The validation of internal rating systems for capital adequacy purposes

by the Banking Policy Department

Under the new Basel II capital adequacy framework[1], banks meeting certain supervisory standards will be permitted to use the output of their internal rating systems for calculating supervisory capital requirements for credit risk. Earlier this year, the HKMA became one of the first supervisory agencies to publish detailed validation standards that it will apply in assessing the eligibility of authorized institutions (AIs) to use their internal rating systems for this purpose. This article describes the main features of the relevant module of the Supervisory Policy Manual and the factors leading to the HKMA's adoption of this approach[2].

Introduction

A major innovation of the Basel II capital adequacy framework is that it allows banks, subject to supervisory approval, to calculate their regulatory capital requirements for credit risk using the output of their internal rating systems. Under the Internal Ratings-based (IRB) Approaches, banks employ internal rating systems (IRB systems) to produce estimates of one or more risk components[3], which are then used as the key inputs to the calculation of regulatory capital requirements for credit risk.

A particularly important issue for bank supervisors is the validation standards they will apply in deciding whether or not to approve a bank to use an IRB Approach. The Basel II document states that "banks must have a robust system in place to validate the accuracy and consistency of rating systems, processes and the estimation of all relevant risk components."[4] To ensure that the capital charges computed by the IRB systems are sufficient for banks to withstand the credit risks they have incurred and to absorb the potential losses resulting from borrower defaults, the estimates of the risk components must be accurate in capturing the relevant aspects of risk. As a result, validation of banks' estimates of the risk components, and the underlying internal rating systems, is crucial to the implementation of the IRB Approaches, and is one of the greatest implementation challenges confronting bank supervisors.

The Basel Committee Accord Implementation Group Validation Subgroup (AIGV) has elaborated on the concept of "validation" and expanded it into six principles[5].

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1. "International Convergence of Capital Measurement and Capital Standards: A Revised Framework", Basel Committee on Banking Supervision, November 2005.

2. "Validating Risk Rating Systems under the IRB Approaches", Supervisory Policy Manual (CA-G-4), HKMA, February 2006. This article summarises the main points of this Supervisory Policy Manual module; however, readers are advised to consult the Supervisory Policy Manual module itself for definitive guidance on the HKMA's requirements.

3. The risk components are probability of default (PD), loss given default (LGD) and exposure at default (EAD).

4. "International Convergence of Capital Measurement and Capital Standards: A Revised Framework", Basel Committee on Banking Supervision, November 2005, paragraph 500.

5. "Update on Work of the Accord Implementation Group Related to Validation under the Basel II Framework", Basel Committee Newsletter No.4, Basel Committee on Banking Supervision, January 2005.

Six Principles of the Basel Committee Accord Implementation Group Validation Subgroup (AIGV)

(i) Validation is fundamentally about assessing the predictive ability of a bank's risk estimates and the use of ratings in credit processes

(ii) The bank has primary responsibility for validation

(iii) Validation is an iterative process

(iv) There is no single validation method

(v) Validation should encompass both quantitative and qualitative elements

(vi) Validation processes and outcomes should be subject to independent review

Nevertheless, many specific areas concerning validation remain unclear, and the public documents issued by most supervisors in the advanced markets have taken the form of research studies, working papers or studies of practices adopted by the industry rather than explicit guidance. To the extent these regulators have issued guidance it is mainly in the form of high level principles, similar to those set out by the AIGV.

As an international financial centre, Hong Kong's banking sector exhibits a wide range of risk management techniques and culture. To cater for this environment, the HKMA has adopted an approach to IRB validation that remains closely aligned with the AIGV principles, but is generally more prescriptive than the principles-based approach being taken by regulators in other developed economies. This approach is intended to reduce the grey areas in validation and ensure a level playing field among all IRB applicant AIs, which, in Hong Kong, consist mainly of subsidiaries of large international banks, plus a relatively few domestic institutions.

It should also be emphasised the HKMA will not require any AI to adopt one of the IRB Approaches; the decision to do so is a matter for the management of each AI based on their assessment of the costs and benefits involved. However, AIs wishing to use

the IRB Approaches will, in addition to the minimum requirements, need to satisfy the HKMA on the issues relating to the validation of risk rating systems set out in the relevant module of the Supervisory Policy Manual. The key components of the Manual are summarised in the following sections and depicted in Diagram 1 below.

