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Consultation paper on technical aspects of diversification under Pillar 2

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Introduction

1. This Consultation paper represents the current thinking on the areas of supervisory interest regarding an institution's management structure, organisation and internal controls within the framework of risk diversification under Pillar 2.

2. The scope of this Consultation paper is limited to discussion of the incorporation of diversification effects within the broader assessment of capital models. It is assumed, as a prerequisite, that the supervisors are satisfied with the general quality of the organisation, internal controls and risk management of an institution under their supervisory review process (cf. CEBS Guidelines on the Application of the Supervisory Review Process under Pillar 2).

3. The core objective of this Consultation paper is to provide the basis for an on-going dialogue (serving as a structured tool for this dialogue) between supervisors and the industry with a view to delineating better the conditions under which a diversification framework can be considered to be satisfactory.

4. Given the technical nature and complexity of the diversification framework, the potential for evolution in capital models' parameters and characteristics, as well as the spirit of the overall Pillar 2 framework, it was felt to be useful at this early stage to develop a document that would highlight general qualitative and quantitative elements that supervisors would have in mind when assessing the process surrounding the measurement and use of diversification effects by institutions.

5. Supervisors are particularly interested in the demonstration of the stability of an institution's diversification framework in the context of its economic capital model, especially under stressed conditions. Therefore, given the sensitivity of the results to correlation estimations, supervisors will value the development of a prudent and conservative approach documented by a thorough analysis of existing studies in the field and their application to the specifics of an institution. The documentation of the methodologies and processes surrounding the determination of diversification effects is a key aspect for supervisors and, as such, has been highlighted throughout the paper.

6. Apart from the general dialogue with the industry, the current paper could be used as a tool for the institution specific ICAAP-SREP dialogue. However, this paper is neither comprehensive nor exhaustive in nature. It is a flexible tool aimed to help supervisors to better understand the diversification methodology chosen by institutions. Supervisors may choose to follow another approach or put more or less emphasis on specific elements depending on their approach. Institutions should not therefore conclude that national supervisors will always refer to the present paper or the list of questions provided during the supervisory review and evaluation process of diversification benefits.

7. Most of the principles laid down in the Consultation paper are derived in part from the following CEBS guidelines: Guidelines on the implementation, validation and assessment of Advanced Measurement (AMA) and Internal Ratings Based (IRB) Approaches (for example, sections on vendor models, internal model validation, and to some extent parameters, etc) and Guidelines on technical aspects of stress testing under the supervisory review process (section on stress-testing).

8. The paper is structured into seven main sections putting forward issues for consideration by supervisors relating to: i) general overview of capital/diversification model; ii) diversification parameters; iii) reliability and conservatism of the methodology; iv) internal model validation; v) internal decision making and process/governance structure of the model; vi) understanding the differences between Pillar 1 and Pillar 2 results; and vii) diversification across groups.

9. In the annex, a list of possible questions on diversification models is provided. Keeping in mind that the ICAAP is a bank driven process, these questions are intended to assist supervisors in their assessment by identifying potential key issues concerning diversification effects. The list is not exhaustive, and no indication is given as to the "correct" answers, nor of the relative priority that should be given to the different questions.

10. Keeping in mind the constant evolution of industry practices and supervisory approaches to the assessment of capital models (including diversification effects), CEBS will pay due attention to field testing the principles and questions put forward in the current paper. The list of questions in the appendix will be tested in the course of a CEBS ECM examination project in 2008-2009. Feedback from those on-site examinations that have already been completed is reflected in this paper. Both the principles laid down in the paper and the questions in the annex are likely to require further revision and elaboration later in 2009 once more ECM examinations have been completed.

1. General overview of the capital model

1.1 Methodology and documentation

11. Given the inherent complexity of estimating diversification effects, and in order to assess the appropriateness of the measures, supervisors would be particularly interested in the methodological approach that has been chosen by institutions to estimate the dependency structures and perform the aggregation of the various risks they are exposed to, and the rationale for their choice. The known limitations of the methodological approach chosen will also deserve particular attention from supervisors and institutions.

12. In some instances, partial models (i.e. focusing on one risk type) may be used in order to estimate more specifically intra-risk diversification. In that case, the areas of interest presented in this document remain exactly the same. Nevertheless, in the case of Pillar 1 risks, it will be important to pay

due attention to the fact that diversification assumptions are already included in the current Basel II framework. For instance, the IRB approach is based on the assumption of an infinitely ("asymptotically") diversified portfolio. In these cases supervisors are likely to be interested in understanding the validity of institutions' own assumptions regarding intra-risk diversification.

13. The use of a model exposes the institution to so-called "model risk", i.e. the risk that models are not sufficiently representative of reality, that they are applied to tasks for which they are inappropriate or are otherwise implemented incorrectly[1]. Therefore, this type of risk is generally taken into account in the development of the methodology by the means of conservative margins, sensitivity analysis or stress testing for instance. Model risk can, in particular, find its origin, for example, in the following causes:

- inappropriate model design;

- unidentified risk factors;

- badly specified risk factors;

- erroneous basic assumptions;

- failure in the model calibration using market data;

- misuse of the model; and/or

- data instability.

14. It is also important that the model has been adequately documented in order to ensure maintenance of the appropriate knowledge and continuity within the relevant parts of the institution. This principle is relevant even if the institution relies on a third party provider for the development of the model. As the model evolves over time (new activities, new products, technology changes, etc), it is important that documentation is regularly reviewed and updated (generally by the function in charge of risk management). Accessibility of the documentation to the relevant persons within the institution will help to meet the twofold objective of knowledge and continuity.

