Implementation note

Title	The Use of Ratings and Estimates of Default and Loss at IRB Institutions
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Table of Contents

I. Introduction

II. Background

III. Principles

- 1. Pervasive Use
- 2. Broad Interpretation
- 3. Identification
- 4. Consistency
- 5. Reconciliation of Estimates
- 6. Conservatism
- 7. Integrity

Appendix I: Examples of the Application of Use Test Principles

- Consistency and Reconciliation

Appendix II: The Relevance of Acquisition and Behaviour Scores for Retail and SME Exposures to IRB Estimates

Appendix III: Reconciliation of Estimates

- An abridged example of reconciliation of a behaviour score bad rates to IRB PDs

Appendix IV: Retail Model Inventory

> This implementation note is valid until the end of the reporting period on January 31, 2027. A newer version is available.

I. Introduction

This paper outlines and explains principles that institutionsBanks and bank holding companies to which the *Bank Act* applies and federally regulated trust or loan companies to which the *Trust and Loan Companies Act* applies are collectively referred to as "institutions". should apply to satisfy the "use test" requirements in Chapter 5 of OSFI's *Capital Adequacy Requirements* (CAR) Guideline A-1. Under the internal ratings-based (IRB) methodology, institutions may calculate minimum regulatory capital using their own estimates of loss from their own internal ratings. However, the use test prohibits institutions from using default and loss estimates that are developed for the sole purpose of calculating regulatory capital. Institutions may only use rating systems and loss estimates from these systems if they are used in other operations of the institution.

Adherence to the above-noted principles will be an important consideration in OSFI's initial approval of institutions for IRB and ongoing use of the IRB approach.

II. Background

In their normal operations, institutions develop internal ratings to measure and manage risk. The assumption behind the IRB method is that if ratings and estimates derived from these ratings play an important role in their operation, institutions are likely to ensure that the ratings and estimates derived from these ratings are accurate. Therefore, estimates from these ratings systems can be used to calculate a regulatory capital requirement that better reflects portfolio risks than do estimates calculated on external ratings. Another reason for the development of the IRB approach was to encourage institutions to improve their measurement and management of risk.

Institutions may look to CAR for specific standards applicable to IRB. This document sets out principles that IRB institutions should apply to the use of ratings and estimates with some discussion and examples. They are given with the understanding that they will be tempered with good judgment. This understanding does not negate the principles, but may restrain their application to avoid undue costs or perverse results. When institutions encounter situations for which the examples given are not appropriate, they should consider other ways to satisfy the principles. Adherence to these principles will be an important consideration in OSFI's initial approval of institutions for IRB and ongoing use of the IRB approach.

III. Principles

In discussion of the use test, "operations" should be interpreted as the operations listed in the use test requirements of CAR; namely, the credit approval, risk management, internal capital allocations, and corporate governance functions of institutionsAppendix I provides examples of the use test principles. .

1. Pervasive Use

To make the use of the IRB approach credible, internal ratings and estimates of default and loss should be entrenched in institution operations and reporting, including reports to senior management and the Board of Directors.

Most institutions rate risks to protect themselves from unprofitable credit exposures. However, some are satisfied with excluding the worst applicants for credit exposures and accepting the best, without attempting to estimate absolute levels of loss. IRB institutions should not only rank risks, they should also produce measures of risk that can be reliably translated into the measures defined in CAR, especially the parameters PD, EAD, LGD"PD" – probability of default; "EAD" – exposure at default; "LGD" – loss given default. , and maturity.

Institutions may use internal ratings and loss estimates that are not used to calculate IRB regulatory capital. However, the rating systems that are used to generate the inputs to IRB capital calculations should have a use with a material impact on institution operations. OSFI recognises that this may be more challenging for certain exposure classes (e.g., retail exposures); however, the underlying principle here is that the simple existence of models and parameter estimates used solely for regulatory capital purposes is not, in and of itself, sufficient for IRB approval purposes.

2. Broad Interpretation

Institutions should interpret internal ratings and default and loss estimates broadly.

An internal credit rating or estimate of credit losses should be considered for the use test even if it does not match all the requirements of CAR for internal ratings and default and loss estimates. For example, an issuer of credit cards can claim that the scoring models it develops to predict the probability of going "bad" is using default estimates even if a "bad" account is not "defaulted" according to definitions contained within CAR. Further, default and loss estimates may be implicit in models that predict profitability.