DIAGRAM 1

HKMA approach to validation
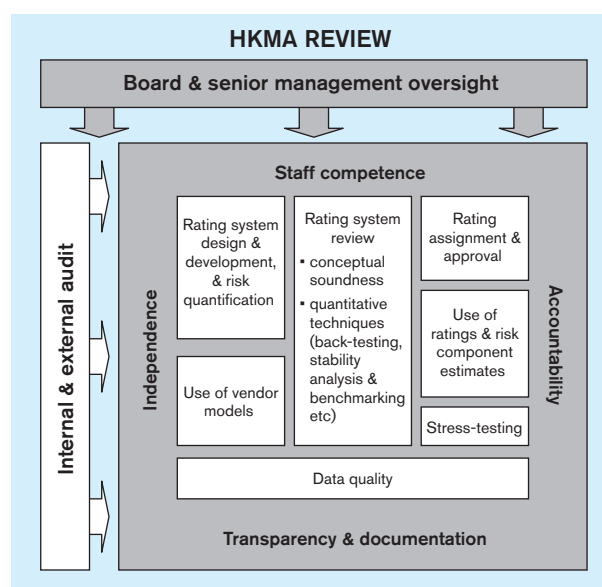
Minimum criteria for the use of the IRB Approaches

The minimum requirements for AIs to use the IRB Approaches will be set out in the Banking (Capital) Rules that the Monetary Authority (MA) proposes to make under section 98A of the Banking (Amendment) Ordinance 2005 and other relevant guidance to be issued by the HKMA. The minimum criteria for an AI to adopt one of the IRB Approaches include the minimum asset coverage levels of the IRB systems, and specific requirements relating to such matters as the role of the Board of Directors in approving key elements of the rating systems and exercising oversight of them. The rating systems themselves must meet certain minimum standards in their ability to identify and assess the AI's credit exposures. The purpose of the requirements set out in the Supervisory Policy Manual module on validating risk rating systems is to provide further explanation to AIs of the way the HKMA will interpret

some of the relevant requirements; the validation standards that are related to the ability of the rating systems to identify, measure, monitor and control credit exposures; and the general control environment within which the systems are operated.

Specific requirements

1. Corporate governance and oversight

The HKMA places substantial emphasis on the systems and controls environment in which an AI's IRB systems are developed, validated and operated. In particular, the HKMA believes that effective oversight by an AI's Board of Directors (the Board) and senior management is the key to a sound IRB system.

The Board and senior management of AIs are required to be actively involved in the implementation of the IRB Approaches both before and after inception. For example, the Board should have a general understanding of the regulatory requirements for using the IRB Approaches, and know how their bank proposes to meet such requirements according to a defined timeframe. In addition, the Board should be responsible for the approval of the key elements of the IRB systems based on information provided by senior management, which should have reviewed the technical aspects with support from internal expertise and, if necessary, external parties. The HKMA also requires the Board to establish an effective Basel II project management framework and ensure that sufficient resources are provided for this.

Similarly, the HKMA has specified the roles and responsibilities of the senior management of IRB AIs. They are responsible for the day-to-day operations and therefore should have a good understanding of the design and operation of the IRB systems to ensure that these systems will work consistently and continually as intended. Some key responsibilities of the senior management of an AI include allocating and maintaining sufficient resources for Basel II and IRB implementation, delineating and assigning responsibilities and accountabilities to different parties of the AI, and ensuring sufficient training to the relevant staff. They are also responsible for

making necessary changes to existing policies and procedures, including systems and controls, to ensure that the IRB systems can be integrated into the AI's credit risk management processes and culture. They need to ensure that these systems will be used properly in the AI's decision-making and monitoring of credit risk.

Senior management should also approve and track material deviations of actual practice from the established policies, and review regularly the performance of the IRB systems through management information reports. They should meet regularly with relevant staff to discuss issues, such as the performance and operation of the rating systems, and advise the Board on these issues as appropriate.

