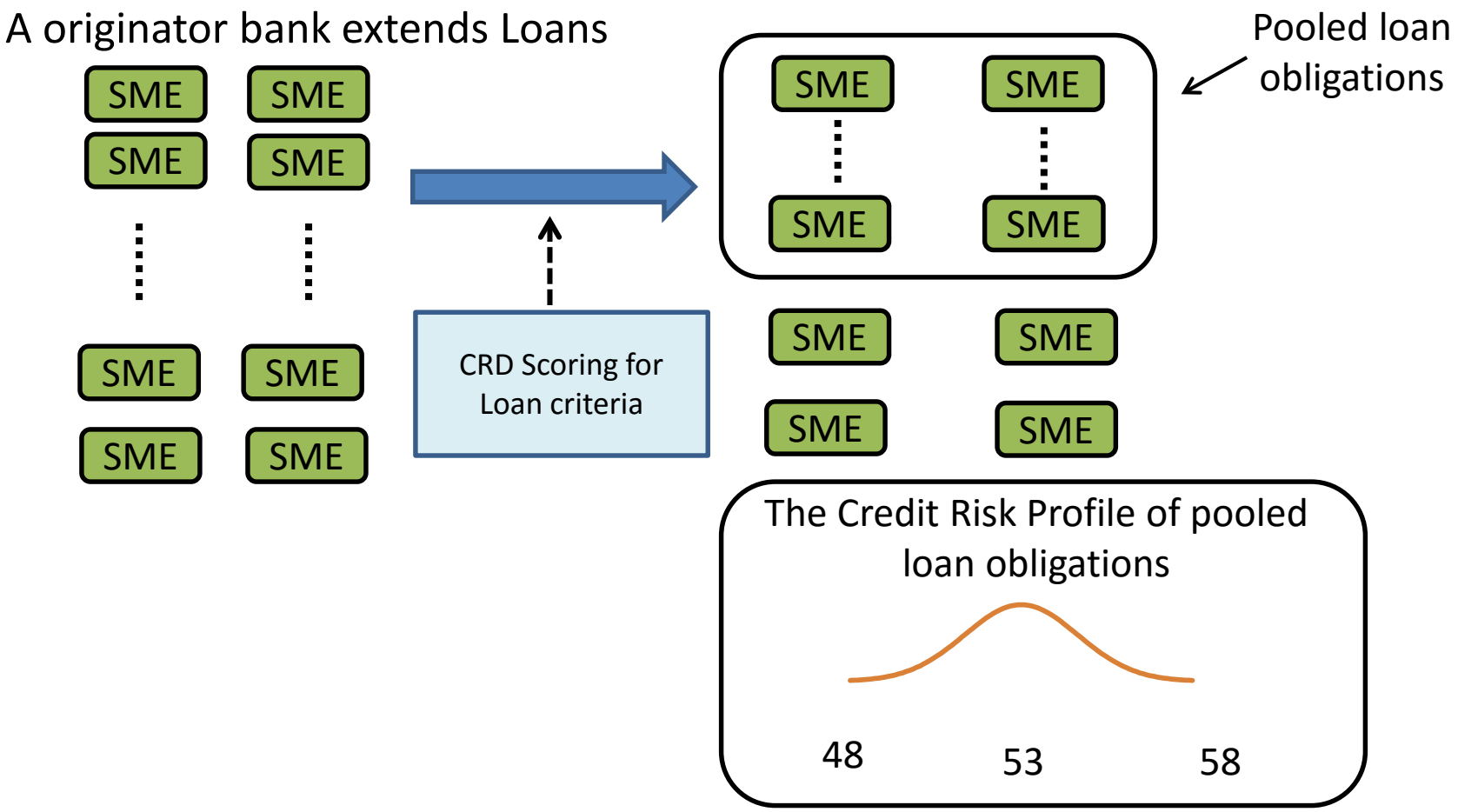
(Reference) Collateralized SME Loan Obligations（1）



The CRD scorings of each SME loans are employed as a criteria for the selection of pooled loan obligations and indicates their credit risk profile.