A narrow interpretation of "internal ratings" and "estimates" would require institutions to make radical and expensive changes to the functions listed in CAR. Ratings and estimates developed specifically for other purposes may do their intended jobs better than ratings and estimates developed to IRB specifications. Risk management measures specified entirely by IRB requirements would likely become outdated, as CAR changes infrequently. In summary, a narrow interpretation would be inconsistent with two chief advantages of the IRB approach: the encouragement of institutions to develop their ability to manage risk, and the increased sensitivity of capital to risk as institutions improve their systems to measure risk.

3. Identification

Institutions should identify all uses of risk rating systems, especially implicit or explicit measures of PD, LGD, EAD and maturity, that are likely to have a material impact on institution operations.

Institutions cannot ensure consistency between estimates of PD, LGD and EAD used throughout the institution with IRB risk inputs unless they know what they are. Without the maintenance of an inventory, there is little possibility that the institution can guard against the cherry picking of estimates.

This principle applies only to operations that are likely to have a material impact. It does not touch calculations for which the impact of credit losses is likely to be small, or that support recommendations that are not yet adopted. Institutions should be careful to distinguish between direct estimates of default and those parameters 'backed out' of models.

Institutions should maintain an inventory of models and estimates. Appendix IV illustrates information that institutions should retain for retail models. Different information would be useful for non-retail exposures.

4. Consistency

Institutions should use estimates for IRB capital calculations that are consistent with the estimates that institutions use for other purposes. In deriving estimates for IRB capital, institutions should recognise risk factors in other operations of risk management, unless these factors have no material relevance.

As set out in CAR, institutions need not use the same estimates in all their operations, but estimates should be consistent: one estimate should be plausible given the other. For example, an estimate of PD over one year used for IRB should generally be higher than the PD over six months, and by a factor consistent with the institution's view of the incidence of defaults for aging exposures.

If the institution recognises a factor as relevant to the estimation or management of credit losses in its operations, it should presume that these factors are relevant to the calculation of IRB parameters, unless it is clear that they are not. For example, if the institution's calculation of economic capital recognises that LGD varies by different classes of collateral, these classes should play a role in the calculation of IRB capital.

If two estimates used in operations are inconsistent with each other, it may be impossible to arrive at IRB estimates consistent with both. While the institution should aim to develop consistent estimates across its operations, the institution may satisfy the consistency principle by comparing its IRB estimates to the estimates that are most relevant, taking into account:

- the similarity of the business providing data underlying the estimates to the business for which capital is calculated;
- any margin of conservatism applied to either estimate; and
- the institution's interest in the accuracy of each estimate.

5. Reconciliation of Estimates

Institutions should reconcile estimates used for IRB capital calculations with other estimates in their inventories.

Reconciliation demonstrates consistency. However, the term “reconciliation” is not to be confused with standards of reconciliation applicable to other financial reporting. Rather, it refers to a reasonable comparison of estimates. For example, an estimate of PD used for IRB regulatory capital purposes should rarely match a PD estimate for the same exposure that is used for pricing (if the defaults in question are defined differently), if only one of the estimates is conditional on current economic conditions, or the estimates are for defaults over different intervals.

Reconciliation is a requirement to demonstrate that differences in estimates are *reasonable*. It also includes, when estimates match, a demonstration that the use of matching estimates is appropriate, because the same thing is estimated. Appendix III further discusses reconciliation.

A reconciliation of estimates may also recognise intended conservatism.

6. Conservatism

If there are material discrepancies between the estimates used for IRB and the estimates for another use, the IRB capital requirements should typically be higher than capital requirements when using other estimates.

Institutions should be no less cautious in the calculation of regulatory capital than they are in their operations.

The comparison required by this principle should be done after the reconciliation process has converted estimates for operations to a form suitable to IRB, such as adjustments to account for variations in default and loss definitions.

Institutions should only apply this principle to estimates that have a material impact on their operations and where conservatism has a material cost.

7. Integrity

Where possible, institutions should develop default and loss estimates affecting a line of business from a common database, using a common model.

The development of many different databases and models creates many problems. These problems may include:

- the need to identify and validate many estimates and uses;

- the burden of reconciliation, which grows with the number of estimates;
- increased operational risk, especially the possibility that exposures or losses are omitted;
- the balkanization of data, reducing the precision of estimates; and
- the possibility of bias in an institution's choice of data or model for specific purposes.

These problems may be alleviated through the creation of an integrated database and a common model to serve different purposes. Further, an integrated database offers evident advantages for the discovery and validation of new explanatory variables.

