Retail Credit Risk Work Program for the Advanced Approaches Rule

October 2015

Contents

I. Overview of Retail Credit Risk **2**
A. Retail Portfolios 2
B. Retail Credit Risk Framework 2

II. Summary of Supervisory Views and Knowledge Gaps **3**
A. Supervisory Views 3
B. Supervisory Knowledge Gaps 3
C. Notable or Best Practices 3

III. Detailed Supervisory Assessment **4**
A. Governance, Control, Documentation, and Use 4
1. Governance, Control, Documentation, and Use 4
B. Risk Segmentation Systems for Retail Exposures 9
2. Risk Segmentation Systems for Retail Exposures 10
C. Data Management and Maintenance 13
3. Data Management and Maintenance 13
D. Quantification of Risk Parameters 16
4. General Topics 17
5. Probability of Default 18
6. Loss Given Default 21
7. Exposure at Default 24
E. Validation, Stress Testing, and Review 27
8. Validation, Stress Testing, and Review 28
F. Calculation of Risk-Weighted Assets 32
9. Calculation of Risk-Weighted Assets 32

Appendix 1: Suggested Review Items **34**
A. Governance, Documentation, Control, and Use 34
B. Risk Segmentation Systems for Retail Exposures 34
C. Data Management and Maintenance 35
D. Quantification of Risk Parameters 35
E. Validation, Stress Testing, and Review 36
F. Calculation of Risk-Weighted Assets 37

Appendix 2: Additional Reference Items **38**

Date last updated:	

Retail Credit Risk Work Program for the Advanced Approaches Rule

The retail credit risk work program is based on the common text of subpart E of the regulatory capital rules adopted by the Office of the Comptroller of the Currency (OCC), the Federal Reserve Board (Board), and the Federal Deposit Insurance Corporation (FDIC) (collectively, federal banking agencies) for calculating risk-based capital requirements for retail credit risk exposures.[1] The work program is consistent with the advanced approaches risk-based capital rule (advanced approaches rule)[2] and no review question or procedure is intended to go beyond the scope of the advanced approaches rule. The work program may be updated as appropriate to further clarify the requirements of the advanced approaches rule and related interpretations and guidance documents issued by the federal banking agencies.

The retail credit risk work program is primarily designed as a tool to help supervisors gather information on retail credit risk management and measurement practices at banks, thrifts, and holding companies that are subject to the advanced approaches rule related to the use of an internal ratings-based (IRB) approach to determine risk-based capital requirements for retail exposures. The information collected through this work program may be used to catalogue supervisory understanding of the regulatory capital practices for retail credit risk employed at reviewed organizations, to facilitate cross-organizational perspectives on sound practices, and for other supervisory purposes. The work program is designed to be sufficiently flexible to be used by supervisors either as an ongoing comprehensive compilation of supervisory knowledge and assessments or as a reference guide supporting individualized scope memos of targeted retail IRB reviews to help determine whether an organization meets the qualification requirements to use the advanced approaches rule.

The work program consists of three sections: (I) an overview of retail credit risk; (II) a summary of supervisory views and knowledge gaps; and (III) a detailed supervisory assessment. Section III includes major components of retail advanced systems,[3] consistent with the advanced approaches rule. The work program includes a number of specific questions, numbered 1.01 through 9.05, and review questions and procedures to help assess compliance with the overall qualification requirements of the advanced approaches rule for using retail advanced systems. Appendix 1 to the work program lists several suggested review items that may be of assistance in answering the specific questions posed in this work program. Appendix 2 to the work program provides additional references to the advanced approaches rule, including key definitions.

While the information collected through this work program is intended to help assess each organization’s overall compliance with the advanced approaches rule, the specific questions and procedures, as well as the suggested review items, are not intended to be all-inclusive. In addition, answers to each question may not be required to reach a conclusion on a particular issue. Upon consideration of materiality and other case-specific factors, if the supervisor believes that additional or alternative review steps should be taken to fully reach a conclusion on the organization’s compliance with the advanced approaches rule, the supervisor may adjust the review scope and document the findings, as appropriate.

Supervisors should treat the work program documentation with the same care that they treat any other supervisory work papers and label the work program documentation accordingly.

---

[1] For purposes of this work program, section numbers refer to the common text of the agencies’ advanced approaches rules, unless noted otherwise. As an example, section 122 refers to 12 CFR 3.122 for OCC-supervised organizations, 12 CFR 217.122 for Federal Reserve-supervised organizations, and 12 CFR 324.122 for FDIC-supervised organizations.

[2] The advanced approaches rules are set forth at 12 CFR 3, subpart E (OCC); 12 CFR 217, subpart E (Federal Reserve); and 12 CFR 324, subpart E (FDIC). The advanced approaches rule applies to an organization described in 12 CFR 3.100(b)(1) (OCC), 12 CFR 217.100(b)(1) (Federal Reserve), and 12 CFR 324.100(b)(1) (FDIC).

[3] The term “retail advanced systems” and “retail IRB systems” are used interchangeably throughout this document.

I. Overview of Retail Credit Risk

A. Retail Portfolios

This section provides supervisors with a table to categorize an organization's retail portfolios and associated segmentation processes to allow for effective scoping of reviews. For each retail exposure subcategory (i.e., residential mortgage, qualifying revolving, and other retail exposure subcategories), identify all portfolios for which the organization is using (or plans to use) retail IRB systems to calculate risk-weighted assets (RWA). For each portfolio, also identify the notional drawn and undrawn exposure values, as well as RWAs under the advanced approaches rule and general risk-based capital rule.[4] Further, for each portfolio, broadly indicate the general approach to segmentation and the resulting number and concentration of segments generated by that process for the portfolio as of the reported date.

As of date: ________________

Subcategory/portfolio	Value of drawn exposure ($)	Value of undrawn exposure ($)	Advanced approaches RWA($)	General RWA ($)	Segmentation process	Number of segments	Percent of exposure at default in five largest segments
Total retail exposure							
Total assets							

B. Retail Credit Risk Framework

This section provides supervisors with an area to categorize the organization's overall risk management framework for its retail IRB systems.

Review questions and procedures	Supervisor comments (with references) by subcategory or portfolio, as appropriate
1. Briefly describe the organization's retail IRB systems. Include • organization structure • roles and responsibilities • operations	

[4] The term "general risk-based capital rule" refers to the risk-based capital rules set forth at 12 CFR 3, subparts A, B, C, and D (OCC); 12 CFR 217, subparts A, B, C, and D (Federal Reserve); and 12 CFR 324, subparts A, B, C, and D (FDIC).

II. Summary of Supervisory Views and Knowledge Gaps

In this section, supervisors should document key supervisory views and knowledge gaps identified during retail advanced systems reviews and ongoing supervision (subsections A and B). For supervisory views addressed as of subsequent supervisory review, enter into the status field "closed" and the date that the view was addressed. Do not delete addressed supervisory views, as this summary section will be used to conduct horizontal analysis of key views and resolutions over time. Supervisory knowledge gaps, on the other hand, can be deleted once resolved. In subsection C, supervisors should document notable or best practices at the organization. Practices documented in subsection C will further peer analysis on emerging best practices with respect to retail advanced systems.

Each subsection is designed similarly. The view/gap/practice field should be used to describe the view/gap/practice as of the date in the status/priority field. The text of the view/gap/practice should reflect supervisors' current understanding of the item. The status/priority field is used to identify the current status of the view/gap/practice ("open" or "closed"), the priority of the item ("high", "medium" or "low") and the most recent assessment date. The work program (WP) question field should be used to identify which work program question a reader can go to for more detail regarding the view/gap/practice. The history field is designed to capture historic information about the view/gap/practice, such as the text of a matters requiring attention (MRA) associated with the item, an organization's response to findings, or supervisor discussion of changes to the view over time. For each history field entry for a given view/gap/practice, the supervisor should provide an entry date (e.g., the date of the transmittal letter containing the MRA).

A. Supervisory Views

View	Status/priority (and as of date)	WP question	History (e.g., MRA text, exit meeting talking points, and organization response)
1.			
2.			
3.			

B. Supervisory Knowledge Gaps

Knowledge gap	Status/priority (and as of date)	WP question	History (e.g., update to knowledge gap)
1.			
2.			
3.			

C. Notable or Best Practices

Practice	Status/priority (and as of date)	WP question	History (e.g., MRA text, exit meeting talking points, and organization response)
1.			
2.			
3.			

III. Detailed Supervisory Assessment

A. Governance, Control, Documentation, and Use

Section 122(i)[5]	**Control, oversight, and validation mechanisms.** (1) The bank's senior management must ensure that all components of the bank's advanced systems function effectively and comply with the qualification requirements in section 122. (2) The bank's board of directors (or a designated committee of the board) must at least annually review the effectiveness of, and approve, the bank's advanced systems. (3) A bank must have an effective system of controls and oversight that: (i) Ensures ongoing compliance with the qualification requirements in section 122; (ii) Maintains the integrity, reliability, and accuracy of the bank's advanced systems; and (iii) Includes adequate governance and project management processes. ... (5) The bank must have an internal audit function or equivalent function that is independent of business-line management that at least annually: (i) Reviews the bank's advanced systems and associated operations, including the operations of its credit function and estimations of probability of default (PD), loss given default (LGD), and exposure at default (EAD); (ii) Assesses the effectiveness of the controls supporting the bank's advanced systems; and (iii) Documents and reports its findings to the bank's board of directors (or a committee thereof).
Section 122(j)	**Documentation.** The bank must adequately document all material aspects of its advanced systems.
Section 122(a)(2)	**Process and systems requirements.** The systems and processes used by a bank for risk-based capital purposes must be consistent with the bank's internal risk management processes and management information reporting systems.

1. Governance, Control, Documentation, and Use

Update log		
Subcategory/portfolio	Date	Prepared by

1.01	**Work program question**	**Overall assessment**	**Reference**
Does the organization's senior management ensure that all components of the organization's advanced systems function effectively and comply with the qualification requirements in section 122?			122(i)(1)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Describe the process the organization's senior management uses to ensure that all components of the organization's retail IRB systems function effectively and		1. 2.	