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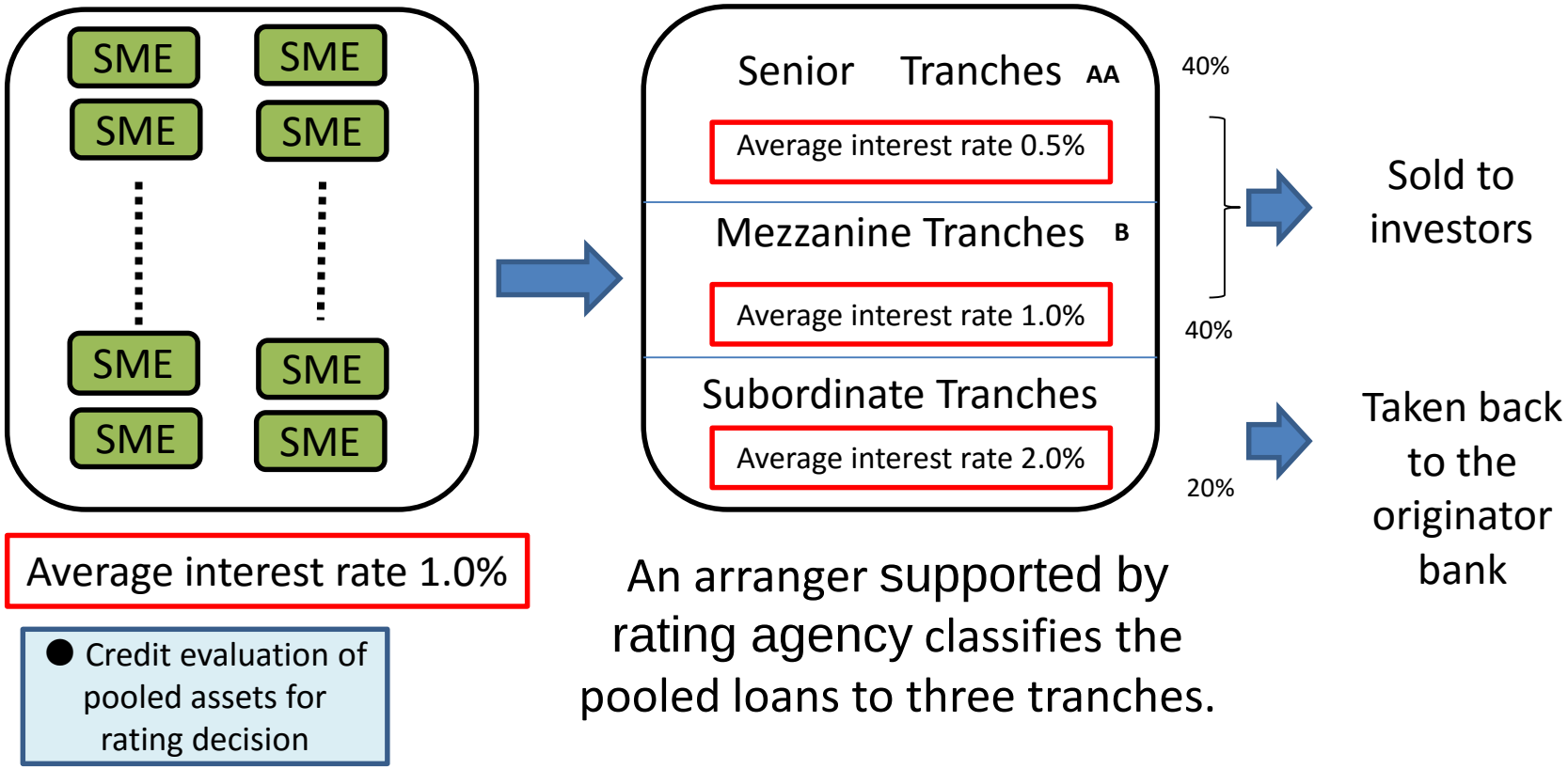
(Reference) Collateralized SME Loan Obligations（2）

SPCs form tie-ups with trust banks



Average interest rate 1.0%

● Credit evaluation of pooled assets for rating decision

An arranger supported by rating agency classifies the pooled loans to three tranches.