15. The following minimum information is generally considered to be available as a part of the model documentation:

- a mathematical description of the model;

- a non-mathematical description of the model including a definition of the technical terms used;

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[1] It is not the intention of this paper to define the "model risk", therefore the definition used here is not exhaustive and does not necessarily represent CEBS's complete views.

- information on the data that feed the model (identification, sources, coherence, input frequency, etc.);

- the basic assumptions of the model and the results of the tests as regards the adequacy (i.e. well founded and observable) of these assumptions (the basic idea is to highlight an overestimation or underestimation bias);

- the reasons for the various choices made during the model's development and an estimate of their impact on the precision of the model (e.g. the modelling technique, length of the observation period, factor loadings of the data, exclusion of certain risk factors or business units, etc);

- a history of the modifications made to the system, mentioning the impact of the modifications on the results from the model; and

- the methodology and the scenarios used for crisis simulations.

1.2 Scope

16. A model developed by an institution at the group level would ideally cover all material activities and business lines incorporating, to the extent possible, all the material legal and operational entities of the group. In that case, it is particularly important to ensure compatibility between various models or an integrated approach to the risk measures and the determination of diversification effects. Additionally, the steps and level of aggregation of the model results (e.g. risk by risk, or business unit by business unit, or at legal entity level) would ideally be justified and documented.

17. Risk factors that have a significant influence on the risk profile of an institution, and therefore on its internal capital estimates, should be identified and included in the model. It is important to retain the risk factors, as well as the potential exposures' interrelationships, that are relevant given the nature, size and complexity of its activities and portfolios.

18. In order to ensure consistency in an institution's risk management approach, coherence should ideally be maintained in the specification of the risk factors between the various models used by the institution.

19. Supervisors may ask institutions to demonstrate that all the relevant risk factors are included, or to demonstrate its immateriality if an institution excludes a risk factor. More important is the demonstration that there is no contradiction between the scope of the model and the scope of internal risk management.

1.3 Model structure and parameter estimation

20. A fundamental factor underlying the estimation of (both intra- and inter-risk) diversification benefits concerns the type of model. Models may have fundamentally different structures (e.g. reduced form versus structural models) or models may be run in a different set-up (e.g. in default mode versus mark-to-market mode). In the case of inter-risk aggregation models, there are several different techniques, such as simple summation (no

diversification effects), variance-covariance approaches, copulas or more advanced application of simulation approaches.

21. Different theoretically well founded model structures may lead to different outcomes, even for similar portfolios. Although this may appear counterintuitive at first sight, it is a logical consequence of working with models, since models are a simplification of reality. At present, there appears to be no consensus on which model structure serves best for which situation. That said, it is important that the model structure applied fits with the characteristics of the portfolio that it tries to describe. For example, in a highly interrelated market structure, it may be desirable to explicitly account for contagion effects among borrowers. Also, specific interrelationships between risk types can be of relevance, especially in tail events, for example between market and credit risk (e.g. "wrong way" risk) or between market and operational risk. Failing to include relevant market characteristics may result in overestimation of diversification benefits.

22. As a next step, when a certain model is chosen, its parameters need to be estimated. In practice there will be a trade-off between the richness and complexity of a model's structure and the extent to which parameters can be estimated in a reliable manner. For example, the use of copulas to model inter-risk diversification effects may do justice to the non-linear relationship that exists between risk types, but at the same time the model could be difficult to calibrate and validate. Another example that may occur in practice is the absence of relevant data to estimate parameters. When trying to model interdependencies between retail or SME exposures, institutions often (have to) rely on data based on equity prices that may not be representative for such exposures. Also, institutions may rely on 'black box' vendor model parameters, for which it can be difficult to assess their meaningfulness in the context of the institution's portfolio.

23. For these reasons, it is important for supervisors to understand the institution's motivation for the selection of a certain model structure in relation to its portfolios and the assumptions underlying that model, as well as the linkage with the subsequent parameter estimation process.

1.4 Vendor models

24. An institution may decide to rely on third party providers to develop their internal model (or a part of it).

25. Models obtained from an independent third party vendor that claim proprietary technology are expected to be treated in the same way as internally developed models. In particular, these models generally have to meet the same internal and, if applicable, external requirements, as internally developed models. It should also be emphasised that outsourcing and the use of vendor models does not reduce the management responsibility of the institution. Therefore, supervisors are likely to be particularly interested on the following aspects:

- The extent to which internal control, internal audit or another similar function and validation team adequately cover the vendor model. Internal

audit or other similar function and the eventual validation team remain fully responsible for its control (qualitatively and quantitatively). Full access to information as well as proper documentation are important.

- The extent to which adequate transfer of competence is ensured to enable the institution to understand the model in all its aspects (knowledge and continuity principle). Special emphasis may therefore be placed on the institution's knowledge concerning the development and appropriate use of external vendors' models.

26. This underlines the importance that, for example, the development and fundamentals of the internal validation process of external vendors' models performed by an institution are documented in a way that enables interested parties (e.g. auditors, supervisors) to gain a detailed understanding of the methodology applied and to assess whether the model is performing adequately. It is considered of particular importance that the limitations of the model and the circumstances in which the model does not perform as expected are known by the institution.

27. To achieve such internal knowledge, institutions will generally require appropriate training from the service provider/model vendor.

