LLOYD'S

SOLVENCY II

DETAILED GUIDANCE NOTES

MARCH 2010

SECTION 6 - EXTERNAL MODELS AND DATA

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Overview

This section outlines the Solvency II requirements for external models and data.

The components of the internal model that are sourced from third parties will need to satisfy the same model tests as set out in articles 120 to 125 – i.e. use test, statistical quality standards, calibration standards, profit and loss attribution, validation standards and documentation standards.

These tests apply to the whole of the internal model, and it will not be acceptable for agents to exclude the application of these standards to a component of the internal model for the sole reason that it is provided by a third party.

Agents will need to identify and document the external models and data used, including details of how they are used, and the governance procedures around their use. This documentation will need to include reasons for using external models or data sets, as opposed to relying entirely on internal ones, and explanations of why their use is suitable.

As for internal models, agents will also need to demonstrate that board and senior management have sufficient understanding of the uses of external models and data and their limitations.

Guidance

Managing agents should note that this guidance represents Lloyd's best view of current requirements but is subject to ongoing discussion and change as both CEIOPS proposals and FSA requirements become finalised and Lloyd's own development on Solvency II progresses. Lloyd's will continue to monitor and review progress in these areas and seek to update the guidance as appropriate.

The commentary on proposed level 2 measures attached highlights the relevant sections for the dry run and does not reproduce the full level 2 text. Any additional guidance provided in this document is intended to supplement the level 2 measures, not repeat them, and agents must therefore ensure that they are familiar with all of the requirements and do not rely solely on the additional guidance provided here.

Whilst this document refers to general Solvency II requirements, this guidance is specific to Lloyd's and managing agents in many areas. Due to the unique structure of Lloyd's and the application of the Solvency II directive at society level, some of this guidance will not be relevant to non Lloyd's firms.

Contents

This section includes the following

- Level 1 directive text and commentary on application of proposed level 2 requirements to Lloyd's managing agents
- Guidance on external models and data

LEVEL 1 AND LEVEL 2 MEASURES

The Level 2 measures set out here are based on CEIOPS paper Doc-48-09 (formerly CP 56), published November 2009. These measures may be subject to modification before they come into force.

External models and data

Directive Article 126

The use of a model or data obtained from a third-party shall not be considered to be a justification for exemption from any of the requirements for the internal model set out in Articles 120 to 125.

Application of proposed level 2 requirements to Lloyd's managing agents

Article 126/CEIOPS Doc 48/09: 10.34-10.40

A managing agent must document and explain the role of external models and data sets and the extent to which they are used within its internal model processes.

A managing agent must be able to explain its reasons for preferring external models or data sets, as opposed to internal ones. A managing agent must also list the alternatives considered and explain the decision for a particular external model or data set including, where relevant, how it determined the weighting to be given to the external model or data set.

A managing agent must demonstrate a detailed understanding of external models and data sets used in its internal model processes. In particular, managing agents should be aware of model and data limitations. The level of detail should be proportionate to the materiality of the external model or data set to its internal model.

A managing agent's use of external models and data sets should be:

- appropriate to the nature and complexity of the risks incorporated in its risk strategy, business objectives and modelling methodologies,
- appropriate to the availability of internal data;
- and should be suitable for use in its internal model.

A managing agent must document the criteria by which it judges whether an external model or data set is material to its internal model.

If the use of external models or data sets plays a material role a managing agent must demonstrate that the internal model requirements are met as fully as possible. In particular, the managing agent retains the responsibility for any deficiencies in its internal model or data introduced by the use of external models or data.

its documentation explains how it meets the requirements of the six internal model tests, namely the use test, the statistical quality standards test, the calibration standards test, the profit and loss attribution test, the validation standards test, and the documentation standards test. It must also identify whether the use of external models or data sets introduces any deficiencies into its internal model or data, and document how it has dealt with any such deficiencies.