Because the regional or head offices of some international banks with local AI subsidiaries lead the implementation of the IRB Approaches, the HKMA will permit certain oversight responsibilities to be taken up by them. However, in some areas, such as monitoring the progress of local implementation and ensuring that sufficient resources are allocated to the subsidiaries, local efforts must be made to meet the requirements.

2. Independence

Independence is another important element of a proper control mechanism. The HKMA specifically requires IRB AIs to have a sufficient level of independence in the rating approval process and in the review of the IRB systems and risk quantification.

To ensure objectivity and accuracy in the assignment of risk ratings, parties responsible for approving ratings and transactions must be independent of sales and marketing. For example, the HKMA requires that credit officers responsible for rating approvals should have independent and separate functional reporting lines from sales and marketing staff; and AIs should establish well-defined performance measures for these officers, such as adherence to policies, rating accuracy and timeliness. For cases where the rating assignment and approval processes are highly automated and do not involve expert judgement, the HKMA requires that

AIs, at a minimum, should have a process of verifying the accuracy and completeness of data inputs.

The HKMA has also specified that IRB AIs should have an independent rating system review process, in which the reviewing parties are independent of the staff and management responsible for developing the IRB systems and performing risk quantification activities. Nonetheless, the HKMA does not prescribe any specific organisational structure for AIs, and individual AIs may choose a structure that fits their management and oversight framework. For example, the review activities could be distributed across multiple units or housed within one unit of the AI.

The HKMA recognises that at present AIs may not have sufficient in-house expertise to meet this independent review requirement. Therefore, it has made an explicit provision that IRB AIs may hire external parties, such as consulting firms, to validate and review their IRB systems. The HKMA also encourages AIs that already have the necessary skills and resources in-house to make use of the services of external reviewers, as they may have broader perspectives on rating system validation in different institutions and jurisdictions, and may have more comprehensive data sets to validate individual AIs' IRB systems.

3. Transparency and documentation

Transparency refers to the extent to which third parties, such as rating system reviewers, internal or external auditors and supervisors, are able to understand the design, operations and accuracy of an AI's IRB systems and to evaluate whether the systems are performing as intended. Transparency should be a continuing requirement and achieved through documentation. AIs are required to update their documentation in a timely manner, such as when modifications are made to the rating systems.

The HKMA understands that many expert judgement-based IRB systems are not very transparent in relation to the personal experience and subjective assessments used in the rating assignment process. In these cases, the AIs will be required to offset the shortcomings by compensating measures, including

greater independence in the rating approval process or a strengthened rating system review.

4. Accountability

As with independence and transparency, the HKMA has specified its regulatory expectations on accountability. Specifically, IRB AIs are required to have policies to identify individuals or parties responsible for rating accuracy and rating system performance. The responsibilities, authority and reporting lines of individuals must be specific and clearly defined. Staff involved in particular aspects of an IRB system, for example rating assignment and approval, rating system validation and review, must be held accountable for complying with the AIs' relevant policies, ensuring that those aspects of the IRB system under their control are unbiased and accurate.

The HKMA also requires IRB AIs to establish measurable performance standards for staff, with incentive compensation tied to these standards. For instance, performance measures of personnel responsible for rating assignment may include the number and frequency of rating errors, significance of errors, and proper and consistent application of rating criteria.

For AIs using models, the HKMA requires them always to maintain an up-to-date inventory of models, and an accountability chart showing the roles of parties within the AI responsible for every aspect of the models, such as design, development, validation, use, data updating and data checking.

An IRB AI is also required to assign a specific individual at sufficiently senior level, for instance a Chief Credit Officer, to bear the responsibility for the overall performance of the IRB systems. This individual must ensure the systems and all their components, including rating assignments, estimation of the risk components, data collection, and control and oversight mechanisms, are functioning as intended. If these components are distributed across multiple units within the AI, this individual will need to ensure that the parts work together effectively and efficiently.