28. Continuity is a key element to be considered by institutions. Therefore, supervisors are likely to be particularly interested in measures that guarantee the on-going maintenance of the model even in the event that the vendor discontinues support, or similar events.

2. Diversification parameters

2.1 Data / time series availability and quality

29. One of the main challenges in modelling diversification effects is controlling model risk, i.e. in this case the risk of inappropriately modelling diversification, especially overestimating diversification effects.

30. Model risk may derive from the methodology chosen (see Section 1.1) but also from the diversification parameters. Therefore, due care is expected to be taken in the definition of these parameters as well as in the data selection process.

31. Broadly there are two main methods for estimating diversification parameters: statistical techniques and expert judgment. In both cases, third party estimates may be used, while in some cases market implied correlation estimates may be derived.

32. The most sensitive issue in applying statistical methods is the availability and quality of the data input.

33. In the first case (i.e. availability of data), statistical methods generally need a minimum length of time series (minimum number of time points or intervals), and typically the longer these time series are, the better the

results will be. On the other hand, longer time series may also suffer from structural breaks in the data. In particular, in order to ensure the consistency of the results, the appropriateness of the length of the time series should be determined according to the specifics of the intended parameter estimation technique and the risk profile of the institution, as well as the objectives set in terms of capital planning.

34. When a sufficient data set is not available, some approximation may be used in which case supervisors may want to pay attention to the justification for the use of an appropriate methodology and suitable alternative data. In some cases, shorter time series may be more appropriate, e.g. if there are significant modifications in the volatility or the correlation of the risk factors, enabling the model to react more rapidly to these changes. Supervisors may be interested in the extent to which institutions have developed a well justified policy on their tolerance for gaps in the data set and conservative approaches for treating missing data, seeking to minimize the amount of missing data over time.

35. In the second case (i.e. data quality), the following aspects may be especially important:

- the source of data (in particular, is it a reliable source or not);

- the completeness of the data sets (availability of all necessary data; any missing data; the percentage of missing data);

- techniques used to estimate the missing data and appropriateness of those techniques;

- the necessity, nature and adequacy of possible adjustments or transformations of the data sets; and

- the extent to which data are representative of the portfolios under consideration.

36. Identifying potential or existing data quality problems is a core issue that supervisors will be interested in, but supervisors will be also interested in how these problems have been analysed and resolved by the institution. The timely reaction of the management and the quality of its response may be important elements in the assessment that will be performed by the supervisors.

37. In order to ensure the adequacy of the data input, appropriate infrastructure and control mechanisms are expected to be implemented. Within that framework, the frequency of adaptations of the historical time series that are used is particularly important. They will generally depend on the nature and the volume of an institution's activities or will be triggered by significant modifications in market conditions.

2.2 Correlations

38. The terms "correlation" and "diversification parameter" are generally used interchangeably, reflecting the fact that currently the most common

technique for defining diversification effects is the use of correlation matrices. It is of interest to supervisors to ensure that the dependency structure of the different risk drivers, portfolios or business lines (depending on the level of diversification) are determined and transposed in an appropriate set of correlation parameters.

39. The technique used to approximate correlations should be appropriate to the nature and complexity of the institution. In particular, a significant change in the risk profile, business strategy or risk appetite of an institution will be likely reflected in the correlation parameters. Given the inherent complexity of assessing correlation, the creation of a benchmarking exercise referring to academic research and best practices, as well as information from peers, can prove to be useful.

40. In order to ensure that correlations are measured in a sufficiently precise way, institutions could be asked to demonstrate for instance that:

   • the statistical method used for estimating correlations is statistically meaningful by the use of "goodness-to-fit" tests (like an R^2 in the case of a regression analysis);

   • the correlation estimates are sensitive to the portfolios' compositions; and

   • by paying due regard to the content of para. 54 below, the correlation estimates are reasonably stable over time.

41. Additionally, supervisors may pay attention to the extent to which institutions appropriately consider potential and effective parameter estimation errors and biases.

42. As for the data stream, supervisors are interested in whether appropriate infrastructure and control mechanisms have been implemented (or are planned) for monitoring and measuring correlations in an adequate manner. Institutions could also usefully present the steps they intend taking to improve such monitoring and measurement.

43. As already mentioned in Section 1.1, these elements generally form part of a detailed and comprehensive documentation of models (including explanations of choices of methods).

2.3 Third party parameters and data

44. Supervisors may be interested in whether institutions are aware of what information (data) is processed in the external vendor model and how this information is linked to information that is processed in-house.

45. Supervisors may also be interested whether institutions make sure that the aggregation of the different parts of the model does not result in the inconsistent application of the model, particularly in cases where parts of the model developed externally are used simultaneously with parts developed in-house.

46. Reliance on third party parameters (which usually result from the use of vendor models – see Section 1.4) could give rise to reliability issues. It is of relevance that those parameters are representative for the institutions concerned. Data availability and update frequency are particularly important in such instances.

47. In the case of third party parameters, complementary checks and/or adjustments may be needed using an appropriate system of reconciliation and validation of the data provided (i.e., are these figures reliable and do they provide the expected results?). Contingency plans could also be considered in case of the unavailability of some of the external providers.

48. Once again, as for proprietary data, detailed documentation of the data sources and methodologies (including the data cleaning process and a description of adjustments) is of importance.

2.4 Statistical vs. expert based estimates

49. In cases of expert based estimates (or a combined statistical-expert based estimation), the key issue is how the risks associated with the subjectivity of expert-based techniques are addressed and controlled.