Arrangers and rating agencies decide the composition of tranches and the rating assignment on each tranches based on the credit risk profile of pooled loan obligations provided by CRD scorings as well as other qualitative factors.

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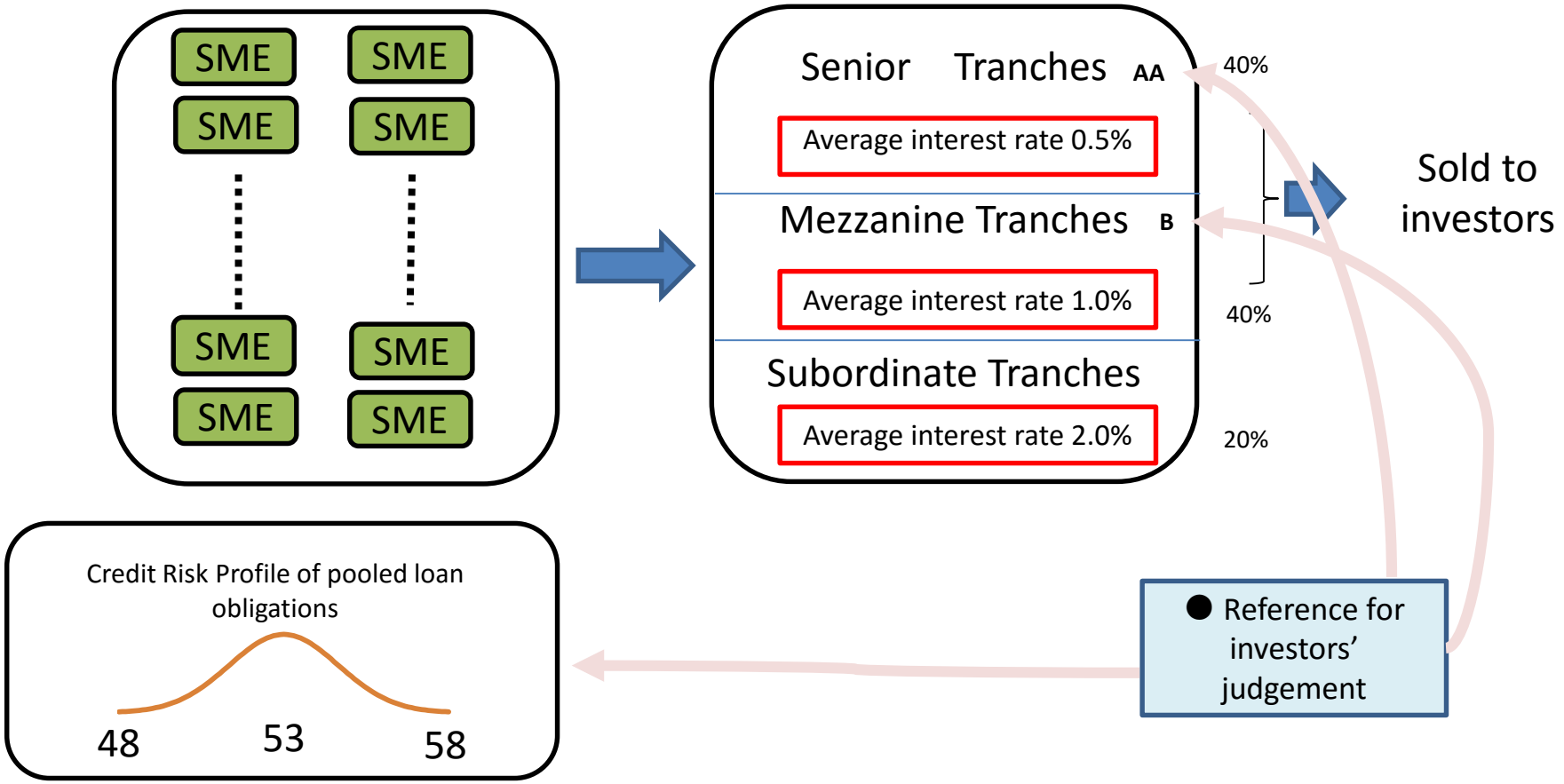
(Reference) Collateralized SME Loan Obligations（3）

SPCs form tie-ups with trust banks



Investors can refer the credit risk profile provided by CRD scoring in addition to the ratings assigned by rating agencies.