5. "Use test"

The Basel II document stipulates that "internal ratings and default and loss estimates must play an essential role in the credit approval, risk management, internal capital allocations, and corporate governance functions"[6] of IRB AIs. The HKMA has expanded on this by listing the specific areas where IRB ratings and risk estimates are expected to be used, such as pricing, individual and portfolio limit setting, assessment of risk appetite, formulating business strategies, monitoring of riskier obligors, reporting of credit risk information for review by the Board and senior management, determining provisioning, and setting of, and assessment against, profitability and performance targets.

However, the HKMA recognises that in the initial years of adopting the IRB Approaches it will be difficult in practice for AIs to use internal ratings and default and loss estimates in all areas of use as suggested in the Supervisory Policy Manual module. Thus, in assessing compliance with the "use test", the HKMA will consider an AI's overall usage of internal ratings and of default and loss estimates, rather than expecting to see evidence of the use of each internal rating system in all areas. As a minimum, the HKMA will expect to see evidence of use in at least three areas – credit approval, credit monitoring, and reporting of credit risk information to senior management and the Board. The HKMA will expect the AI to have a time-bound plan for extending the internal usage to the preponderance of the other areas specified in the Manual, taking into account the AI's specific circumstances. The AI should develop such a plan for internal implementation subject to Board or senior management approval and the HKMA's agreement.

Compliance with the "use test" will not mean that AIs will have to use exactly the same estimates for both regulatory capital calculation and all internal purposes. As the Basel Committee states, where such differences exist, "a bank must document them and demonstrate their reasonableness to the supervisor."[7] According to the HKMA's requirement, an IRB AI will need to justify the differences and demonstrate consistency of both inputs, including rating criteria and risk factors, and outputs, such as ratings and risk estimates, between the internal ratings and risk component estimates for regulatory capital calculation and those for the AI's internal purposes. The AI will also need to provide qualitative and quantitative analysis of the logic and rationale for the differences. The justification will need to be reviewed by the AI's credit risk control unit and approved by the senior management.

Some IRB AIs may maintain more than one rating model for the same portfolio, for example one for regulatory capital calculation and another for benchmarking. In these cases, the HKMA requires AIs to justify the application of a specific model to a specific purpose, and the role they have assigned to that model in their credit management process. Nonetheless, in assessing whether the "use test" requirement for an IRB system has been met, the HKMA will consider the extent to which an AI uses the system as a whole, rather than applying the test to individual models.

6. Roles of internal and external audit

The HKMA has specified the roles of internal and external audit in IRB validation. Internal audit (IA), or an equivalent function possessing a similar degree of independence, is required to review at least annually the AI's IRB systems including the validation process and the operations of the related credit risk control unit, and report the findings to the Board and senior management.

The IA review is to verify whether the control mechanisms over the IRB systems are functioning as intended. The HKMA has specified the areas of review to include the scope, depth and quality of

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6   "International Convergence of Capital Measurement and Capital Standards: A Revised Framework", Basel Committee on Banking Supervision, November 2005, paragraph 444.

7   "International Convergence of Capital Measurement and Capital Standards: A Revised Framework", Basel Committee on Banking Supervision, November 2005, paragraph 444.

work of the AI's credit risk control unit. The IA functions will be required to give an opinion on the continuing appropriateness, relevance and comprehensiveness of the AI's control mechanisms, including the adequacy of staff expertise and of resources available to the credit risk control unit.

The HKMA also requires the IA to verify whether the AI adheres to all the regulatory requirements for using the IRB Approach. As evidence of this, the internal auditor needs to be one of the sign-off parties of the completed self-assessment questionnaires to be submitted to the HKMA for the AI's application for using the IRB Approach (see the section on the recognition process below).

In addition, the HKMA has stated that if independence in the review of IRB systems and risk quantification cannot be otherwise achieved, an AI's internal auditor will need to scrutinise the whole validation exercise, including evaluation of the model logic and assumptions and statistical modelling techniques, and back-testing the models. In this case, the AI's IA function will need to be staffed by personnel with sufficient expertise and be supported with adequate resources.

The HKMA has made it clear that in its assessment of an AI's IRB application, it will evaluate whether the skill sets of IA staff and resources have been suitably strengthened, and whether the scope of the annual audit plan has been broadened to include verification of the AI's compliance with the IRB regulatory requirements.