50. Several approaches such as benchmarking, margins for conservatism, stress or sensitivity tests, etc. could be used to ensure the appropriateness and the stability of the estimates.

51. Supervisors may consider it relevant that institutions, in spite of having all of these tools, have sufficiently convincing evidence and argumentation to demonstrate that their capital estimates will not be distorted (at least downward) in an undesirable way due to the use of these parameters, even in stressed situations.

3. Reliability and conservatism of the methodology

3.1 Robustness, stability and conservatism

52. The robustness, stability and conservatism of the methodology adopted by the institution are among the key issues of interest to supervisors when looking into capital models.

53. As far as robustness is concerned, one of the main areas of interest for supervisors is the performance of the model. Apart from being sufficiently accurate, an indication of robustness could be that the performance of the model remains satisfactory under different economic conditions. It is important that the results are not biased by backward-looking evidence. The estimation process should reflect current and foreseeable market conditions and provide forward-looking estimates of the diversification benefits, resulting in prompt reaction to sudden changes in the economic cycle.

54. The assumptions on the stability of the correlation parameters over time also deserve attention from the supervisors. Correlations might show a degree of instability, due to systemic (e.g. financial turmoil) and/or idiosyncratic reasons that might lead to errors when assessing diversification benefits. Potential sources of instability could be addressed in the estimation process for the correlation parameters; examples of this might be the simulation of stressed parameters and/or estimation under stressed scenarios.

55. Finally and importantly, given the inherent possibility of drawbacks and/or pitfalls occurring in the methodology because of the overall complexity of the models, supervisors may want to pay attention to ensuring that an adequate margin of conservatism is embedded in the estimates. Where the methods and data are less robust (e.g. short time series, expert-based assumptions that cannot be observed directly, use of benchmarks derived from third parties' experience), the range of errors may be wider, and consequently, the margin of conservatism would need to be larger.

3.2 Stress-testing

56. By performing stress-tests on a regular basis possible events or changes in market conditions that could adversely affect the size of the estimated/claimed diversification effects could be identified. It is up to institutions to establish the methodological framework of the stress-testing and to demonstrate the adequacy of these frameworks to supervisors.

57. Supervisors would expect that, regardless of the approach adopted, the stress-testing methodology and procedures are appropriately documented by institutions, and the documentation allows them to understand the impact of stressing different parameters on the diversification effects. This includes a description of the assumptions lying behind the stress, the data used (e.g. internal vs. external), the "severe but plausible events" assumed and, possibly, the "second round" effects taken into account.

58. While reviewing the models used to quantify diversification benefits, supervisors aim to gain an insight into how institutions test their systems' behaviour and suitability under stressed conditions, which would imply, inter alia, an analysis of dependency structures embedded in the models, of the volatility of correlation parameters and of possible differences in the methodology adopted in stressed situations vis-à-vis the normal situation.

3.3 Sensitivity analysis

59. Supervisors are likely to be interested in whether institutions, within the overall framework of their monitoring activity, make use of sensitivity analysis aimed at verifying the impact of the chosen levels of the diversification parameters and other key drivers of the diversification benefits. In addition, supervisors will be interested in knowing how the results of the sensitivity analysis are taken into account in decision-making processes or reflected in management actions.

60. To this end, the dialogue between institutions and supervisors will help the supervisors obtain a deep knowledge of the process set by the former to

perform sensitivity analysis. This could cover, inter alia, the tests adopted and the range of parameters/assumptions used.

61. The data to be shared with supervisors could include the following:

    • effects of the elimination (or addition) of significant parts of institutions' business (e.g. the sale of a business unit / merger according to strategic plans);

    • changes in correlation assumptions; and

    • impact of omitting from the model some of the risks / risk factors faced by the institution.

62. Supervisors would need to have insight into the results of the analysis in order to be able to understand which are the model parameters contributing the most to the diversification benefits and how the results of the sensitivity analysis contribute to the calibration of the diversification parameters and to the improvement of the model.

4. Internal model validation

63. Internal model validation[2] is the responsibility of the institution itself and not the supervisors. It has to be stressed that it is in the best interests of the institution to ensure the accuracy and robustness of the diversification parameters, which are not only used for the purposes of the ICAAP, but also for internal decision-making processes.

64. In the context of the present paper, internal model validation can be seen as the foundation for ensuring the accuracy and stability of the models used as the basis for claiming diversification benefits in the context of the ICAAP. If for any reason the models do not meet the desired degree of accuracy, it will be necessary maintain sufficient conservatism.

65. Internal model validation is essentially a forward-looking process providing assurance about the robustness of the model and contributing to the model's improvement. It is an on-going, iterative process taking into account both the changes in the economic environment and in the business operations of the institution.

66. Supervisors will be interested in the extent to which the validation process is subject to a formal procedure. In that context, the following elements could be of interest to supervisors:

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[2] CEBS has addressed the issue of internal model validation in the Guidelines on the implementation, validation and assessment of Advanced Measurement (AMA) and Internal Ratings Based (IRB) Approaches, published in April 2006

- In order to avoid potential conflicts of interest and to ensure the highest level of integrity, it is important that the model validation is performed by an internal function of the institution which is sufficiently independent from the model design and development.

- The level of knowledge and technical training of the validation team.

- The validation process covers the assumptions, as well as the limitations on, and the precision of, the calculations in the model.