[5] Unless noted otherwise, all section references are to the advanced approaches rule.

comply with the qualification requirements of section 122. 2. Has the organization determined and documented ownership/responsibility for the following (see question 1.04 for additional discussion of ownership/responsibilities): • Governance and oversight? • Controls supporting the retail advanced systems? • Data management and integrity? • Segmentation system? • Quantification process? • Validation? 3. Is the governance process structured to provide satisfactory senior management oversight of the retail IRB systems?	3.
4. Review and evaluate the adequacy of internal reporting to senior management for ongoing monitoring and oversight, including • model performance • segmentation • quantification • data integrity • validation 5. Do reports to senior management include exceptions to tolerance limits? If so, do the reports adequately describe the tolerance limits used? 6. Do reports to senior management include internal and external benchmarks? If so, do the reports adequately describe the benchmarks used? 7. How does senior management monitor and ensure that validation, audit, and compliance issues relative to retail IRB systems are addressed? • What interim measures are required until the corrective actions are taken? • How is progress to correct deficiencies monitored by senior management? • Test a sample of audit, validation, or compliance issues reported to senior management from initiation to resolution. Describe the processes and document any concerns.	4. 5. 6. 7.

1.02	**Work program question**	**Overall assessment**	**Reference**
Does the organization's board of directors, or a designated board committee, at least annually review the effectiveness of and approve the organization's advanced systems?			122(i)(2)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Does the board of directors designate to a board committee the responsibility to annually review and approve the effectiveness of the organization's advanced systems? If so, to which committee did the board designate responsibility? 2. Assess the adequacy of information provided to the board (or designated board committee) on the organization's retail advanced IRB systems. • Is the frequency of reporting to the board appropriate? • Do the reports include sufficient information to assess the effectiveness of the retail advanced systems, including the control environment?		1. 2. 3. 4.	

• Were any problems with compliance noted in the reports? If so, what actions did the board (or designated board committee) take to address them? 3. Review minutes of board (or designated board committee) meetings and evaluate the discussion regarding the effectiveness of the organization's retail IRB systems. 4. Does the board (or designated board committee) explicitly approve the organization's retail IRB systems?	

1.03	Work program question	Overall assessment	Reference
Does the organization have an effective system of controls and oversight that ensures ongoing compliance with section 122 qualification requirements and maintains the integrity, reliability, and accuracy of the organization's advanced systems?			122(i)(3)(i) 122(i)(3)(ii)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Evaluate whether internal controls, processes, and reports are adequate to ensure that the retail IRB systems remain compliant with the qualification requirements. • What key control points has the organization identified and established? • What quality-assurance processes has the organization established for the retail advanced systems (e.g., data integrity, model documentation, quantification, and capital calculation)? 2. Who or what groups are responsible for control and oversight for each of the following components of a retail advanced system: • Segmentation systems? • Quantification processes? • Data management and maintenance systems? 3. What reports and processes are used to monitor and ensure the reliability of the organization's retail IRB systems? 4. What is the role, if any, of internal loan review and corporate compliance (e.g., ensuring data integrity, reviewing changes in models, and reviewing model validation)? 5. Determine if the oversight process • ensures various systems used in determining risk-based capital requirements are operating as intended. • identifies errors and weaknesses. • recommends corrective action as appropriate. • ensures appropriate follow-up. 6. To the extent that aspects of the retail IRB systems have been outsourced to external parties, how does the organization ensure that the integrity, reliability, and accuracy of the retail IRB systems are maintained?		1. 2. 3. 4. 5. 6.	

1.04	Work program question	Overall assessment	Reference
Does the organization have an effective system of controls and oversight that includes adequate governance and project management processes?			122(i)(3)(iii)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Review reports that pertain to advanced retail systems development or		1.	

enhancement (e.g., minutes from project management meetings, internal audit findings, and reports for project management). • Is project management reporting adequate? • Do gaps or deficiencies still need to be addressed? If so, what corrective action plans are in place? • Identify the key milestones. – Determine if outstanding issues have exceeded established due dates. – Determine if management reporting identifies critical dependencies. • Determine whether remediation plans are reasonably aligned with the identified gaps and if timelines and staffing levels/cost outlays represent reasonable estimates given the nature of the deficiency.	

1.05	Work program question	Overall assessment	Reference
Does the organization adequately document all material aspects of its advanced systems?			122(j)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Describe the manner in which the organization organizes all supporting documentation for its retail IRB systems. 2. Has the organization developed documentation standards and requirements for its retail advanced systems? 3. Based on reviews of individual components of the organization's retail advanced systems, evaluate whether available documentation is complete, current, and includes the following: • Retail IRB policies and procedures • Controls supporting the retail advanced systems • Segmentation framework • Model design • Database construction, management and maintenance • Risk parameter quantification processes, including clear and comprehensive exposition of the developmental evidence; • Assessment of data limitations, modeling assumptions and uncertainties, and associated conservative adjustments; and • Validation 4. Is documentation of the retail advanced systems easily accessible and sufficiently transparent so that a qualified third party, such as internal auditors or external supervisors, can follow and understand it? • To the extent that the organization has not adequately documented all material aspects of its retail advanced systems, what remediation processes does the organization have in place to address such gaps and how is resolution of gaps tracked? 5. How does the organization ensure that documentation remains up-to-date with the current implementation of the retail advanced systems?		1. 2. 3. 4. 5.	

1.06	Work program question	Overall assessment	Reference
For retail exposures, are the systems and processes used by the organization for risk-based capital purposes consistent with its internal risk management processes and management information reporting systems?			122(a)(2)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Assess the “use test” by comparing the consistency of the retail advanced systems development, ongoing monitoring, reporting, and governance with the organization’s risk management processes. Consider the following: • Are modeling methodologies similar to models used for other business purposes? • Are groupings (portfolios) similar to the way the lines of business are managed? • Are risk characteristics used for segmentation and loan-level models similar to key risk metrics used for risk management? • Are roles and responsibilities consistent with governance and oversight used for credit risk management? 2. If applicable, how else are retail IRB systems used (e.g., economic capital calculations, portfolio analyses, loss forecasting, allowance methodologies, hold-sell decisions, and stress testing)?		1. 2.	

1.07	Work program question	Overall assessment	Reference
Does the organization have an internal audit function or equivalent function that is independent of business-line management?			122(i)(5)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Confirm with supervisors responsible for supervising the organization’s internal audit function that internal audit is independent of business-line management.		1.	

1.08	Work program question	Overall assessment	Reference
Does the internal audit function, at least annually, assess the effectiveness of the controls supporting the organization’s advanced systems?			122(i)(5)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Discuss with supervisors responsible for supervising the organization’s internal audit function the general quality of internal audit’s work. 2. Are internal audit plans for assessing the effectiveness of the controls supporting the organization’s retail advanced systems sufficient? • Do plans include assessments of implementation and project plans, if applicable? 3. Describe the scope and findings of work supporting internal audit’s assessment of the effectiveness controls supporting retail advanced systems. • What testing is conducted to ensure that the retail advanced systems meet advanced approaches rule requirements? • How frequently is testing conducted?		1. 2. 3. 4. 5. 6.	

• How was the depth and quality of the testing program established? • Does the internal audit function review and assess the effectiveness of controls of the validation process, including validation procedures, responsibilities, results, timeliness, and responsiveness to findings? • Do internal audit reviews include reviews of the data management framework, inspection of data, information technology (IT) controls, data metrics, and data quality plans? 4. Are internal audit policies, work programs, and work papers related to assessing the effectiveness of the controls and oversight of the retail advanced systems sufficient? 5. Are audit findings tracked and corrective action taken in a timely manner? • How is progress to correct deficiencies monitored? • Who is responsible for ensuring that deficiencies are corrected? • What interim measures are required until the corrective actions are taken? 6. Test a sample of internal audit work assessing controls supporting the retail IRB systems and evaluate the quality of internal audit's work.	

1.09	**Work program question**	**Overall assessment**	**Reference**
Does the internal audit function document and report its findings at least annually to the organization's board of directors (or a designated board committee)?			122(i)(5)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Evaluate the adequacy and frequency of internal audit reporting to the board (or designated board committee). • Are significant deficiencies relative to qualification requirements reported to the board as appropriate?		1.	

B. Risk Segmentation Systems for Retail Exposures

Section 122(b)(1)	**Risk rating and segmentation systems for exposures** (i) A bank must have an internal risk rating and segmentation system that accurately, reliably, and meaningfully differentiates among degrees of credit risk for the [bank]'s wholesale and retail exposures. When assigning an internal risk rating, a bank may consider a third-party assessment of credit risk, provided that the bank's internal risk rating assignment does not rely solely on the external assessment. (ii) If a bank uses multiple rating or segmentation systems, the bank's rationale for assigning an exposure to a particular system must be documented and applied in a manner that best reflects the exposure's level of risk. A bank must not inappropriately allocate obligors across systems to minimize regulatory capital requirements. (iii) In assigning retail exposures to retail segments, a bank must use all relevant and material information and ensure that the information is current. (iv) When assigning a retail exposure to a probability of default (PD segment, a bank must assess the retail borrower's ability and willingness to contractually perform, taking a conservative view of projected information.
Section 122(b)(3)	**For retail exposures** (i) A bank must have an internal system that groups retail exposures into the appropriate retail exposure subcategory, groups the retail exposures in each retail exposure subcategory into separate segments with homogeneous risk characteristics that provide a meaningful differentiation of risk. The bank's system must identify and group in separate segments by subcategories exposures identified in paragraphs (c)(2)(ii) and (iii) of section 131. (ii) A bank must have an internal system that captures all relevant exposure risk characteristics, including borrower credit score, product and collateral types, as well as exposure delinquencies, and must consider cross-collateral provisions, where present.