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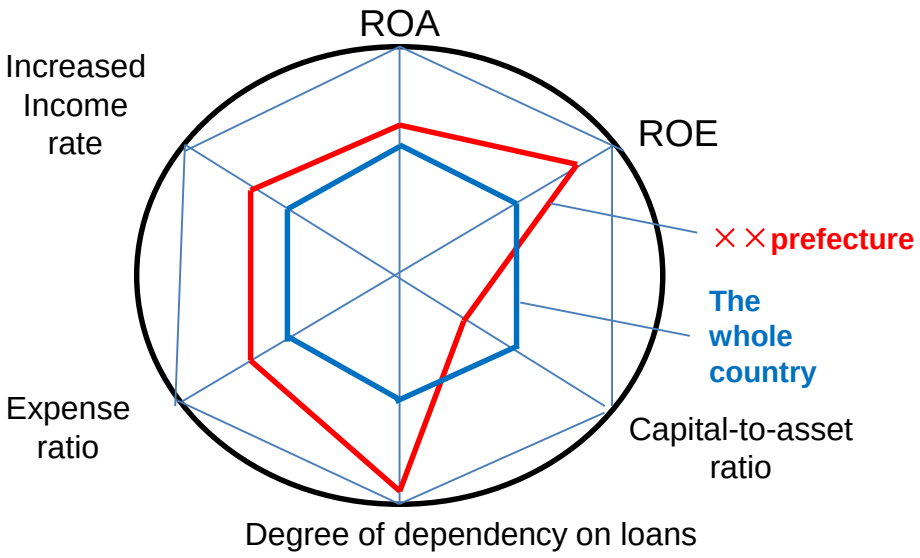
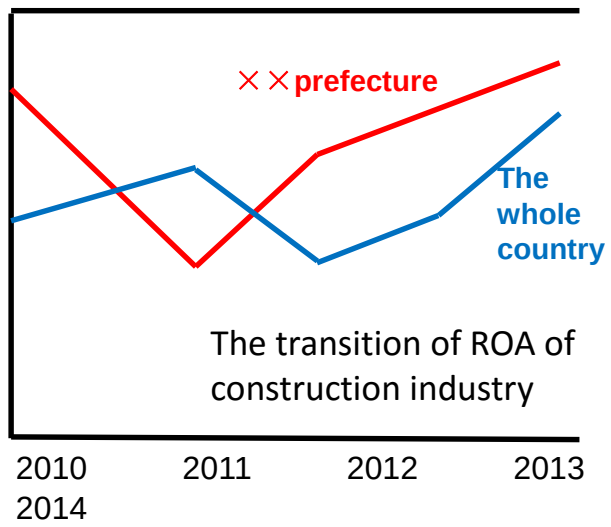
4.Concrete Images of Practical Usage （4/5）

(4) Using the financial indexes of CRD in regional comprehensive strategy

iii. The regional comprehensive strategy aims preventing depopulation and revitalizing local areas. Regional governments are asked to set the targets after 5years in its strategy. They have to choose Key Performance Indicator (KPI) as those targets that are possible to be verified. Regional governments have to promote regional comprehensive strategy by utilizing the PDCA cycle. Therefore they need to choose firm KPI and decide to use the financial indexes of CRD.

Schematic views





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4.Concrete Images of Practical Usage（5/5）

(5) Others

- SME Agency

— To use CRD data and scoring result of CRD model for Policy making and monitoring policy effect (e.g. Credit Guarantee system)

- Bank of Japan

— To analyze and to examine the situation of SMEs

(check the distribution of credit risk and financing situation of SMEs, etc.)