- Appropriate documentation regarding the methods and processes used for validating the diversification parameters provides interested parties (e.g. auditors, supervisors) with a clear understanding of the underlying procedures and, as a consequence, increases the transparency of the model validation process. Accurate and thorough documentation, and sufficient record keeping, on the validation is important to demonstrate that the institution has an adequate process for model validation in place. In general, the documentation could contain, for example, an indication of what has been validated, when the model has been reviewed, according to which method, with which tests and with what results.

- The results of the validation are maintained for an appropriate period of time, enabling their review by the internal and/or external auditors.

67. Supervisors consider it relevant that institutions aiming to claim diversification benefits within their ICAAP are able to demonstrate that they have adequate methods and processes for model validation in place.

68. The choice of methods used for model validation is at the discretion of the institution itself. Although methods such as back-testing have been proved to be useful for model validation, it has to be emphasised that there is no single method or combination of methods which is considered to be "correct" for the purposes of model validation. Nevertheless, supervisors consider it of interest that the methods used for validating the diversification parameters are sufficiently conservative and fit for the purpose.

69. Once put into production, the model usually undergoes a period of "live testing" that is sufficiently long for an ex-post control to be performed. Supervisors are likely be interested in the extent to which the validation process leads to the review of the model if the results of the model validation or the "live testing" turn out to be unsatisfactory. Other issues of interest could be the tolerance level for deviations in the validation results and the extent to which subsequent actions are clearly defined by the management of the institution. The documentation of methods and processes used for recalibrating the models used as a basis for claiming diversification benefits may also be of interest to supervisors.

70. Supervisors are also likely to pay attention to whether, in the event of a significant modification of the model, it undergoes the same internal validation process as a new development along the lines set out in the previous paragraphs.

71. It is also likely to be of interest whether the models are being periodically checked (or checked on an ad hoc basis in the case of significant changes in the environment) in order to ensure that they remain adequate for the activities of the institution (nature, complexity and volumes) and, if necessary, adapted in an appropriate manner.

72. Another element that may be of relevance to supervisors is whether known and potential model uncertainties and data shortcomings are evaluated in the course of the independent internal review of the ICAAP conducted by an internal audit function or a comparable independent function.

73. In that context, supervisors are likely to pay attention to the extent to which detailed attention is given by the internal audit function (or an equivalent internal control function) to the following elements:

   • organisation of the department in charge of risk management and in charge of capital management (if appropriate);

   • adequacy of the documentation of the model and the internal procedure of validation;

   • procedures for modifications to the model;

   • quality of the data sources (coherence, reliability, continuity, punctuality and synchronism);

   • quality and precision of the model, as well as the ex-post control;

   • quality of the sensitivity analysis and stress testing;

   • reporting requirements;

   • integration of the model into the daily management of the risks; and

   • integrity of the Management Information Systems.

74. Keeping the internal audit function informed of the process of the development of the models can facilitate the development of adequate controls. Supervisors may be interested in whether it is intended to increase of frequency of the internal audit's reviews if significant deficiencies or problems are discovered.

5. Internal decision-making processes

75. Claiming diversification effects under Pillar 2 are at any point in time the results of decisions made throughout the organisation. The development of models and estimation of parameters are based on many decisions. The on-going monitoring within the organisation of the models and parameters used are also the results of many decisions made within the organisation, which is also the case when vendor models are used.

5.1 Governance

76. The senior management and board members are responsible for the ICAAP. It is of interest to the supervisors how well the ICAAP is integrated into the management function. Therefore the supervisors will pay due attention to how well the senior management understands the methodology used for internal capital calculations including reallocation of diversification benefits and, in particular, any possible shortcomings in this framework. Supervisors may also be interested in the regular reporting to the senior management and board members on the capital models, their parameters and outcomes and the use of models in the risk management processes.

77. Supervisors are likely to be interested to know whether the uncertainties regarding model specification, data shortcomings or shortcomings in the validation of model results influence the board's final assessment of the institution's capital adequacy relative to its risk profile. Regardless of the specification of the models, parameters etc the overall judgement of whether the ICAAP returns a reasonable results rests firmly with the senior management and board members. Therefore it is of particular interest to supervisors whether the final say in setting parameters for diversification purposes, especially in case of expert judgements, is grounded in senior management.

5.2 Decision-making process and reporting

78. The ICAAP should be an integrated part of the management function. The management function is in many organisations at the same time divided at different levels (entities) and different dimensions (portfolios).

79. The diversification effects and parameters used can be seen as an integral part of the decision-making processes at group-level, entity-level and portfolio-level. It is of interest for the supervisors to assess whether the internal management structure appropriately reflects the ICAAP process and vice versa.

80. The diversification effects claimed play a key role in capital planning, capital allocation, strategic decision making, risk management, internal governance, etc. (e.g. performance measurement, limit management, policies and procedures). It is therefore of interest to the supervisors to understand whether the diversification effects claimed are reflected in the same way that responsibilities on capital management, risk management, internal governance etc are distributed in the group.

81. One of the key issues for supervisors is to ensure that the estimation of diversification effects is not detached from the internal management process. It would be relevant to know whether senior management and board members regularly receive information regarding the derived numbers for diversification effects and the appropriate background.

82. The nature and content of the communication to senior management and board members are key to ensuring that they correctly understand the underpinnings of the determination of diversification effects claimed by the

institution. Supervisors are likely to be interested in whether the information provided is sufficiently clear and precise so that its recipients can interpret it correctly, in particular with regard to results produced by models.

83. In this regard, supervisors are also likely to be interested to know whether an adequate Management Information System, is in place. The definition of the information to be reported, the addressees and the reporting frequency are fundamental decisions for institutions in this area.