	(iii) A bank must review and update (as appropriate) assignments of individual retail exposures to segments and the loss characteristics and delinquency status of each identified risk segment. These reviews must occur whenever the bank receives new material information, but generally no less frequently than quarterly, and, in all cases, at least annually.
Section 131(b)	**Categorization** The bank must determine which of its exposures are wholesale exposures, retail exposures, securitization exposures, or equity exposures. The bank must categorize each retail exposure as a residential mortgage exposure, a qualifying revolving exposure (QRE), or another retail exposure.
Section 131(c)(2)	**Segmentation of retail exposures** (i) The bank must group the retail exposures in each retail subcategory into segments that have homogeneous risk characteristics. (ii) The bank must identify which of its retail exposures are in default. The bank must segment defaulted retail exposures separately from non-defaulted retail exposures. (iii) If the bank determines the EAD for eligible margin loans using the approach in section 132(b), the bank must identify which of its retail exposures are eligible margin loans for which the bank uses this EAD approach and must segment such eligible margin loans separately from other retail exposures.
Section 131(e)(4)	**Calculation of risk-weighted assets – non-material portfolios of exposures** The risk-weighted asset amount of a portfolio of exposures for which the bank has demonstrated to the primary federal supervisor's satisfaction that the portfolio (when combined with all other portfolios of exposures that the bank seeks to treat under paragraph (e) of section 131) is not material to the bank is the sum of the carrying values of on-balance-sheet exposures plus the notional amounts of off-balance-sheet exposures in the portfolio. For purposes of paragraph (e)(4) of section 131, the notional amount of an OTC derivative contract that is not a credit derivative is the EAD of the derivative as calculated in section 132.

2. Risk Segmentation Systems for Retail Exposures

Update log		
Subcategory/portfolio	Date	Prepared by

2.01	**Work program question**	**Overall assessment**	**Reference**
Does the segmentation system group retail exposures appropriately into the following subcategories: residential mortgage exposure, qualifying revolving exposure and other retail exposure?			122(b)(3) 131(b)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Determine if all retail exposures are accounted for and grouped appropriately into the following exposure subcategories as defined in the advanced approaches rule: • Residential mortgage • Qualifying revolving • Other retail 2. Has the organization characterized as a retail exposure each exposure that meets the definition of a retail exposure under the advanced approaches rule? • Request and review a reconciliation of subcategories to the general ledger, including off-balance-sheet exposures to ensure that all retail exposures are captured within a subcategory. • Compare outstanding balances of portfolios used to calculate minimum risk-		1. 2. 3.	

based capital to reports used for risk management. 3. Is there any group that tests and monitors the segmentation system for retail exposures that is independent from personnel and management functions responsible for originating exposures?	

2.02	Work program question	Overall assessment	Reference
Has the organization satisfactorily demonstrated that any portfolio of retail exposures to which the organization seeks to apply section 131(e)(4) of the advanced approaches rule (when combined with all other portfolios of exposures that the organization seeks to risk-weight in accordance with that section) is immaterial to the organization?			131(e)(4)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Review the organization's policy for determining non-material portfolios and support for the exclusions to advanced approaches. • What is the organization's definition of immaterial? • How does the organization monitor whether excluded portfolios are, in aggregate, immaterial to the organization? 2. Review a listing of the retail portfolios that the organization proposes to temporarily or permanently exclude from the retail advanced approaches and assess the appropriateness of each proposed excluded portfolio. • Has the organization provided adequate support for each proposed exclusion from the retail advanced approaches and considered such criteria as portfolio size, growth plans, level of risk, or risk profile and whether the portfolios are stable or liquidating? 3. Combine the total amount of retail and all other exposures for which the organization is seeking to apply section 131(e)(4), and determine whether the resulting amount is material to the organization. 4. Determine whether the organization assigns risk-weighted asset amounts equal to the carrying value of on-balance-sheet exposures and notional amount of off-balance-sheet exposures for immaterial portfolios.		1. 2. 3. 4.	

2.03	Work program question	Overall assessment	Reference
Does the segmentation system accurately and reliably differentiate among degrees of credit risk within each retail exposure subcategory?			122(b)(1) 122(b)(3)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Within each retail subcategory, are the groupings of exposures (i.e., portfolios) from which segments are derived logical and appropriate? 2. Describe the organization's method of segmentation (e.g., decision-tree modeling, exposure-level statistical models, and combination of exposure-level models with historical default frequencies for PD quantification). • Does the organization's documentation of segmentation systems include descriptions of methodologies, data sources, data limitations, modeling assumptions, statistical testing, and reasonability checks? • Does the overall segmentation adequately address potential correlation among risk parameters through shared risk drivers?		1. 2. 3.	

• Assess the appropriateness of statistical tests used during model development for supporting differentiation of risk. • How or why did the organization settle on its chosen method of segmentation? 3. Review segmentation documentation for selected portfolios, and determine how the risk variables were selected. • Does the organization's empirical evidence support the selection of risk characteristics used? • To what degree was expert judgment relied on? • As applicable, determine the cause for omitting any key risk drivers used to manage risk (e.g., lack of empirical evidence supporting driver as predictive in model development and lack of data).	

2.04	Work program question	Overall assessment	Reference
Are exposures within each retail subcategory grouped into separate segments with homogeneous risk characteristics?			122(b)(3)
Review questions and procedures		**Supervisor Comments (with references) by subcategory and/or portfolio as appropriate**	
1. Assess the appropriateness of the granularity of the segments. • Are there any unusual divisions of the portfolios into segments or unexplained absences of division? • Within portfolios, do concentrations of exposures exist in a limited number of segments? If so, has the organization conducted sufficient sensitivity analysis to support a finding that risk is homogeneous within those segments? • For portfolios with highly granular segments, has the organization provided sufficient evidence that each segment will produce accurate and reliable risk parameter estimates? 2. Are boundary values for the segments clearly specified and supported by statistical analysis?		1. 2.	

2.05	Work program question	Overall assessment	Reference
Are defaulted retail exposures segmented separately from non-defaulted retail exposures?			122(b)(3) 131(c)(2)(ii)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Does the policy specify how defaulted exposures are segmented separately from non-defaulted exposures? 2. Under what conditions are there default segments in retail portfolios? • Are residential mortgages with loan modifications, where the bank has written down a portion of principal, treated as defaulted? 3. Is the segmentation of defaulted exposures based on the criteria most predictive of current loss and recovery rates that provide sufficient differentiation of defaulted exposures? Is the segmentation granularity sufficient? Is this well documented and supported?		1. 2. 3.	

2.06	Work program question	Overall assessment	Reference
Are eligible margin loans where financial collateral is factored into the determination of EAD rather than LGD to reflect risk mitigation segmented separately from all other retail exposures?			122(b)(3) 131(c)(2)(iii)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Does the documentation describe the method used? 2. How is the portfolio with financial collateral treated in the segmentation process?		1. 2.	

2.07	Work program question	Overall assessment	Reference
Are the assignments of retail exposures to segments reviewed and updated (as appropriate) whenever the organization receives new material information, but generally no less frequently than quarterly?			122(b)(3)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Determine the adequacy of the organization's policies, procedures, and documentation supporting ongoing monitoring, updating of information on risk exposures, and migration of exposures between segments. • Do the policies and procedures specify the frequency for updating the risk characteristics and the specific risk characteristics to be updated? • Is the frequency for updating key risk characteristics reasonable and appropriate? 2. Does the organization update the risk characteristics of exposures and migrate exposures between segments as appropriate? 3. As part of the monitoring process, does management compare the migration of exposures across segments to changes in underlying credit quality as portrayed in other risk management, management information systems (MIS)?		1. 2. 3.	

C. Data Management and Maintenance

Section 122(h)	**Data management and maintenance.** (1) A bank must have data management and maintenance systems that adequately support all aspects of its advanced systems and the timely and accurate reporting of risk-based capital requirements. (2) A bank must retain data using an electronic format that allows timely retrieval of data for analysis, validation, reporting, and disclosure purposes. (3) A bank must retain sufficient data elements related to key risk drivers to permit adequate monitoring, validation, and refinement of its advanced systems.

3. Data Management and Maintenance

Update log		
Subcategory/portfolio	Date	Prepared by

<table>
<tr><th>3.01</th><th>Work program question</th><th>Overall assessment</th><th>Reference</th></tr>
<tr><td colspan="2">Does the organization have data management and maintenance systems that support all aspects of its advanced systems?</td><td></td><td>122(h)(1)</td></tr>
<tr><td colspan="2">Review questions and procedures</td><td colspan="2">Supervisor comments (with references) by subcategory or portfolio, as appropriate</td></tr>
<tr><td colspan="2">1. Determine whether a data-governance function has been established to support retail advanced systems.
• Are the roles associated with data-quality management well defined?
• Has management developed and approved a framework outlining the organization’s approach to managing data?
• Is there an effective governance framework and mechanism for ensuring data quality?
• What data architecture standards and processes have been developed and established by the organization for data capturing, processing, and retention?
• Has a process been developed for granting exceptions?
2. What controls have been established for managing the advanced systems data management IT environment with regard to change management?
3. Do retail advanced systems data maintenance policies, procedures, and practices address the following:
• Specify all IRB and internal credit risk data elements that will be collected at exposure origination, during ongoing exposure monitoring, and for collection and recovery purposes?
• Require the data to be maintained on an individual exposure-level?
• Establish appropriate data-retention periods (including for charged-off, paid-off, or sold exposures, as well as recovery costs on defaulted accounts) that include a minimum of five years of data for individual exposures or segments and include a period of economic downturn conditions?
• Address the process for implementing, documenting, and verifying system and data changes?
4. Do retail advanced systems data maintenance policies, procedures, and practices address the following:
• Periodic review and approval of anyone with the ability to change production data?
• Use of alternative internal data sources?
• Collection, storage, maintenance, and use of external data?
• Missing data, including the effects of missing data on risk segmentation and quantification systems?
• Data errors and reporting of data errors and data linkage breaks to source, downstream, or external systems?
5. Describe the organization’s program to ensure end-to-end retail IRB data integrity.
• Has the organization established tolerances for data integrity?
• Does the organization have a certification process for data integrity, a tracking and reporting process, and a requirement to have an action plan for resolution for out-of-tolerance conditions?
• Has the organization identified all manual processes and documented roles and responsibilities for staff with manual update capabilities to production data?</td><td colspan="2">1.
2.
3.
4.
5.
6.
7.
8.</td></tr>
</table>

6. Determine if the organization has documented the entire retail IRB data-flow process, including data flow diagrams, control points, data dictionaries, and identified control gaps. 7. Has the organization established "business as usual" repeatable processes, monitoring, and reporting with regard to retail advanced systems? 8. Are the retail IRB data dynamic enough to provide exposure level information for a snapshot portfolio analysis and throughout the life cycle of the exposure?	