For external auditors, the HKMA expects them to be satisfied that the AIs IRB systems are measuring credit risk appropriately and that their regulatory capital positions are fairly presented. External auditors should also seek to assure themselves that AIs' internal controls relating to regulatory capital calculation comply with the relevant HKMA requirements.

7. Requirements on using external vendor models

The HKMA notes that many AIs have commissioned external vendors to develop models for use in the IRB Approaches and, therefore, has detailed the supervisory expectations on this.

The HKMA considers the use of external vendor models an outsourced activity and therefore requires AIs to follow the existing guidelines on outsourcing, which cover such issues as AIs' accountability for and control over the outsourced activities[8]. The HKMA has also stated that the transparency of vendor models and their links with AIs' internal information will be the focus of its assessment, and, therefore, may request detailed information from AIs and vendors.

Regardless of the support provided by the vendors, the HKMA expects AIs to have the in-house knowledge to be able to understand the key aspects of the models, including model development, validation, use and limitations. They also need to possess sufficient in-house expertise to support and assess these models on a continuing basis. Similarly, adequate training must be provided for staff using these models.

8. Data quality

Data quality is one of the most important issues for AIs using the IRB Approaches, especially with the extensive use of model-based rating systems in the industry. However, it is also an issue that deserves the attention of all AIs, regardless of whether they are IRB AIs. The HKMA's requirements on data quality have been devised in such a way that many can also be generalised and applied to non-IRB AIs. The HKMA has set down its expectations on management oversight and control regarding data quality, IT infrastructure and data architecture, data collection, storage, retrieval and deletion, reconciliation between the IRB and finance data, and other data processing aspects such as data

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[8] "Outsourcing", Supervisory Policy Manual (SA-2), HKMA, December 2001.

checking and cleansing. In addition, IRB AIs are explicitly required to conduct independent assessment, for instance by the IA function, of data quality at least once a year.

The HKMA notes that AIs may use external or pooled data in rating system development and validation, rating assignment and risk quantification, and has therefore also stipulated requirements on this. For example, AIs need to check the external or pooled data against multiple sources, and regularly evaluate the appropriateness of the continuing use of external or pooled data.

AIs often apply statistical techniques, such as sampling, smoothing and sample truncation, when preparing data for rating system development, validation or in production. Missing data is another critical practical issue that AIs have to deal with. The HKMA has also spelt out its expectations on these areas.

9. Use of quantitative techniques in validation

Apart from the qualitative aspects, the HKMA has adopted a "menu" approach to the use of quantitative techniques in assessing the performance of AIs' IRB systems. For example, there are two stages in the validation of probability of default (PD) – validation of the discriminatory power and validation of the calibration of an internal rating system. For each stage, the HKMA expects AIs to be able to demonstrate that they employ one or more of the quantitative techniques shown in Diagram 2.

DIAGRAM 2
Quantitative techniques for validation of PD

Discriminatory power	Calibration
• Cumulative Accuracy Profile (CAP) & Gini coefficient	• Binomial test with assumption of independent default events
• Receiver Operating Characteristic (ROC), ROC measure & Pietra Index	• Binomial test with assumption of non-zero default correlation
• Bayesian error rate	• Chi-square test
• Entropy measures (e.g. Conditional Information Entropy Ratio (CIER))	
• Information value	
• Kendall's Tau & Somers' D	
• Brier score	
• Divergence	

When applying these techniques, the application procedures and assumptions must be documented and consistently applied. AIs are also required to establish internal standards or thresholds, and breaches of these should trigger appropriate responses which may range from higher validation frequency to redevelopment of the rating systems. The internal standards or thresholds and responses may vary for different AIs, as they should be commensurate with the potential impact on individual AIs' financial soundness if the rating systems perform poorly. Therefore, instead of prescribing the standards or thresholds and responses, the HKMA requires AIs to take account of factors such as the size of the relevant portfolios, their risk appetite relating to the portfolios and the inherent risk characteristics of the portfolios when setting their own standards or thresholds and responses.