6. Comparing results of Pillar 2 and Pillar 1 capital calculations

84. In order to better understand and address diversification effects, the comparison of the internal capital calculations (in fact, economic capital calculations) and Pillar 1 minimum capital calculations could often provide useful information and are a possible tool to consider.

6.1 Feasibility

85. As a preliminary step, supervisors are particularly interested in understanding how the institution identifies and measures the effects of diversification that are claimed, which includes how it decomposes and allocates the effects of diversification according to relevant criteria (by risk category, sector, location, business units, legal entities etc).

86. In particular, the way the institution identifies the differences arising from intra-risk diversification, as well as the differences from inter-risk diversification will generally be considered. Indeed, these two types of diversification need in principle to be distinguished: whereas the assessment of intra-risk diversification can be achieved through the comparison of internal capital calculations and Pillar 1 capital numbers on a risk by risk basis, assessment of inter-risk diversification often requires a more global assessment.

6.2 Understanding the differences between internal capital and regulatory capital numbers

87. Since diversification is obviously not the only factor resulting in differences between internal and Pillar 1 capital numbers, it is important for supervisors to determine precisely the drivers influencing the internal calculation. Therefore, to address the overall contribution of diversification, reasons for differences between internal and regulatory capital numbers for Pillar 1 risks may have to be identified and highlighted.

88. For instance, supervisors are likely to be interested to know whether the impact of the following elements is clearly understood and addressed:

- the use of a different confidence level in the economic capital model (e.g. target rating, supervisory confidence intervals, 1 in 10 events, etc.);

- any change in the scope of the risk considered;

- removal of floors (like PD floors) or any regulatory constraints;

- the impact of a different methodology (VaR vs Expected Shortfall, full economic capital modelling); and

- any change in the assumptions used (granularity of IRB portfolio).

89. Documentation of differences between internal and Pillar 1 capital numbers would be useful for the comparison.

6.3 Addressing the differences

90. Once the reasons for the differences between internal and Pillar 1 capital numbers have been identified, the next step is the precise assessment and measurement of the impact of intra- and inter-risks diversification (in absolute terms and in comparison with other factors).

91. The contribution of each category of diversification to these differences (i.e. "intra" versus "inter") will be considered by supervisors, since they are generally expected to be treated differently (due notably to the inherent complexity of their respective measurements).

92. Furthermore, supervisors would probably be interested in understanding the extent to which the differences between internal and Pillar 1 capital numbers reflect the specific features of the institution's own portfolio, in comparison to the Basel II "representative" portfolio (i.e. the assumption of an infinitely, "asymptotically", diversified portfolio).

93. When addressing diversification, supervisors could also pay attention to the level at which the identification of these differences between internal and Pillar 1 capital numbers is performed (e.g. exposure, risk category, business unit).

94. Supervisors may also take into consideration the source of the diversification effects (i.e. risks considered under Pillar 1, Pillar 2 or both) and the dependencies between risks considered under Pillar 1 and risks considered under Pillar 2 in order to fully assess the impact of diversification and consider the extent to which identification of differences between Pillar 2 and Pillar 1 capital numbers affect capital allocation at all levels.

7. Group dimension

95. Diversification within a group poses additional issues. There could be three major concerns that home and host supervisors may have to address through the supervisory college framework, where applicable.

96. First, supervisors are interested whether the ICAAP calculation made at a consolidated level, taking into account diversification effects and dependencies, is performed in a prudent way, given the group's specific

structure and internal organisation and particularly under stressed circumstances.

97. A second important element concerns the mechanism (criteria and techniques) for allocating the consolidated capital numbers downwards to subsidiaries with regards to the respective risk profile of the entities concerned. Supervisors are likely to look for the existence of a risk sensitive and conservative allocation of financial resources to the entities they are responsible for.

98. Third, when considering diversification from a local (host) perspective, supervisors may want to be informed about the effective ability of the parent institution and/or the financial group as a whole to support any entity which for some reason faces difficulties meeting capital needs, and the probability that they will do so. Relevant factors are the absence of any major material or formal impediment to the transfer of financial resources, the financial capacity of the group to support a distressed entity (either parent or subsidiary), the willingness of the parent institution or the group to support the entity concerned as well as the presence (or absence) of relevant arrangements between the subsidiary and the parent (e.g. written capital/liquidity guarantees, letters of comfort, etc).

99. Some indicators that could be used to determine whether these concerns are addressed are, for instance, an integrated risk management and control structure for all entities in the group which demonstrates that diversification and allocation issues are effectively considered and managed on an integrated basis and that the "integrating" entity takes responsibility for the risks borne by the other entities. Additionally, a comfortable level of capital (i.e. well above CRD minimum requirements) and the availability/liquidity of the surplus will tend to demonstrate the effective capability of a group to support an entity where necessary. The liquidity position of the subsidiaries is also a potential indicator as it enables them to withstand temporary solvency shortfalls while waiting for group interventions. Elements related to the reputation of a group might also help to demonstrate the willingness of the group or parent company to intervene (e.g. same business name, disclosures indicating integrated operations or common operational platforms, common business lines, etc).

100. Within this context, the question of transferability of financial resources is a key issue. Indeed, the transfer of financial resources cannot always be made within a short period or under stressed circumstances. For example, local supervisory requirements, tax or other commercial/contractual/statutory provisions may create barriers or restrict the effective transferability of funds. These elements may therefore need to be carefully analysed when considering cross-border group diversification.