- FSA

— To check the level of each financial institution's credit risk rating

(We are recognized by FSA as a third-party evaluation)

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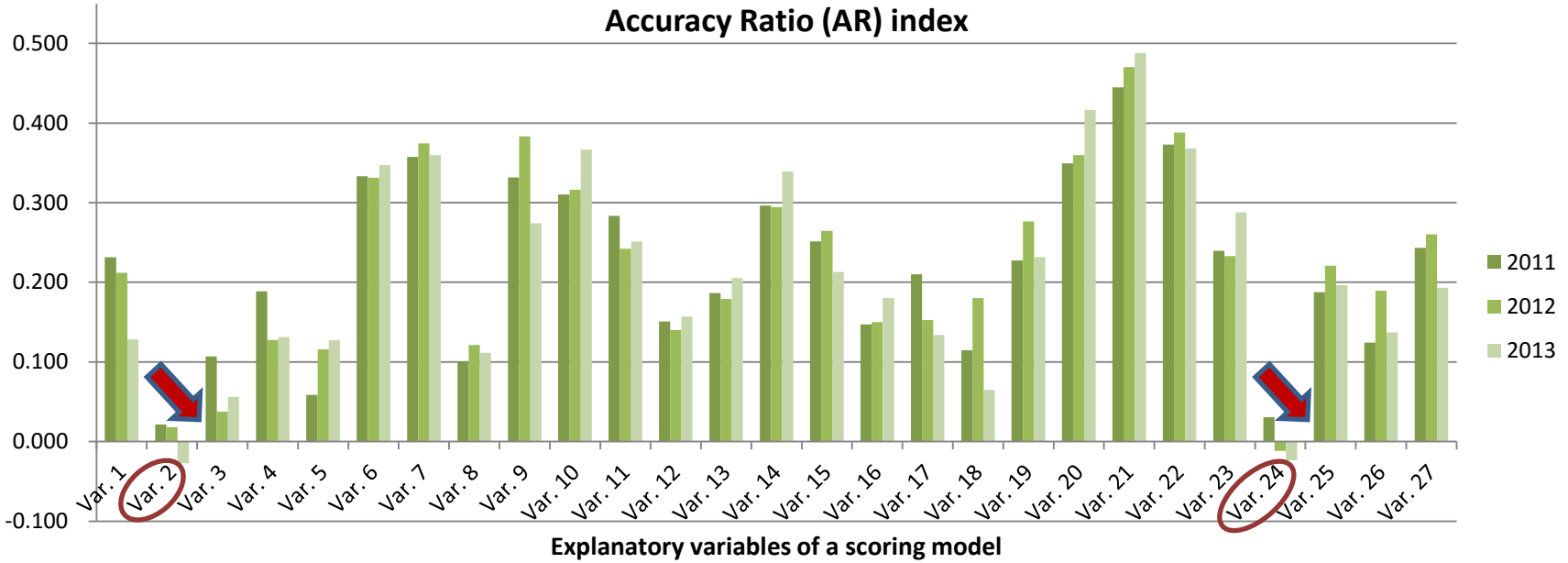
5. Importance of validation (1/3)

- **CASE1 Effectiveness of explanatory variables**

Financial indexes and qualitative variables adopted as explanatory variables are periodically validated. If some variables are ineffective to predict defaults, we replace them and reconstruct a scoring model.



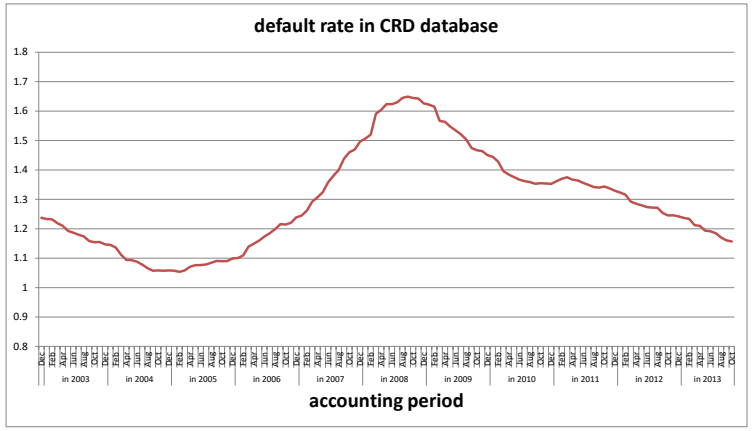
- Effectiveness for each explanatory variable is measured with AR index on the above graph.
- AR indexes of two variables, no.2 and no.24, are relatively low and declining in recent years.
- Causal analyses are conducted from various aspects.
- Accuracy of the scoring model can be improved by adopting alternative variables and reconstructing the model.