3.02	Work program question	Overall assessment	Reference
Does the organization have data management and maintenance systems that support timely and accurate reporting of risk-based capital requirements?			122(h)(1)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Does the organization have data reconciliation processes that ensure all exposures are appropriately accounted for? 2. Does the technology framework supporting the retail advanced systems assimilate data collection, data warehousing, and report creation?		1. 2.	

3.03	Work program question	Overall assessment	Reference
Does the organization retain data in an electronic format that allows timely retrieval of data for analysis, validation, reporting, and disclosure purposes?			122(h)(2)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Are data elements for the retail IRB system maintained outside an electronic format? Describe those data elements. 2. Does the organization address in policy any data maintained for retail IRB system purposes that are not maintained in electronic format?		1. 2.	

3.04	Work program question	Overall assessment	Reference
Does the organization retain sufficient data elements related to key risk drivers to permit adequate monitoring, validation, and refinement of its advanced systems?			122(h)(3)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Are the data elements used to segment and quantify retail exposures captured in such a manner as to facilitate refinement, ongoing monitoring, and validation of the organization's advanced systems? 2. Are risk drivers not used to segment and quantify risk, but with potential explanatory power, retained in the data systems? 3. Does the organization have procedures in place to ensure adequate retention of data for sold portfolios and adequate capture of data for acquired portfolios? 4. Is the data system able to link re-defaults to initial defaults? 5. Does the technology framework integrate both application and refreshed borrower data?		1. 2. 3. 4. 5.	

D. Quantification of Risk Parameters

Section 122(c)	**Quantification of risk parameters for wholesale and retail exposures.** (1) The bank must have a comprehensive risk parameter quantification process that produces accurate, timely, and reliable estimates of the risk parameters on a consistent basis for the bank's retail exposures. (2) A bank's estimates of PD, LGD, and EAD must incorporate all relevant, material, and available data that is reflective of the bank's actual retail exposures and of sufficient quality to support the determination of risk-based capital requirements for the exposures. In particular, the population of exposures in the data used for estimation purposes, and lending standards in use when the data were generated, and other relevant characteristics, should closely match or be comparable to the bank's exposures and standards. In addition, a bank must: (i) Demonstrate that its estimates are representative of long-run experience, including periods of economic downturn conditions, whether internal or external data are used; (ii) Take into account any changes in lending practice or the process for pursuing recoveries over the observation period; (iii) Promptly reflect technical advances, new data, and other information as they become available; (iv) Demonstrate that the data used to estimate risk parameters support the accuracy and robustness of those estimates; and (v) Demonstrate that its estimation technique performs well in out-of sample tests whenever possible. (3) The bank's risk parameter quantification process must produce appropriately conservative risk parameter estimates where the bank has limited relevant data, and any adjustments that are part of the quantification process must not result in a pattern of bias toward lower risk parameter estimates. (4) The bank's risk parameter estimation process should not rely on the possibility of U.S. government financial assistance, except for the financial assistance that the U.S. government has a legally binding commitment to provide. (5) The bank must be able to demonstrate which variables have been found to be statistically significant with regard to EAD. The bank's EAD estimates must reflect its specific policies and strategies with regard to account management, including account monitoring and payment processing, and its ability and willingness to prevent further drawdowns in circumstances short of payment default. The bank must have adequate systems and procedures in place to monitor current outstanding amounts against committed lines, and changes in outstanding amounts per obligor and obligor rating grade and per retail segment. The bank must be able to monitor outstanding amounts on a daily basis. (6) At a minimum, PD estimates for retail segments must be based on at least five years of default data. LGD estimates for retail segments must be based on at least five years of loss severity data. EAD estimates for retail segments must be based on at least five years of exposure amount data. If the bank has relevant and material reference data that span a longer period of time than the minimum time periods specified above, the bank must incorporate such data in its estimates, provided that it does not place undue weight on periods of favorable or benign economic conditions relative to periods of economic downturn conditions. (7) Default, loss severity, and exposure amount data must include periods of economic downturn conditions, or the bank must adjust its estimates of risk parameters to compensate for the lack of data from periods of economic downturn conditions. (8) The bank's PD, LGD, and EAD estimates must be based on the definition of default in section 101. (9) If a bank uses internal data obtained prior to becoming subject to the advanced approaches rule or external data to arrive at PD, LGD, or EAD estimates, the bank must demonstrate to the primary federal supervisor that the bank has made appropriate adjustments if necessary to be consistent with the definition of default in section 101. Internal data obtained after the bank becomes subject to the advanced approaches rule must be consistent with the definition of default section 101. (10) The bank must review and update (as appropriate) its risk parameters and its risk parameter quantification process at least annually. (11) The bank must at least annually conduct a comprehensive review and analysis of reference data to determine relevance of reference data to the bank's exposures, quality of reference data to support PD, LGD, and EAD estimates, and consistency of reference data to the definition of default contained in section 101.
Section 131(d)(2)	**Floor on PD assignment.** The PD for each retail segment may not be less than 0.03 percent, except for exposures to or directly and unconditionally guaranteed by a sovereign entity, the Bank for International Settlements, the International Monetary Fund, the European Commission, the European Central Bank, or a multilateral development bank to which the bank assigns a rating grade associated with a PD of less than 0.03 percent.
Section 131(d)(6)	**EAD for eligible margin loans.** A bank may take into account the risk-reducing effects of financial collateral in support of an eligible margin loan through an adjustment to EAD as provided in section 132(b) and (d). A bank that takes collateral into account through such an adjustment to EAD under section 132 may not reflect such collateral in LGD.

4. General Topics

Update log		
Subcategory/portfolio	Date	Prepared by

4.01	Work program question	Overall assessment	Reference
Are the risk parameter estimates based on the definition of default in the advanced approaches rule (section 101(b))?			122(c)(8)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Does the definition of default in the organization's reference data used for PD estimation meet the advanced approaches rule default definition? If the definition of default differs, in what way is the organization's definition inconsistent with the advanced approaches rule? 2. Do the reference data used to calculate LGD use accounts that have defaulted based on the retail IRB default definition? Are costs and recoveries discounted to the time of default as determined by the IRB default definition? 3. Do the reference data used to calculate EAD use accounts that have defaulted based on the retail IRB default definition?		1. 2. 3.	

4.02	Work program question	Overall assessment	Reference
Does the risk parameter estimation process exclude consideration of U.S. government financial assistance except for instances where the U.S. government has a legally binding commitment to provide such assistance?			122(c)(4)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Describe circumstances where U.S. government financial assistance is considered in the quantification process and evaluate appropriateness. 2. How is implicit U.S. government support handled within the organization's risk parameter estimate process?		1. 2.	

4.03	Work program question	Overall assessment	Reference
Are the risk parameters and risk parameter quantification processes reviewed and updated (as appropriate) by the organization at least annually?			122(c)(10)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Assess whether the organization reviews and updates, as appropriate, risk parameters and risk parameter quantification processes. • Do reviews take place at least annually for all retail IRB risk parameters? • Does the organization have documented thresholds for when risk parameters and risk parameter quantification processes may need to be updated?		1. 2.	

• How does the organization factor into its reviews significant changes in products and underwriting standards? 2. Test a sample of previous reviews and evaluate whether conclusions were well supported and any recommendations implemented.	

4.04	Work program question	Overall assessment	Reference
Does the organization at least annually conduct a comprehensive review and analysis of all reference data to determine the relevance of such reference data to the organization's exposures, quality of the reference data used to support the parameter estimates, and consistency of the reference data to the definition of default for retail exposures?			122(c)(11)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Describe the organization's reference data review processes. • Do reviews take place at least annually? • How does the organization factor into its reviews significant changes in products and underwriting standards? 2. Test a sample of previous reviews and evaluate whether conclusions were well supported and any recommendations implemented.		1. 2.	

5. Probability of Default

Update log		
Subcategory/portfolio	Date	Prepared by

5.01	Work program question	Overall assessment	Reference
Does the PD quantification process produce accurate, timely, and reliable estimates of the probability of default for the organization's retail exposures, and are these estimates assigned to each segment on a consistent basis?			122(c)(1) 122(b)(3)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Does the PD estimate for each non-defaulted segment equal the organization's empirically based best estimate of the long-run average one-year default rate for the exposures in the segment, capturing the average default experience for exposures in the segment over a mix of economic conditions (including economic downturn conditions) sufficient to provide a reasonable estimate of the average one-year default rate over the economic cycle for the segment? 2. Describe the method(s) used to estimate PD. • How are long-run averages calculated? • Does the long-run PD estimation method comply with sound quantification practices? • How are prepayments, attrition, and loan sales incorporated into the		1. 2. 3. 4.	

estimation method? • If a loan cures from default (via modification or otherwise) and then re-defaults, does the PD calculation reflect an appropriate determination as to whether this constitutes a single default event? 3. Determine if the organization has provided sufficient analysis and support for its PD quantification methodology. 4. Does PD equal 100 percent for segments of retail exposures meeting the definition of default?	

5.02	Work program question	Overall assessment	Reference
Does the PD estimate for each non-default segment equal no less than 0.03 percent (except for exposures to or directly and unconditionally guaranteed by a sovereign entity, a supranational entity listed in section 131(d)(2), or a multilateral development bank as defined in the advanced approaches rule, to which the organization assigns a rating grade associated with a PD of less than 0.03 percent)?			131(d)(2)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Review policy and MIS on PD minimums to ensure organization complies with the requirements in the advanced approaches rule.		1.	