101. It should be noted that this issue is currently being debated at the level of the European Commission. Indeed, following the October 2007 ECOFIN, the Commission has been requested, within the framework of the revision of the Winding-Up Directive (2001/24/EC), to provide proposals on how to reduce barriers to asset transferability within cross border banking groups and how to further improve EU banking groups' crisis resolution and management

arrangements. In this context, it is also stressed that barriers to asset transferability can be reduced if critical safeguards are in place to preserve the legitimate interests of the entities from which the assets would be transferred. The results of this exercise should be available by mid-2009. In the meantime, supervisors will pay particular attention to whether the structures proposed by institutions are prudent and conservative.

List of possible regulatory questions for the recognition of intra- / inter-risks as well as group diversification effects

The purpose of this annex is to identify possible questions to be used by supervisors for assessing intra- / inter-risks as well as group diversification requests from firms. These questions aim to assist supervisors in the assessment process by helping them to identify key issues related to the process surrounding the measurement and use of diversification benefits by banks. The questions should in no way be regarded as minimum standards.

1 General overview of the model

1.1 Methodology

1. What methodological approach is used for measuring diversification effects, i.e. for aggregation and dependency structures estimation (e.g. correlation matrices "var-covar", scenario analysis and simulation, copula models)?

2. To what extent do the model and the diversification parameters take into account tail dependencies?

3. Given the fact that different methodologies would provide different results, what criteria determine the choice of one particular model? Are these criteria well documented and re-assessed on a regular basis?

4. What are the known limitations of the chosen methodological approach?

1.2 Scope

5. Has the institution produced an inventory of the risks to which it is exposed?

6. Does the internal model cover all material risks / risk factors faced by the institution?

7. Does the model that is used capture the specific interrelationships between exposures that are relevant for the institution's portfolio (e.g. in case of measuring retail exposures, SME exposures, etc.), like microstructure dependencies, homogeneous pools, etc.?

8. What are the steps and levels of aggregation (e.g. risk by risk or business unit by business unit)?

1.3 Vendor models

9. To what extent does the institution rely on third parties for the development of their internal model?

2 Diversification parameters

2.1 Data / Time series availability

10. What data are the diversification parameters based on? What are the sources? What is the observation period and is it consistent with the observation period of the

risks incorporated in the diversification model? What is the frequency of the data updates?

11. What are the main identified problems regarding the data (inappropriate structure, incompleteness, trend changes, length and frequency of time series, volatility, etc.) and how are they addressed?

12. What infrastructure and control mechanisms has the institution implemented (or plans to implement) in order to keep monitoring and measuring diversification parameters (i.e. correlations) in an adequate manner? What possible steps have been considered to improve measurement going forward?

2.2   Correlations

13. How does the institution take into account the risk inherent in the challenges of establishing correlation estimates (e.g. additional buffers, correction factors, etc.)?

14. How does the institution derive a correlation structure and what are the related (implicit) assumptions behind the correlation estimates?

15. Are interdependencies modelled consistently (e.g. is correlation between PDs and LGDs taken into account)?

16. Are correlations measured implicitly or explicitly?

17. Are correlations conditional and allow for increasing values?

18. Does the institution change the correlation parameters used when they change their risk profile / risk appetite?

2.3   Third party providers

19. Does the institution rely on third party parameters? For what kind of data? What checks and/or adjustments are performed to ensure the quality, reliability and representativeness of the data?

2.4   Statistical vs. expert based Estimates

20. To what extent do the chosen methodological approach and estimation of parameters rely on expert judgment? If they do, is the process sufficiently well documented and subject to internal validation? How is the risk associated with the subjectivity of expert-based approaches taken into account?

3   Reliability and conservatism of the methodology

3.1   Stability, conservatism and robustness

21. To what extent is the institution able to demonstrate that the calibration of the models used ensure stability and are forward looking?

22. How has the risk of correlation instability over time been taken into account, in particular in the case of changes in the business environment and business cycle?

23. How does the institution ensure conservatism in its estimation of parameters? Have appropriate margins of conservatism been adopted? Are there any theoretical arguments for the reliability and conservatism of the methodology applied?

3.2 Stress-testing

3.2.1 Scope of stress-testing

24. Does the institution carry out stress-tests and scenario analyses on the estimated/claimed correlation effects (and parameters)?

25. Which parameters are stressed in diversification stress testing? What is the impact of stressing different parameters of *correlations* on diversification effects?

26. Which stress scenarios are used? Do they reflect severe but plausible events?

27. To what extent are "second round" effects (e.g. among borrowers) taken into account?

3.2.2 Methodology

28. How does the institution test/prove its system's behaviour/suitability under stressed conditions (in particular, the inclusion of dependency structures and the volatility of correlations)?

29. Is the methodology differentiating between stressed situations and normal situations (e.g. changing parameters, techniques)?

30. To what extent are the diversification benefits claimed underpinned by the outcomes of meaningful scenario based stress tests?

3.2.3 Stressed data

31. Are the data and assumptions used in the stress-test reliable in and reflective of stressed situations?

32. When external databases or proxy / benchmark time series are used, how well do these data fit with the firm's actual portfolio, especially under stressed circumstances?

3.3 Sensitivity analysis

3.3.1 Existence & Description

33. Does the institution make use of sensitivity analysis of the diversification parameters and key assumptions?

34. What tests does the institution apply? What range of parameters / assumptions is used in sensitivity analysis, and why?

    For instance:

    - are the effects of the elimination (or addition) of significant parts of its business (e.g. the sale of a business unit / merger according to strategic plans) considered?