There are often plausible reasons to retain distinct models for different purposes. For example, institutions issuing retail business often have different data available for origination than for ongoing account management and the development of provisions. A complex model may also take too much time to run for adjudication, but may be feasible for the estimation of a parameter used in IRB. Whatever the reason for the use of different models, institutions should consider whether the models tell the same story. For example, the adjudication model might say that PD (or some proxy) depends on a set of given variables. The model used to calculate IRB PD might say that PD depends on another set of given variables. Both models should give the same answer for an average portfolio PD.

Appendix I: Examples of the Application of Use Test Principles

Consistency and Reconciliation

a) Defaults defined over different terms

If an institution has reason to believe that the risk of default is reasonably constant through the tenor of a loan, it may reconcile PD_t, to PD_s, defined over terms t and s, respectively, through the formula $(1-PD_t)^{(1\div t)}=(1-PD_s)^{(1\div s)}$. However, many loans exhibit strong seasoning effects. In this case, reconciliation would need to take into account the variation of default risk through time.

b) Differing default events

If one definition of default covers a different list of events than the definition of default used for IRB estimates, the institution should study the relative incidence of these events to justify the relationship between resulting estimates

of PD, LGD and EAD.

c) Differing definition of loss

Institutions should verify that estimates of loss are consistent, and verify differences. In particular, institutions should reconcile the economic losses used for IRB estimates to accounting estimates and data.

d) Components of loss

If non-IRB estimates are analysed into PD, LGD and EAD, the product should be reconciled to the product of PD, LGD, and EAD used for IRB after each component has been suitably adjusted (e.g., for differing definitions or terms) and reconciled individually. For some purposes, institutions may report and estimate losses without an analysis into PD, LGD and EAD as required for the calculation of IRB capital. Estimates of total loss to the total losses implied by PD*EAD*LGD from IRB estimates should be reconciled after other appropriate adjustments.

The institution should ensure a sensible relationship between current default estimates, long-term estimates, and the current default experience of other lenders in the same sector.

Appendix II: The Relevance of Acquisition and Behaviour Scores for Retail and SME Exposures to IRB Estimates

In their retail operations, institutions develop scores or other indicators that are useful in predicting events that are highly correlated with default as defined in CAR. For example, scores may predict the probability of going "bad" over a horizon of 18 months. The scores are often used in decisions to extend more credit, to reduce limits, or to pursue full payment of outstanding loans. At acquisition these scores are generally based on data from credit data agencies. Later, scores are enriched with data from the institution's own files, especially records of customers' behaviour. As such, these scores are referred to as "behaviour scores".

Principle 3 of this Note directs institutions to identify various measures of risk used in the management of the institution, and Principle 5 calls for a reconciliation. As drivers of ratings and measures of the odds of default (not necessarily default as defined in CAR), behaviour and acquisition scores should be identified and reviewed for

consistency with IRB estimates. However, the depth of this review should depend on the relevance of the score to IRB estimates.

Institutions may be able to demonstrate that once behaviour scores are available, acquisition scores are irrelevant to the management of accounts and the prediction of risk: knowing acquisition scores in addition to behaviour scores does not help predict defaultsAfter an account is booked or a banking relationship has been established, an acquisition score, or credit information underlying the acquisition score, may be a *component* of a behaviour score. . This is strong evidence that acquisition scores do not affect the credibility of IRB estimates once behaviour scores replace them in the management of accounts and other functions sensitive to credit risk, such as the establishment of provisions and the measurement of economic capital. With this evidence, there is no need to reconcile acquisition scores to IRB estimates for any business managed by behaviour scores, or to consider whether IRB segmentation is as predictive as acquisition scores. It is sufficient to compare IRB estimates to odds derived from behaviour scores and verify that the major drivers of behaviour scores are recognized in IRB segmentation.

Any institution that is originating transactions will have some business for which there are only acquisition scores. If this is material, the institution should compare the credit quality as predicted by acquisition scores to IRB estimates of PD.

Appendix III: Reconciliation of Estimates

As outlined in Principle 5 of this Note, institutions should reconcile different estimates of default to their IRB inputs. Because both IRB and other estimates are subject to uncertainty, this reconciliation cannot be precise. When two estimates are bound by tight confidence intervals, apply to the same population, and differ only in one well-defined aspect (such as days' delinquency to default), a close reconciliation should be possible. In other circumstances it may be possible only to demonstrate that the difference between the estimates is in the right direction.