5.03	Work program question	Overall assessment	Reference
Are the data used to estimate PD relevant to the organization's retail exposures and of sufficient quality to support the determination of risk-based capital requirements for these exposures and, where the organization has limited relevant data, does the quantification process produce appropriately conservative PD estimates?			122(c)(2) 122(c)(3)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Are the data used to estimate PD representative of the current portfolio? 2. Do available internal data contain the necessary history and detail to correctly quantify the PD estimates? If not, why? 3. How does the organization evaluate or demonstrate the accuracy and reliability of segment level PD estimates? 4. If loan sales have occurred historically, have the data required for default identification and PD measurement been retained or recovered? 5. Does the organization continue to add recent reference data as they become available? 6. Does the organization weight time periods differently? If so, does the organization adequately support its choices? 7. If external data are used, are the data appropriately incorporated into the quantification process? • Have differences in underwriting and lack of mapping to comparable segmentation criteria been considered and documented and has conservatism in the parameter estimates been incorporated? • Does the organization regularly review mapping to external reference data and the appropriateness of uses of the reference data sets (vs. internal sources)?		1. 2. 3. 4. 5. 6. 7. 8. 9.	

<table>
<tr><td>8. Does the organization appropriately identify and adjust for significant data gaps?
What measures does the organization take to mitigate significant data gaps in the information on its own borrowers (e.g., obtain historical credit bureau data, draw historical data from similar sections of the portfolio with identical borrower and loan characteristics, or other methods)?
Where essential data elements necessary for accurate quantification are missing or have not been maintained, does the organization have a plan to capture the required data elements going forward?
Does the organization document transitional approaches it has used to account for gaps in data histories and data gaps due to mergers or acquisitions?
Does the organization take an appropriately conservative approach to quantification when data gaps exist?
9. To the extent that reference data do not meet the retail IRB definition of default, what adjustments have been made, if any, to reflect appropriate conservatism?</td><td></td></tr>
</table>

<table>
<tr><th>5.04</th><th>Work program question</th><th>Overall assessment</th><th>Reference</th></tr>
<tr><td colspan="2">Does the organization ensure that adjustments that are part of the PD quantification process do not result in a pattern of bias toward lower risk parameter estimates?</td><td></td><td>122(c)(3)</td></tr>
<tr><td colspan="2">Review questions and procedures</td><td colspan="2">Supervisor comments (with references) by subcategory or portfolio, as appropriate</td></tr>
<tr><td colspan="2">1. Does the organization make any judgmental adjustments?
If so, what adjustments are made and at what stage in the quantification process are such adjustments applied?
How does the organization identify and address negative biases due to these adjustments?</td><td colspan="2">1.</td></tr>
</table>

<table>
<tr><th>5.05</th><th>Work program question</th><th>Overall assessment</th><th>Reference</th></tr>
<tr><td colspan="2">Are PD estimates for retail segments based on at least five years of default data?</td><td></td><td>122(c)(6)</td></tr>
<tr><td colspan="2">Review questions and procedures</td><td colspan="2">Supervisor comments (with references) by subcategory or portfolio, as appropriate</td></tr>
<tr><td colspan="2">1. How many years of default data are included in the reference data used to estimate PD?
Is a minimum of five years of data used to estimate PD?
If more than five years of reference data are available, to the extent that data are excluded, has the organization appropriately justified such exclusions?</td><td colspan="2">1.</td></tr>
</table>

<table>
<tr><th>5.06</th><th>Work program question</th><th>Overall assessment</th><th>Reference</th></tr>
<tr><td colspan="2">Do the default data include a period of economic downturn conditions or has the organization adjusted its PD estimates appropriately to compensate for the lack of data from a period of economic downturn conditions?</td><td></td><td>122(c)(7)</td></tr>
<tr><td colspan="2">Review questions and procedures</td><td colspan="2">Supervisor comments (with references) by subcategory or portfolio, as appropriate</td></tr>
<tr><td colspan="2">1. Do the reference data include a period of economic downturn conditions?</td><td colspan="2">1.</td></tr>
</table>

• What are the economic downturn periods? • Are the downturn periods consistent with the industry experience? 2. Are the downturn periods properly identified as periods where default rates are significantly above average? • Has the organization formally defined "significantly above the average"? • At what level (such as subcategory or portfolio) are economic downturn conditions determined? 3. If the reference data do not include a period of economic downturn conditions, evaluate the methodology and support for adjusting the PD estimates. • How does the organization adjust its PD estimates to compensate for lack of data from a period of economic downturn conditions? • Does the estimation methodology result in an appropriate degree of conservatism?	2. 3.

6. Loss Given Default

Update log		
Subcategory/portfolio	Date	Prepared by

6.01	Work program question	Overall assessment	Reference
Does the LGD quantification process produce accurate, timely, and reliable estimates of the loss given default for the organization's retail exposures and are these estimates assigned to each segment on a consistent basis?			122(c)(1) 122(b)(3)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Does the LGD estimate for each segment equal the greatest of • zero? • the organization's empirically based best estimate of the long-run, default-weighted average economic loss, per dollar of EAD, that the organization would expect to incur if the exposures in the segment were to default within a one-year horizon over a mix of economic conditions, including economic downturn conditions? • the organization's empirically based best estimate of the economic loss, per dollar of EAD, that the organization would expect to incur if the exposures in the segment were to default within a one-year horizon during economic downturn conditions? 2. If the organization does not estimate LGD using the advanced approaches rule definition of default, does the organization have an explanation for the variations and a plan for achieving compliance? 3. Describe the method(s) used to estimate LGD. • Are long-run average LGD estimates calculated as default-weighted average economic loss?		1. 2. 3. 4. 5.	

• Do the LGD estimates include collection and recovery costs? If so, how does the organization determine such costs? • Are cash flows discounted to point of default? • What are the discount rates used and how were the rates determined? • Do LGD estimates for mortgages include the loss-reducing benefits of loan-level private mortgage insurance? 4. Determine if the organization has provided sufficient analysis and support for its LGD quantification methodology. 5. Does the organization use the supervisory mapping function described in the preamble to the advanced approaches final rule published in the Federal Register on December 7, 2007, or other downturn estimation methods to quantify an LGD reflective of economic downturn conditions? • If so, does the organization have adequate documentation supporting its applicability to the exposures to which it is being applied?	

6.02	Work program question	Overall assessment	Reference
Does the LGD estimate for each segment of residential mortgage exposures (other than segments of residential mortgage exposures for which all or substantially all of the principal of each exposure is directly and unconditionally guaranteed by the full faith and credit of a sovereign entity, or guaranteed by a contingent obligation of the U.S. government or its agencies) equal at least 10 percent?			131(d)(3)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Are LGDs for mortgage portfolios 10 percent or greater (except those with government guarantees, e.g., Federal Housing Administration loans or U.S. Department of Veterans Affairs loans)?		1.	

6.03	Work program question	Overall assessment	Reference
For segments of eligible margin loans where financial collateral is factored into the determination of EAD, does the estimate of LGD only reflect collateral other than financial collateral?			131(d)(6)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. How is LGD determined for eligible margin loans when collateral is factored into the determination of EAD? • Does the organization use an unsecured LGD or some other measure?		1.	

6.04	Work program questions	Overall assessment	Reference
Are the data used to estimate LGD relevant to the organization's retail exposures and of sufficient quality to support the determination of risk-based capital requirements for these exposures? Where the organization has limited relevant data, does the quantification process produce appropriately conservative LGD estimates?			122(c)(2) 122(c)(3) 122(c)(7)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Are the historical data used to estimate LGD representative of the current portfolio		1.	

and of current servicing and loss mitigation practices? 2. Do available internal data contain the necessary history and detail to correctly quantify the LGD estimates? If not, why? 3. If loan sales have occurred historically, have the data required for default identification and LGD measurement been retained or recovered? 4. Does the organization continue to add recent reference data as it becomes available? 5. Does the organization appropriately account for potential impacts of unresolved historical defaults on LGD estimates? 6. Does the organization appropriately account for significant data gaps or limitations? • What measures does the organization take to mitigate significant data gaps in the information on its own borrowers (e.g., obtain historical credit bureau data, or draw historical data from similar sections of the portfolio with identical borrower and loan characteristics, or other methods)? • Where essential data elements necessary for accurate quantification are missing or have not been maintained, does the organization have a plan to capture the required data elements going forward? • Does the organization document transitional approaches it has used to account for gaps in data histories and data gaps due to mergers or acquisitions? • Does the organization take an appropriately conservative approach to quantification when data gaps exist?	2. 3. 4. 5. 6.

6.05	Work program question	Overall assessment	Reference
Does the organization ensure that adjustments that are part of the LGD quantification process do not result in a pattern of bias toward lower risk parameter estimates?			122(c)(3)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Determine how the organization identifies and addresses systemic differences or negative biases. • Does the organization make any judgmental adjustments? If so, what adjustments are made and at what stage in the quantification process are such adjustments applied?		1.	

6.06	Work program question	Overall assessment	Reference
For segments where the organization's quantifications of LGD directly or indirectly incorporate the effectiveness of the organization's credit risk management practices in reducing its exposure to troubled obligors before default, does the organization support its estimates with empirical analysis showing that the estimates are consistent with the organization's historical experience in dealing with such exposures during economic downturn conditions?			122(c)(5)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. During economic downturn, does the organization directly or indirectly reduce its exposures to troubled obligors before default?		1.	

• If it does, do the historical reference data reflect such a practice?	

6.07	Work program question	Overall assessment	Reference
Are LGD estimates for retail segments based on at least five years of loss severity data?			122(c)(6)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. How many years of recovery data are included in the reference data used to estimate LGD? • Is a minimum of five years of data used to estimate LGD? 2. If more than five years of reference data are available, to the extent that data are excluded, has the organization appropriately justified such exclusions? 3. Are the recovery data at the exposure, segment, or portfolio level? 4. What is the recovery horizon for defaulted exposures?		1. 2. 3. 4.	

6.08	Work program question	Overall assessment	Reference
Do the loss severity data include a period of economic downturn conditions, or has the organization adjusted its LGD estimates appropriately to compensate for the lack of data from a period of economic downturn conditions?			122(c)(7)
Review questions and procedures		**Supervisor Comments (with references) by subcategory and/or portfolio as appropriate**	
1. Do the reference data include a period of economic downturn conditions? • What are the economic downturn periods? • Are the downturn periods consistent with the industry experience? 2. Are the downturn periods properly identified as periods where default rates are significantly above the average? • At what level (such as subcategory or portfolio) are economic downturn conditions determined? 3. If the reference data do not include a period of economic downturn conditions, evaluate the methodology and support for adjusting the LGD estimates. • Does the estimation methodology result in an appropriate degree of conservatism? 4. If using the supervisory mapping function for LGD estimation, determine if the long run data includes economic downturn conditions or has been sufficiently adjusted to compensate for the lack of such data.		1. 2. 3. 4.	