    - how do changes in correlation assumptions influence capital numbers? and

    - what would be the impact of omitting some of the risks / risk factors faced by the institution from the model?

35. Is there a connection (i.e. commonalities) between the assumptions behind the ICAAP numbers claimed and those behind sensitivity tests?

3.3.2 Results

36. Which model parameters contribute the most to the determination of the size of the diversification benefits?

37. How does sensitivity analysis contribute to the calibration of the diversification parameters and the improvement of the model?

38. How are the sensitivity tests used in the decision-making processes or reflected in management actions?

4 Model validation

39. What are the methods used for validating the diversification parameters (e.g. back-testing)? If the institution carries out back-tests on the parameters involved, are they well documented and sufficiently conservative?

40. How have model uncertainties and/or data shortcomings been evaluated in the independent internal review of ICAAP?

41. Which internal function is responsible for performing the validation?

42. Is the methodology as well as the process of parameter setting adequately documented?

5 Internal decision-making processes of the institution

5.1 Governance

43. How are diversification effects communicated to senior management and board members?

44. How well do senior management and board members understand the methodology used for calculating and reallocating diversification benefits and its shortcomings?

45. Who has the final say in the process of setting parameter estimates for diversification purposes, especially in case of expert judgement?

46. How do uncertainties regarding model specification, data shortcomings or shortcomings in validation of model results influence the board's final assessment of the institution's capital adequacy relative to its risk profile?

5.2 Level of integration in the decision-making process

47. How - and at which level (group, entity, portfolio) - are the diversification effects and parameters integrated into the decision-making processes?

48. What role do diversification effects play in capital planning, capital allocation, strategic decision making, risk management, internal governance, etc. (e.g. performance measurement, limit management, policies and procedures)?

5.3   Reporting

49. Is the information on diversification parameters and effects used for internal reporting purposes? How? Who are the main addressees?

50. Are differences between internal capital numbers and regulatory numbers due to diversification effects being reported?

6.1   Feasibility

51. How does the institution identify and decompose the effects of diversification? Could the institution provide the impact of the diversification effects on internal capital numbers?

6.2   Internal capital vs regulatory capital numbers

52. Which drivers are behind the differences between internal capital numbers and regulatory numbers for Pillar I risks? For instance, is the internal capital calculated at different confidence levels (e.g. internal rating, supervisory confidence intervals, 1 in 10 events, etc.) and how does it explain the differences? Is there a logical connection between the differences in internal capital numbers and regulatory numbers?

53. How does intra- and inter-risks diversification affect the differences between internal capital numbers and regulatory capital numbers (in absolute terms and in comparison with other factors)? What is the contribution of each category of diversification (i.e. "intra" vs "inter")?

54. Are these differences reasonable given the characteristics of the Basel II 'representative' portfolio and the institution's own portfolio?

55. At what level (e.g. exposure, risk category, BU) are these differences identified?

56. Where do diversification effects come from,- Pillar 1 risks, Pillar 2 risks or both? What are the dependencies between Pillar 1 and Pillar 2 risks?

6.3   Impact

57. What are the consequences for capital allocation / attribution to different risks, products, entities etc.?

7   Group dimension

7.1   Group ICAAP and group diversification

7.1.1 Group diversification effects

58. To what extent are group diversification effects (i.e. between legal entities, countries or business lines) taken into consideration?

59. Is it possible to decompose internal capital numbers in order to clearly identify the effects of group diversification?

60. Are the model and correlation parameters reflecting the existing group structure and repartition of activities within the group?

7.1.2 Scope

61. When conducting a consolidated ICAAP, are all the entities of the group included and treated in a similar way? If not, could the institution explain why? What could be the impact of using different methodologies?

62. Is the legal and organisational structure of the group (e.g. centralised vs decentralised risk management, etc) coherent with the allocation approach?

7.1.3 Stress testing

63. Are diversification stress tests performed at group level? If yes, are they sufficiently reflective of local risks and impacts of an economic downturn?

7.2   Group allocation and transferability of financial resources

7.2.1 Allocation

64. How does the group management distribute the diversification effects to the various business lines / legal entities?

65. How does the institution allocate its internal capital within the group? Can this allocation be different from any local or specific ICAAP that may also exist? If yes, could the institution explain?

66. How is the allocation process dealing with the regulatory constraints that might be imposed on the different entities of the group?

67. Can the institution reconcile the internal capital allocated among different entities, Pillar I capital and Available Financial Resources? Can the institution explain the differences?

68. Does local management ensure the adequacy of their allocated internal capital? How?

69. How is the group ICAAP integrated in local level activities' decision making processes? How do the allocated diversification effects (and corresponding capital allocation) affect the local decision making processes?

7.2.2 Transferability

70. How does the institution take into account, in the calculation of diversification effects the fact that capital transferability may not be perfect?

71. Has the institution already performed an analysis of the transferability of funds? In particular, have the following elements been reviewed:

    • possible management actions (issuance, mitigation, fund transfers, etc.);

    • possible constraints or barriers (currency restrictions, tax issues, supervisory or regulatory issues, etc.); and

    • other possible contractual, commercial or statutory restrictions.

72. Have intra-group legal arrangements, for instance a guarantee to provide capital to other entities in the group, been adopted?

73. Does the consolidated ICAAP incorporate the results of such an analysis?

74. Are hypothesis of funds transferability valid under stressed situations? In particular, is the ability of the parent company to support (liquidity line, recapitalisation, etc.) its subsidiaries in times of crisis tested?