The first step in this reconciliation is to determine what estimates are relevant and the degree of precision in these estimates. Generally, an estimate is relevant to an IRB estimate if it is applied to the same exposures.

The next step in this reconciliation is to identify how the development of the estimates differed in ways that might affect measures of risk. Some measures to consider are:

- definition of default,
- horizon for a probability measure,
- population from which data are taken,
- population to which data are applied,
- segmentation of the estimates,
- time of data collection,
- response to environmental factors,
- adjustments to arrive at a long term average,
- conservatism.

Institutions will think of other relevant factors. After identifying the differences in the development of the estimates, institutions should calculate the most likely effect of each difference, as well as a possible range. Finally, institutions should consider whether the aggregated differences could bring one estimate within the confidence interval surrounding the other.

An abridged example of reconciliation of a behaviour score bad rates to IRB PDs

	Difference	Basis for probable effect	Effect, Range
Definition of default	• Behaviour score delinquency – 60 day • IRB - 90 day delinquency	Repeated comparisons in different years show that the 60-day definition results in X% higher defaults.	X%, +/- E1%
Population	• Development population for score - all cards. • IRB score applied to Gold Cards	For a given score, Gold cards have traditionally had a W% lower bad rate than average for all cards.	W%,+/-E2%
Horizon	• For behaviour scores, 18 months • For IRB, 1 year	Company studies show that if the retail PD over one year is between .005 and .02, the probability of default over 18 months is Z% higher.	Z %,+/-E3%
Time of data collection	• Behaviour scores most recently calibrated to data collected calendar year 2003. • IRB PD developed from time series of default rates 1997-2003, before adjustment for conservatism and long-term PD	Behaviour scores may be designed to be insensitive to economic cycle. Studies show that these behaviour scores give similar bad rates in good times as in recession. Changes in environment affect the distribution of scores. To overcome this difficulty, reconciliation will be of PDs aggregated across score bands used to segment IRB default rates.	No effect expected within grades.
Adjustments to arrive at long-term average	• None for behavior score • IRB is developed by adjusting average of a time series of observed default rates	Reconciliation will be done to IRB estimates before application of conservatism and adjustment to arrive at long-term average.	

Conservatism	• No margin of conservatism in behaviour score. See above.	Reconciliation will be between estimates before margins of conservatism.	

The institution should determine how to aggregate the individual effects and arrive at a reasonable range of possibilities. It would then compare the behaviour score, adjusted for the aggregate effects of the differences, to the IRB PD, calculated before adjustment, to arrive at a long-term average and the addition of margins for conservatism. The institution would then decide whether the estimates are consistent. At best, given the many differences between the estimates, the institution might be able to decide that the aggregate probability of going bad predicted by the behaviour, could plausibly fall between 1.10 and 1.90 times the aggregate IRB for the same population, before adjustment to arrive at a long-term average and addition of margins of conservatism.

Appendix IV: Retail Model Inventory

Principle 4 outlines that institutions should maintain clear and comprehensive documentation regarding the objectives, scope and design of the rating systems. For retail exposures of retail risk rating systems where there could be multiple risk rating models, the following sample inventory listing could be used to summarize the rating system design and relevance of the models.

Name of Model (Specific Product /Portfolio)		Purpose or Type	Exposure Class	Implementation Date	Last Validation Date	# of Accounts	$ Exposure	Definition of Event (Good /Bad)	Description	Re Do
Residential Mortgages	Residential Mortgage App	Acquisition	Residential Mortgage	Dec-00	Mar-04	10,000	1.5 Billion	90+ days	Incorporates credit bureau data to approve / decline / refer applications.	De do me dev an of
Card Products	Product 1	Account Management	QRRE	Dec-01	Feb-04	100,000	300 million	60+ days	Vendor developed model based on internal data.	De do me dev an of
Card Products	Product 2	IRB PD Estimation	QRRE	Feb-04	Jun-04	95,000	285 million	180+ days	Internally developed model based on 5 years of internal data.	De do me dev an of
Personal Loans	Thin	Origination	Other Retail	Oct-03	Dec-03	80,000	240 million	60+ days	Origination model, based on credit bureau data and application characteristics.	De do me dev an of
Personal Loans	Thick/Clean	Origination	Other Retail	Sep-03	Nov-03	115,000	345 million	60+ days	Origination model, based on credit bureau data and application characteristics.	De do me dev an of