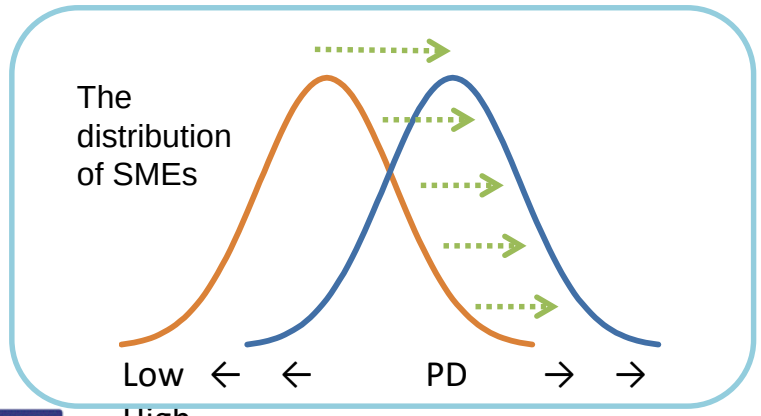
5. Importance of validation （2/3）

The accuracy of scoring models tend to deteriorate with the lapse of time. We need to validate scoring models in order to maintain the quality of scoring models. We show 3cases of our validation and reaction to those as follows.

- **CASE2 after Lehman shock**

We modified the scoring model to correspond with the situation after Lehman shock.





- Many SMEs' bankruptcies were triggered by Lehman shock.
- Then Default rate (≒bankruptcy ratio among SMEs) in CRD database raised rapidly. Actual default rate is higher than PD of scoring model.
- The probability of SME bankrupt heightened after Lehman shock.
- The shape of distribution curve was not drastically changed. We could keep high AR just by changing parameter values.

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

α, β, γ: parameters

X: general assessment of financial indexes

Adjusting α, mainly

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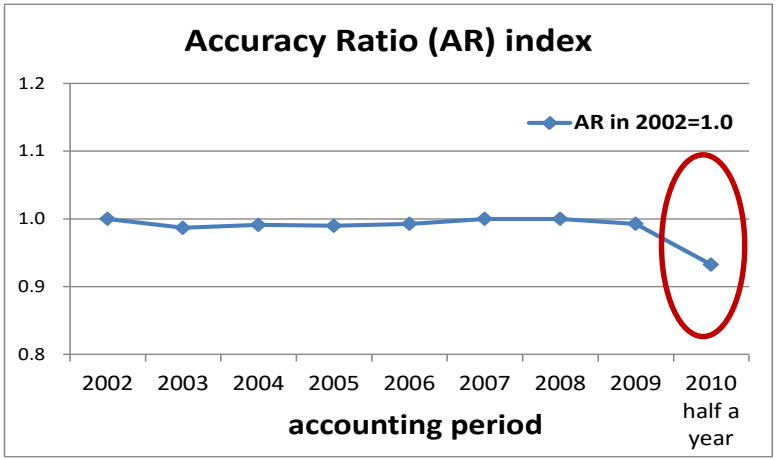
5. Importance of validation （3/3）

- **CASE3 The Great East Japan Earthquake**

The accuracy ratio of scoring model which was very stable until 2009 suddenly declined in the first half year of 2010(accounting period).



- The data set of the first half year of 2010 (accounting period) includes the default data affected by the Great East Japan Earthquake.
- We thought that the sudden decline of AR was affected by the Great East Japan Earthquake.

- We explored the background of sudden AR decline through the validation as follows.
  - We excluded the data of heavily devastated area (Fukushima prefecture, Miyagi prefecture and Iwate prefecture), then calculated AR.
  - We specified industries damaged badly.
  - We calculated AR by the data set shifting one month by one month in order to identify when it declined.

We figure out that the decline of AR occurred at the same time as the earthquake, deeply in devastated area and considerably in manufacturing industry through the supply chain and the electric power supply. We notified that the sudden decline is from the issue of the peculiar areas and the peculiar industries.

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