AIs may use quantitative techniques other than those shortlisted by the HKMA, such as proprietary or customised tests. But they need to demonstrate that the chosen techniques are theoretically sound, well-documented and consistently applied. In this way, the HKMA aims to provide sufficient flexibility in its requirements so that it will not stifle further development and innovation in validation techniques.

For loss given default (LGD) and exposure at default (EAD), quantitative validation techniques are significantly less advanced than those for PD. On the basis that assessments of the measurement and estimation methodologies of these risk components are of the greatest relevance, the HKMA has shortlisted the commonly-used measurement and estimation methodologies that would be acceptable, and stipulated their relevant requirements.

For example, there are four generally accepted methods for assigning LGD to non-default facilities. These are workout LGD, market LGD, implied historical LGD and implied market LGD. Of these four methods, workout LGD is the most commonly-used in the industry, and the HKMA has set out the standards it expects for the estimation process, including the construction of a development data set of defaulted facilities, calculation of the realised LGD

from the data set, and generation of LGD estimates for the non-defaulted facilities. On validation of LGD estimates, the HKMA expects AIs to perform stability analysis and comparisons with relevant external data sources and the realised LGD of new defaulted facilities to ensure that they are stable and robust.

For EAD, the HKMA expects AIs to use either the cohort method or fixed-horizon method in the construction of the development data set for EAD estimation. The HKMA requirements for the estimation process of EAD and the validation of EAD estimates are similar to those for LGD.

As with the validation of PD, the HKMA expects AIs to set their own standards or thresholds and responses to breaches of standards or thresholds on the validation of their LGD and EAD estimates as outlined above.

10. Benchmarking
Benchmarking is widely used in IRB validation. If properly designed and implemented, benchmarking can be a useful validation tool to assure both the regulators and the AIs themselves that their IRB systems are likely to be accurate. However, benchmarking can take a wide variety of forms, and a standard or common methodology has yet to emerge in the industry.

To bridge the gap, the HKMA has detailed its expectations on the use of benchmarking in validation while not prescribing the precise methodology. In particular, the HKMA expects AIs to obtain benchmarks from third parties, provided that external benchmarks relevant to their portfolios are available. AIs must provide justification and have compensating measures, such as back-testing at a higher frequency, if they do not use external benchmarks despite their availability.

Where a relevant benchmark cannot be obtained externally, for instance for retail exposures, the HKMA expects AIs to develop benchmarks internally. For example, AIs may use the estimates produced by an old model to benchmark against those by a new model. The requirement on benchmarking can be waived only if the AIs have other compensating measures.

In addition, the HKMA has highlighted the key aspects of benchmarking and specified the requirements on these aspects, such as management oversight of the exercise, and the appropriateness of the benchmarks and methodologies. It has also illustrated some benchmarking methodologies with examples.

11. Stress-testing
Stress-testing does not have direct implications for the performance of an IRB system. But since IRB AIs "must have in place sound stress-testing processes for use in the assessment of capital adequacy,"[9] the HKMA must evaluate whether AIs can meet this requirement when assessing their eligibility for using the IRB Approaches.

Setting aside the Basel II framework, the HKMA has already issued detailed guidance to AIs and required them to conduct stress tests[10]. While most of the IRB requirements on stress-testing are consistent with the existing regulatory framework, the HKMA has set out the aspects on which it will focus in the context of IRB validation. These aspects include, for example, adequacy of the stress tests in relation to the complexity and level of risks of an AI's activities, appropriateness of the assumptions, oversight by the Board and senior management, and relevance to the AI's current portfolios and prevailing socio-economic and political conditions.

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[9] "International Convergence of Capital Measurement and Capital Standards: A Revised Framework", Basel Committee on Banking Supervision, November 2005, paragraph 434.