7. Exposure at Default

Update log		
Subcategory/portfolio	Date	Prepared by

7.01	Work program question	Overall assessment	Reference
Does the EAD quantification process produce accurate, timely, and reliable estimates of the exposure at default on a consistent basis for the organization's retail exposures?			122(c)(1) 132(b)

Review questions and procedures	Supervisor comments (with references) by subcategory or portfolio, as appropriate
1. For the on-balance-sheet portion of each segment, does the EAD estimate equal the organization's carrying value (including net accrued but unpaid interest and fees) for the exposure or segment less any allocated transfer risk reserve for the exposure or segment? • How does the organization determine the accrued but unpaid interest and fees for each segment? 2. For the off-balance-sheet component of each segment of retail exposures (other than eligible margin loans for which financial collateral is factored into the determination of EAD) in the form of a loan commitment, line of credit, trade-related letter of credit, or transaction-related contingency, does the EAD estimate equal the organization's best estimate of net additions to the outstanding amount owed the organization, including estimated future additional draws of principal and accrued but unpaid interest and fees, that are likely to occur over a one-year horizon assuming the exposures in the segment were to go into default? • How does the organization incorporate accrued but unpaid interest and fees in the reference data in estimating EAD for each segment? • Do the estimates of net additions reflect what would be expected during economic downturn conditions? 3. For segments of eligible margin loans where financial collateral is factored into the determination of EAD, is EAD for each segment calculated as described in section 132? 4. For segments of retail exposures in which only the drawn balance has been securitized, do the EAD estimates reflect the organization's share of the exposures' undrawn balances? 5. Describe the method(s) used to estimate EAD. • Do the estimates of net additions reflect what would be expected during economic downturn conditions? • Do the EAD estimates include current and future accrued, but unpaid, interest and fees? • Are the EAD estimates for open-ended loans (such as credit cards and home equity lines of credit) measured by a method that accurately captures potential drawdowns up to default, within a one-year horizon? • For revolving products (home equity lines, credit cards, retail cards, etc.), how are inactive accounts treated in terms of their undrawn balances? • If a loan cures from default via modification or otherwise, and then re-defaults, does the EAD calculation reflect an appropriate determination as to whether this constitutes a single default event? 6. Determine if the organization has provided sufficient analysis and support for its EAD quantification methodology. 7. Is the EAD for each segment of exposures greater than or equal to the segment's current outstanding balance?	1. 2. 3. 4. 5. 6. 7.

<table>
<tr><th>7.02</th><th>Work program question</th><th>Overall assessment</th><th>Reference</th></tr>
<tr><td colspan="2">Are the data used to estimate EAD relevant to the organization’s retail exposures and of sufficient quality to support the determination of risk-based capital requirements for these exposures and, where the organization has limited relevant data, does the quantification process produce appropriately conservative EAD estimates?</td><td></td><td>122(c)(2)
122(c)(3)
122(c)(7)</td></tr>
<tr><td colspan="2">Review questions and procedures</td><td colspan="2">Supervisor comments (with references) by subcategory or portfolio, as appropriate</td></tr>
<tr><td colspan="2">1. Are the data used to estimate EAD representative of the current portfolio?
2. Do available internal data contain the necessary history and detail to correctly quantify the EAD estimates? If not, why?
3. Does the organization continue to add recent reference data as they become available?
4. If external data are used, are the data appropriately incorporated into the quantification process?
• Have differences in underwriting and lack of mapping to comparable segmentation criteria been considered and documented and has conservatism in the parameter estimates been incorporated?
• Does the organization regularly review mapping to external reference data and the appropriateness of uses of the reference data sets (vs. internal sources)?
5. If loan sales have occurred historically, have the data required for default identification and LGD measurement been retained or recovered?
6. Does the organization appropriately account for significant data gaps?
• What measures does the organization take to mitigate significant data gaps in the information on its own borrowers (e.g., obtain historical credit bureau data, or draw historical data from similar sections of the portfolio with identical borrower and loan characteristics, or other methods)?
• Where essential data elements necessary for accurate quantification are missing or have not been maintained, does the organization have a plan to capture the required data elements going forward?
• Does the organization document transitional approaches it has used to account for gaps in data histories and data gaps due to mergers or acquisitions?
• Does the organization take an appropriately conservative approach to quantification when data gaps exist?
7. To the extent that reference data do not meet the retail IRB definition of default, what adjustments have been made, if any, to reflect appropriate conservatism?</td><td colspan="2">1.
2.
3.
4.
5.
6.
7.</td></tr>
</table>

<table>
<tr><th>7.03</th><th>Work program question</th><th>Overall assessment</th><th>Reference</th></tr>
<tr><td colspan="2">Does the organization ensure that adjustments that are part of the EAD quantification process do not result in a pattern of bias toward lower risk parameter estimates?</td><td></td><td>122(c)(3)</td></tr>
<tr><td colspan="2">Review questions and procedures</td><td colspan="2">Supervisor comments (with references) by subcategory or portfolio, as appropriate</td></tr>
<tr><td colspan="2">1. Does the organization make any judgmental adjustments?
• If so, what adjustments are made and at what stage in the quantification</td><td colspan="2">1.</td></tr>
</table>

process are such adjustments applied? • How does the organization identify and address negative biases due to these adjustments?	

7.04	Work program question	Overall assessment	Reference
Are EAD estimates for retail segments based on at least five years of exposure amount data?			122(c)(6)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. How many years of exposure at default data are included in the reference data used to estimate EAD? • Is a minimum of five years of data used to estimate EAD? 2. If more than five years of reference data are available, to the extent that data are excluded, has the organization appropriately justified such exclusions? 3. Are the exposure data at the exposure, segment, or portfolio level?		1. 2. 3.	

7.05	Work program question	Overall assessment	Reference
Do the exposure amount data include a period of economic downturn conditions, or has the organization adjusted its EAD estimates appropriately to compensate for the lack of data from a period of economic downturn conditions?			122(c)(7)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Do the reference data include a period of economic downturn conditions? • What are the economic downturn periods? • Are the downturn periods consistent with the industry experience? 2. Are the downturn periods properly identified as periods where default rates are significantly above the average? • At what level (such as subcategory, portfolio, etc.) are economic downturn conditions determined? 3. If the reference data do not include a period of economic downturn conditions, evaluate the methodology and support for adjusting the EAD estimates. • Does the estimation methodology result in an appropriate degree of conservatism?		1. 2. 3.	

E. Validation, Stress Testing, and Review

Section 122(i)(4) Section 122(i)(6)	**Control, oversight, and validation mechanisms.** The bank must validate, on an ongoing basis, its advanced systems. The bank's validation process must be independent of the advanced systems' development, implementation, and operation, or the validation process must be subjected to an independent review of its adequacy and effectiveness. Validation must include: (i) An evaluation of the conceptual soundness of (including developmental evidence supporting) the advanced systems; (ii) An ongoing monitoring process that includes verification of processes and benchmarking; and (iii) An outcomes analysis process that includes back testing. ...

	The bank must periodically stress test its advanced systems. The stress testing must include a consideration of how economic cycles, especially downturns, affect risk-based capital requirements (including migration across rating grades and segments).

8. Validation, Stress Testing, and Review

Update log		
Subcategory/portfolio	Date	Prepared by

8.01	**Work program question**	**Overall assessment**	**Reference**
Does the organization validate, on an ongoing basis, its advanced systems?			122(i)(4)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Determine whether the organization has a well-documented and board-approved validation policy that encompasses key aspects of the segmentation systems and quantification processes and describes • independence. • the process and the timetable for validation activities. • the documentation requirements for validation. • specific assigned responsibilities. • tests and analysis to be performed. • well-defined governance structure to address, escalate, and resolve disagreements between validation and model development. • well-defined model adequacy thresholds for model/estimate error • corrective actions to be taken when inaccuracies are found. 2. Evaluate whether the organization's validation activities comprehensively assess the accuracy and reliability of the quantification process. • Does the organization maintain an updated schedule of validation activities that covers all material segmentation systems and retail IRB quantification processes? • Is the frequency of validation reviews sufficient to ensure that retail advanced systems are reasonably valid on continuous basis? • Does the organization have standards for the qualifications of validators? 3. What role does expert opinion play in validating the segmentation systems? 4. Which group(s) tests and monitors assignment of internal rating grades? Is there any group that tests and monitors assignment of internal rating grades that is independent from personnel and management functions responsible for originating exposures?		1. 2. 3. 4.	

8.02	Work program question	Overall assessment	Reference
Does validation include sufficient evaluation of the conceptual soundness of (including developmental evidence supporting) the advanced systems?			122(i)(4)(i)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Determine whether the validation evaluates developmental evidence supporting the segmentation and quantification processes, and whether the developmental evidence addresses the four aspects of quantification (reference data, estimation, mapping, and application). 2. Describe the validation testing and analysis conducted to evaluate developmental evidence. 3. Determine whether the organization updates developmental evidence when significant changes in methodologies, data, or implementation occur. 4. Evaluate the validation of developmental evidence. Establish whether the organization could reasonably conclude that • the advanced systems have been designed to meet the advanced approaches rule requirements. • the quantification process can be expected to accurately estimate PDs, LGDs, and EADs.		1. 2. 3. 4.	

8.03	Work program question	Overall assessment	Reference
Does validation include an adequate ongoing monitoring process that includes verification of processes and benchmarking?			122(i)(4)(ii)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Describe the ongoing monitoring process. 2. Determine whether the organization conducts ongoing process verification on the segmentation and quantification processes to ensure proper implementation and operation, including whether • segmentation and quantification processes are used, monitored, and updated as designed. • correct data are used to categorize exposures, segment the portfolio, and quantify the risk parameters. • ongoing monitoring activities are conducted. • evaluate the internal reports used by management to oversee and monitor the retail IRB system are evaluated. 3. Evaluate the organization’s benchmarking of its risk segmentation and quantification estimates • describe the benchmarking that the organization does, comparing results with both internal and external measures. • does the benchmarking include comparisons of chosen approaches to alternate methodologies? • does the benchmarking of low default segments or portfolios with limited defaults use methods that validate reliance on external data, pooled data, or factors based on proxies from “related portfolios” and is this justified, documented, and reasonable?		1. 2. 3.	