[10] "Stress-testing", Supervisory Policy Manual (IC-5), HKMA, February 2003.
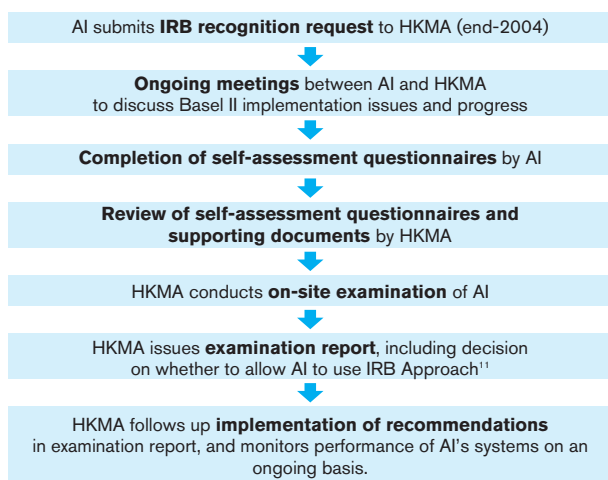
12. Frequency

The HKMA requires AIs to conduct internal validation at least annually, echoing the AIGV principle that validation is an iterative process. Taking account of the industry practice, an AI may conduct a rolling validation exercise for individual portfolios (or components of a rating system, depending on the design of the AI's validation programme), provided the arrangement is justified by valid operational considerations and approved by senior management; and the validation cycle for each portfolio (or each component of a rating system) is initiated no more than 12 months and finished no more than 18 months after the completion of the previous cycle.

Recognition process

The recognition process for AIs planning to adopt the IRB Approaches is shown in Diagram 3.

Recognition process for AIs planning to adopt the IRB Approaches

AI submits **IRB recognition request** to HKMA (end-2004)

Ongoing meetings between AI and HKMA to discuss Basel II implementation issues and progress

Completion of self-assessment questionnaires by AI

Review of self-assessment questionnaires and supporting documents by HKMA

HKMA conducts **on-site examination** of AI

HKMA issues **examination report**, including decision on whether to allow AI to use IRB Approach[11]

HKMA follows up **implementation of recommendations** in examination report, and monitors performance of AI's systems on an ongoing basis.

By the end of 2004, around 10 AIs had expressed their intention to adopt the IRB Approaches during the transition period from 2007 to 2009. The HKMA has since held regular bilateral meetings with these AIs to understand their IRB implementation progress. The IRB recognition process has already begun for AIs planning to adopt the IRB Approaches in 2007

and their on-site examinations have been completed or are currently in progress. Follow-up visits will be conducted in early 2007 to assess the implementation of recommendations made in the examinations and to re-visit the performance of their rating systems.

The HKMA is now reviewing the completed self-assessments and supporting documents from AIs intending to use the IRB Approaches in 2008, and will conduct on-site examinations on these AIs in due course.

Conclusion

The HKMA's primary objective in developing its approach to validation has been to enhance the consistency of standards applied to different IRB AIs, which in many cases have their headquarters in different jurisdictions around the world. As a result, the HKMA has adopted a twofold approach to validation as outlined in this article, with the first component focusing on AIs' processes, procedures and controls, and the second on the use of quantitative techniques. This twofold approach is in line with the AIGV principle that validation should encompass both quantitative and qualitative elements. Although more prescriptive than the guidance on IRB validation published to date by other regulators, the HKMA's policies remain in line with the AIGV principles and also contain sufficient flexibility to accommodate current and future market practices.

In devising the detailed requirements, the HKMA has made substantial reference to the current practice of AIs, the views of consulting firms, the approaches adopted by other regulators, and the latest developments of the international community including guidance from the Basel Committee and AIGV. As such, the HKMA believes that the requirements essentially reflect current sound practices within the industry.

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[11] AIs aggrieved by the decision will have the right to appeal against the decision.

The HKMA has also observed that the techniques – especially the quantitative techniques – that are being used by AIs to validate their rating systems and the risk component estimates are very diverse, portfolio specific and still evolving. Thus, the framework also provides the flexibility to take into account new developments and emerging sound practices, for example by permitting the use of proprietary or customised quantitative tests.

The HKMA will continue to keep industry practices under review, and will monitor the guidance issued by other regulators, the Basel Committee and AIGV, to ensure that its approach continues to align with sound practices adopted elsewhere. This will be especially relevant in the event that there is greater convergence in the quantitative techniques and standards or thresholds in use in the industry. The HKMA will also continue to revise and refine its current guidance as it gains greater experience of AIs' IRB systems in the course of its on-site examinations.