• Does the organization take timely, appropriate actions when benchmarking reveals unexpected or inconsistent results in risk segmentation or quantification? • Is benchmarking conducted as described in the organization's documentation and consistent with supervisory expectations?	

8.04	Work program question	Overall assessment	Reference
Does validation include an adequate outcomes analysis process that includes backtesting?			122(i)(4)(iii)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Describe the statistical methods to back-test the quantification process. 2. Determine whether the organization compares actual outcomes with expected ranges around the estimated values of the risk parameters for each segment. • Assess the organization's support for establishing those expected ranges and compare realized outcomes with predicted estimates (e.g., compare the actual long-run average default frequency for each segment with the PD assigned, the actual downturn conditioned loss rates experienced on defaulted exposures with the LGD estimates assigned, and downturn conditioned draw rates on defaulted exposures with EAD estimates). 3. Establish whether the organization's validation policy specifies the type and timing of remedial actions when backtesting tolerance limits are exceeded. • Determine whether the organization has established parameters around performance expectations (tolerance limits) and appropriate responses when actual and expected performance differ. 4. Determine whether performance thresholds are appropriately considered and model improvement appropriately acted on to improve model accuracy. 5. Assess whether backtesting is conducted as described in the organization's documentation and consistent with supervisory expectations. Where there are shortfalls or inconsistencies, have they been addressed?		1. 2. 3. 4. 5.	

8.05	Work program question	Overall assessment	Reference
Is the organization's validation process either independent of the advanced systems' development, implementation, and operation, or subjected to an independent review of its adequacy and effectiveness?			122(i)(4)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Establish that validation activities were performed or reviewed and verified independently. • Identify the unit/position responsible for performing independent review or validation activities. 2. Have validations effectively challenged the model and/or process development? • Consider any internal or external independent reviews of validation activities. Are the reviews complete? • Evaluate the sufficiency of the testing and analysis performed to test model development process and modelers support for the accuracy and reliability of		1. 2. 3. 4.	

the models. • Determine whether the depth of coverage is adequate. 3. Assess the process the organization uses to independently review the risk segmentation systems and parameter quantification processes to ensure that established policies and procedures are followed and are appropriately designed to provide reasonable assurance that the advanced approaches rule requirements are met. 4. Determine whether recommendations for corrective action have been adequately addressed and incorporated into the segmentation system and risk quantification process reviews.	

8.06	**Work program question**	**Overall assessment**	**Reference**
Does the organization periodically stress test its retail segmentation and parameter quantification systems as described in section 122(i)(6) of the advanced approaches rule, including consideration of how economic cycles, especially downturns, affect risk-based capital requirements (including migration across segments)?			122(i)(6)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Determine whether the organization has a well-documented stress-testing policy, procedure, or practice that encompasses the key stress scenarios and describes • the stress-testing process and the timetable for stress-testing activities. • outlines the documentation requirements for stress testing. • clearly specifies assigned responsibilities. • identifies tests and analyses to be performed. 2. Does the analysis include a range of plausible but severe scenarios? 3. Describe the scenarios analyses (historical, hypothetical, or model-based) and whether they are appropriate given the organization's risk profile. 4. Does the stress test consider the effects of migration across segments? 5. Does stress testing include all material retail portfolios? If not, what portfolios were omitted and why? 6. Is the time horizon of the analysis consistent with the specifics of the scenario and long enough to measure the material effects of the scenario on key performance measures? 7. Determine whether the stress testing of the advanced systems utilizes stressed parameter estimates reasonably calibrated to simulate the effects of downturn conditions on the retail portfolios. Do stress tests consider • the impact of downturn conditions on expected default rates and assess the impact on capital requirements from such default rates? • the impact of downturn conditions on the severity of losses in the event of default, including the realization of collateral value, selling of distressed debt, and other loss limiting actions taken by the organization to mitigate LGD? • whether downturn conditions result in additional draw of unused portions of commitments, the degree to which the organization can limit such additional exposure, and generally how the exposure profile is affected by the stress scenario? 8. In what way, if any, are stress-test results used within the organization?		1. 2. 3. 4. 5. 6. 7. 8.	

F. Calculation of Risk-Weighted Assets

Section 131(e)(1) Section 131(e)(2)	**Calculation of risk-weighted assets.** (1) Non-defaulted exposures. (i) A bank must calculate the dollar risk-based capital requirement for each of its segments of non-defaulted retail exposures by inserting the assigned risk parameters for retail segment into the appropriate risk-based capital formula specified in Table 1 to section 131 and multiplying the output of the formula (K) by the EAD of the exposure or segment. Alternatively, a bank may apply a 300 percent risk weight to the EAD of an eligible margin loan if the bank is not able to meet the primary federal supervisor's requirements for estimation of PD and LGD for the margin loan. (ii) The sum of all the dollar risk-based capital requirements for each segment of non-defaulted retail exposures calculated in paragraph (e)(1)(i) of section 131 and in paragraph (e) of section 135 equals the total dollar risk-based capital requirement for those segments. (2) Segments of defaulted retail exposures. (i) Not covered by an eligible U.S. government guarantee: The dollar risk-based capital requirement for each segment of defaulted retail exposures not covered by an eligible guarantee from the U.S. government equals 0.08 multiplied by the EAD of the segment. (ii) Covered by an eligible U.S. government guarantee: The dollar risk-based capital requirement for each segment of defaulted retail exposures covered by an eligible guarantee from the U.S. government equals the sum of: (a) The sum of the EAD of the portion of each segment of defaulted retail exposures that is covered by an eligible guarantee from the U.S. government multiplied by 0.016, and (b) The sum of the EAD of the portion of each segment of defaulted retail exposures that is not covered by an eligible guarantee from the U.S. government and the resulting sum is multiplied by 0.08. (iii) The sum of all the dollar risk-based capital requirements for each segment of defaulted retail exposures calculated in paragraph (e)(2)(i) of section 131 plus the dollar risk-based capital requirements for each segment of defaulted retail exposures calculated in paragraph (e)(2)(ii) of section 131 equals the total dollar risk-based capital requirement for those segments.

9. Calculation of Risk-Weighted Assets

Update log		
Subcategory/portfolio	Date	Prepared by

9.01	**Work program question**	**Overall assessment**	**Reference**
For each segment of non-defaulted retail exposures (excluding eligible margin loans covered under question 9.02), has the organization calculated K by inserting the assigned risk parameters for that segment into the following risk-based capital formula, $K = \left[LGD \times N\left(\frac{N^{-1}(PD) + \sqrt{R} \times N^{-1}(0.999)}{\sqrt{1-R}} \right) - (LGD \times PD) \right]$ with R=0.15 for residential mortgage exposures, R=0.04 for qualifying revolving exposures, or R=0.03 + 0.13 x e^{-35xPD} for other retail exposures? Is K then multiplied by EAD of the segment to determine risk-based capital for each segment?			131(e)(1)(i)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Review the organization's calculation of its risk-based capital requirements.		1.	

9.02	Work program question	Overall assessment	Reference
For each non-defaulted eligible margin loan that is a retail exposure and was not included in the calculation described in question 9.01, has the organization calculated its risk-based capital requirement by multiplying the EAD of the segment by 24 percent?			131(e)(1)(i)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Review the organization’s calculation of its minimum regulatory risk-based capital requirement.		1.	

9.03	Work program question	Overall assessment	Reference
For each segment of defaulted retail exposures that is not covered by an eligible guarantee from the U.S. government, is the minimum risk-based capital requirement equal to 0.08 multiplied by the EAD of the segment?			131(e)(2)(ii)(B)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Review the organization’s calculation of its minimum regulatory risk-based capital requirement.		1.	

9.04	Work program question	Overall assessment	Reference
Does the organization sum the calculated risk-based capital for each segment of non-defaulted retail exposures and for each defaulted segment of retail exposures to determine the total risk-based retail IRB capital requirement?			131(e)(1)(ii) 131(e)(2)(iii)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Review the organization’s calculation of its minimum regulatory risk-based capital requirement.		1.	

9.05	Work program question	Overall assessment	Reference
Does the organization’s total risk-based capital calculation for all retail exposures include non-material portfolios of retail exposures?			131(e)(4)
Review questions and procedures		**Supervisor comments (with references) by subcategory or portfolio, as appropriate**	
1. Review the organization’s calculation of its minimum regulatory risk-based capital requirement in accordance with section 131(e)(4).		1.	

Appendix 1: Suggested Review Items

A. Governance, Documentation, Control, and Use

- Key board-level reports summarizing the performance of the retail IRB system.
- Board-approved implementation plan, gap analysis, and project plans.
- Minutes and board packages from board meetings or relevant board committee meetings where IRB issues are discussed, including board approval of the components of the retail IRB system and review of the effectiveness of controls.
- Board-related findings from other IRB review areas.
- Retail IRB-related committee charters and reporting structures.
- Functional organizational charts showing responsibility for retail IRB activities.
- Flow charts describing IRB processes and approval points.
- Key reports used by senior management to implement, oversee, and monitor compliance of the retail IRB systems.
- Minutes and packages from senior management meetings where retail IRB issues are discussed.
- Minutes of management meetings where validation results were discussed.
- Results of the organization's internal IRB monitoring activities.
- Internal audit policies, work programs, and work papers related to the bank's assessment of the effectiveness of the controls and oversight of the IRB system.
- Management responses to audit findings and criticisms, along with corrective actions to address audit findings.
- Examination findings related to
  - validation of the segmentation and quantification processes.
  - independent reviews of data maintenance.
  - other internal controls related to the IRB system, including the independence of control processes conducted by the line of business.
  - qualifications of independent review staff.
  - targeted reviews conducted by supervisors responsible for ongoing supervision of the organization.

B. Risk Segmentation Systems for Retail Exposures

- Segmentation policies, procedures, and training materials.
- Documentation of segmentation system design describing the factors used to develop the segmentation approach (e.g., statistical analysis comparing various segment distribution methods).
- Documentation and analyses supporting the risk drivers or loss characteristics used for segmentation, including statistical analysis demonstrating the reasonableness and reliability of risk drivers and boundary values.
- Documentation supporting the number or granularity of retail risk segments.
- Latest summary retail risk segmentation report that includes applicable parameter values.
- Latest summary report detailing information regarding retail exposures deemed nonmaterial and thus not subject to the retail IRB approach.
- Reconcilements of exposures from the data warehouse supporting the quantification process to the general ledger.
- Policies and practices concerning past due loans and charge-offs.
- Latest summary reports detailing past due, non-accrual, and charged off retail loans.
- Segmentation policies, procedures, and training materials related to ongoing monitoring, refreshing data, and migration of exposures among segments.
- Monitoring reports used for review and migration purposes, such as migration patterns with emphasis on unexpected results, changes in risk parameter estimates, and changing portfolio trends and risks.

- Documentation and support for migration of exposures between segments.
- Scope, findings, and supporting documentation from the validation process.
- Examination findings from the review of validation.
- Policies, procedures, and training materials relating to the annual review of the segmentation system.
- Results of the annual review of the segmentation system and recommendations for modification.
- Documentation and support for changes in or modifications to the segmentation system.
- Documented approvals for any system modifications.
- Minutes from discussions with individuals assigned to conduct the annual review.
- Results of tests of system modifications to ensure consistency of data and ensure reliable risk segmentation.
- Policies and procedures governing the identification, capture, and recording of defaults.
- Internal audit plans, reports, issues, and issue resolution plans related to internal risk rating systems.

C. Data Management and Maintenance

- Prior IT examination findings.
- Previous examination findings for risk segmentation, quantification, and validation that detail shortcomings in the required data elements and data systems.
- Management organization charts for credit risk management and IT departments that display IRB roles and responsibilities.
- Data maintenance policies and procedures.
- Documentation pertaining to risk characteristics, monitoring characteristics, and performance data used for segmentation and quantification purposes.
- Minutes from credit risk management meetings, IT steering committee meetings, and other executive management meetings devoted to data maintenance.
- Documentation maintained by the organization to validate the use of a period of economic stress or a period of high losses.
- Recent portfolio sales or securitization reports, completed asset sales contracts or securitization agreements.
- The information security program and its associated risk assessments for IRB data maintenance functions.
- Data maintenance system budget and resource information.
- Topologies of data systems and asset transaction flows.
- Data and data system gap analysis and documentation.
- Interim mitigation strategies for gaps in asset data and data collection and retention systems.

D. Quantification of Risk Parameters

- Policy regarding and documentation supporting the quantification of the organization’s IRB process.
- Previous examination findings, data, and analysis related to the organization’s quantification processes, including findings from credit, MIS, and internal capital adequacy assessment process reviews.
- Documentation describing how the organization addresses all of the issues presented in the data, estimation, mapping, and application stages.
- Documentation describing the frequency of updates to risk segmentation criteria and parameter estimates.
- Policy governing risk parameter estimation methods including the specific calculation methods and data history utilized for the PD, LGD, and EAD.
- MIS trend reporting of key measurements, such as the portfolio risk distribution, credit line and balance measurements, prepayment and attrition rates, and charge-offs.
- Policy governing vintage analyses and other MIS-related to seasoning.
- MIS reporting for defaulted loans of charge-offs, plus credit line and balance measurements before default.
- Collections reporting on charged-off balances and the associated recovery streams, as well as analyses of recovery costs and timing from charge-off to recovery.

- Documentation of any loan level credit risk mitigants obtained for any portfolios or portions of portfolios (e.g., insurance).
- Policy and documentation related to IRB system's data warehouse design, including detailed information on variables available at the loan level (borrower and loan characteristics and disposition variables) and the length of data history.
- Policy and documentation of the organization's MIS, specifically the balance, credit line and loss measures that are reported, the granularity of the data, and the length of data history.
- Policy and documentation of the organization's data system for collections, such as the loss and recovery measures tracked for loans in collections, granularity of these measurements, and length of history available for the collections data.
- Documentation of external data utilized in the quantification process for a risk parameter.
- Documentation on any analysis conducted to relate the internal portfolio performance to the economy, specifically any external economic drivers or performance benchmarks.
- Documentation of historical asset sales and securitization activity.
- Documentation of differences in credit quality between asset sales or securitizations and the entire portfolio.
- Policies and documentation governing the regular sales or securitizations of assets, such as legal specifications, forward sales contracts or other agreements to originate and sell. There should be specific documentation on the regularity of sales or securitization practices over time.
- Documentation on methodologies to calculate or impute the historical performance of loans that were sold or securitized.
- Audit reports and the firm's self-evaluations relating to the quantification process.
- Documentation on whether the reference data set includes downturn credit cycle(s), and if not, the adjustment methodology for arriving at appropriate parameters.

E. Validation, Stress Testing, and Review

- Validation policy.
- The organization's model policies.
- Documentation of validation methods employed and the frequency of validation.
- Internal or external validation studies used by the organization.
- Recent model validation results.
- Management's plans for implementation of model review recommendations including plans for remedial action.
- Scope, findings, and relevant documentation from examinations of IRB components (including assessments of organization modeling experience and expertise).
- Scope, findings, and supporting documentation from independent IRB system reviews and the annual IRB assessment. (Note: Independent reviews are not required if validation is conducted independently.)
- Developmental evidence for the IRB system.
- Policies related to the updating of developmental evidence.
- Ongoing performance reports.
- Results of process verification and benchmarking exercises.
- Policies related to ongoing monitoring.
- Ongoing override monitoring reports.
- Audit review of ongoing monitoring and benchmarking processes.
- Policies related to outcomes analysis/back testing.
- Back testing analyses and reports.
- The methodology for setting tolerance thresholds.
- Statistical models fit to long-run outcomes, in order to establish accompanying tolerance thresholds (e.g., time series models).
- Evidence that tolerance thresholds consider the relative frequency of back testing and parameter updates.

- Procedures and results of the back testing process.
- Justification for any adjustments in the forecasted risk parameters when comparing with recent outcomes, e.g., backing out any conservative adjustments to the risk parameters.
- Organization charts and reporting structures indicating position and reporting lines of validation staff relative to segmentation and quantification staff.
- Documentation of the validation processes.
- Audit review of validation, back testing, and benchmarking, especially the annual assessment of the IRB system.
- Scope, findings, and supporting documentation from the validation or independent review of the validation.
- Reports to senior management on the performance of the retail risk segmentation system.
- Background information on organization staff conducting the validation or other independent reviews of this area.
- Results of any stress testing for these portfolios.
- Documentation of realized recessionary outcomes.
- MIS on portfolio distributions by segment over time.
- Results of any analyses of migrations between segments.
- Documentation of variables specified in a recessionary scenario, such as interest rates, transition matrices (ratings and score-band segments), asset values, growth rates, or unemployment rates.

F. Calculation of Risk-Weighted Assets

- Documentation supporting the risk-weighted asset calculation.
- Organization’s most recent reporting form FFIEC 101.
- Reconciliation reports tying exposures in general ledger to exposures used to report RWA.
- Internal analysis of RWA under general risk-based capital rule versus advanced approaches rule by subcategory or portfolio.

Appendix 2: Additional Reference Items

Section 101	**Default - (1) Retail.** (i) A retail exposure of a [bank] is in default if: (a) The exposure is 180 days past due, in the case of a residential mortgage exposure or revolving exposure; (b) The exposure is 120 days past due, in the case of retail exposures that are not residential mortgage exposures or revolving exposure; or (c) The bank has taken a full or partial charge-off, write-down of principal, or material negative fair value adjustment of principal on the exposure for credit-related reasons. (ii) Notwithstanding paragraph (1)(i) of this definition, for a retail exposure held by a non-U.S. subsidiary of the bank that is subject to an internal ratings-based approach to capital adequacy consistent with the Basel Committee on Banking Supervision's "International Convergence of Capital Measurement and Capital Standards: A Revised Framework" in a non-U.S. jurisdiction, the bank may elect to use the definition of default that is used in that jurisdiction, provided that the bank has obtained prior approval from its primary federal supervisor to use the definition of default in that jurisdiction. (iii) A retail exposure in default remains in default until the bank has reasonable assurance of repayment and performance for all contractual principal and interest payments on the exposure.
Section 2, subpart A of the regulatory capital rules	**Residential mortgage exposure** means an exposure (other than a securitization exposure, equity exposure, statutory multifamily mortgage, or presold construction loan) that is: (1) An exposure that is primarily secured by a first or subsequent lien on one- to four-family residential property; or (2) (i) An exposure with an original and outstanding amount of $1 million or less that is primarily secured by a first or subsequent lien on residential property that is not one-to-four family; and (ii) For purposes of calculating capital requirements under subpart E of this part (the advanced approaches rule), is managed as part of a segment of exposures with homogeneous risk characteristics, not on an individual-exposure basis.
Section 101	**Qualifying revolving exposure (QRE)** means an exposure (other than a securitization exposure or equity exposure) to an individual that is managed as part of a segment of exposures with homogeneous risk characteristics, not on an individual-exposure basis, and: (1) Is revolving (that is, the amount outstanding fluctuates, determined largely by the borrower's decision to borrow and repay, up to a pre-established maximum amount, except for an outstanding amount that the borrower is required to pay in full every month); (2) Is unsecured and unconditionally cancelable by the bank to the fullest extent permitted by federal law; and (3) (i) Has a maximum exposure amount (drawn plus undrawn) of up to $100,000, or (ii) With respect to a product with an outstanding amount that the borrower is required to pay in full every month, the total outstanding amount does not in practice exceed $100,000.
Section 101	**Other retail exposure** means an exposure (other than a securitization exposure, an equity exposure, a residential mortgage exposure, a presold construction loan, a qualifying revolving exposure, or the residual value portion of a lease exposure) that is managed as part of a segment of exposures with homogeneous risk characteristics, not on an individual-exposure basis, and is either: (1) An exposure to an individual for non-business purposes; or (2) An exposure to an individual or company for business purposes if the bank's consolidated business credit exposure to the individual or company is $1 million or less.