A managing agent must have clearly articulated strategies for validating and regularly reviewing external model results and the integrity of the external data sets used in its risk quantification process.

A managing agent must recognise and document the risks arising from the use of external data sets and models. If the risks are material and quantifiable they should be taken into account in the SCR calculation. This should be accompanied by an explanation of how it has managed or mitigated those risks, and how it has reflected any material and quantifiable residual risks in its SCR calculation.

Where a managing agent uses an external model or external data, that model or data must be suitable for representing the risk profile of the syndicate being modelled. Where the external model or external data set is being used within a partial internal model, the integration technique selected to integrate the results of the partial internal model and the results of the standard formula must also reflect the risk profile of the syndicate being modelled.

EXTERNAL MODELS AND DATA

Ensuring external models and data meet the tests

The components of the internal model that are sourced from third parties will still need to satisfy the same model tests as set out in articles 120 to 125 – i.e. use test, statistical quality standards, calibration standards, profit and loss attribution, validation standards and documentation standards.

These tests apply to the whole of the internal model, and it will not be acceptable for agents to exclude the application of these standards to a component of the internal model for the sole reason that it is provided by a third party.

What is in scope?

Any third party components or data that are part of the internal model are in scope of these requirements. Given the agreed scope of the internal model, managing agents may decide to use components/data that are created or sourced internally or components/data that are sourced from third parties and it is the responsibility of the managing agent to identify any such external models and data sources.

Some examples of third party components or data that managing agents may wish to include in their internal models are:

- models or data in relation to specialist areas of underwriting risk such as natural catastrophes
- industry loss, loss development, loss distribution or exposure databases, or models derived from such data, that can be used to validate, augment or substitute for the managing agent's own data or models
- models or data in relation to economic variables or economic scenarios, such as ESGs, yield curves, exchange rates, default rates
- studies carried out by professional advisors that support parameterising the internal model

Managing agents may plan to license a commercial capital management platform from a software supplier, for example calculation engines, simulation and scenario engines. These may be used as model platforms, internal model add-ins or applications and will require special attention in definition:

- where the managing agent has to scope, design and programme its tailored version before populating the platform with data, then this is likely not to be an “external model” as such, and will be subject to the internal model tests in the normal way;
- where the managing agent outsources the scoping, design and programming of its tailored version before taking over to populate the platform with own data, then this has the potential to be an “external model”, and so should be subject to the guidance in this section. Whilst this approach may be acceptable under the Solvency II requirements, Lloyd’s expects that it will make demonstration of model embedding and meeting the use test significantly more difficult.

The managing agent should clarify where it lies on this spectrum, and why it believes the use of the platform to be an “external model” or not.

Early contact with suppliers of external models and data

The different suppliers of external models or data seem to display a range of degrees of preparedness and forward thinking on the new requirements of Solvency II. If managing agents are intending to use an external model or data source as part of their internal model, they are strongly recommended to contact their supplier at the earliest possible opportunity, in order to alert them to the extra requirements that will be demanded from them if they wish to continue supplying that service to the agent.

Special issues may arise if there long term existing contractual arrangements in place, for example, three year contracts. If these have a material impact on the ability of the agent to influence the service of the supplier, the impact should be documented, and the agent should explain how this has been taken into account in the overall assessment of the SCR.

Explaining the role of external models and data

Managing agents are expected to identify the external models and data, and document how they are used as part of their internal model.

For each **external model**, managing agents should provide the following documentation:

- details of the third-party supplier, version of model used, release date and any modifications to the standard version.
- a description of how the external model is used within the internal model, with reference to the specific risk modules and/or business lines covered by the external model
- a list of the specific outputs of the external model which are used within their internal model, and explanations of how they are used
- details of the validation and governance processes surrounding the output provided by the external model
- a description of the roles and responsibilities of the people or teams within the managing agent using the external model; and
- an estimate of the proportion of the SCR that is derived from external models or data

For each **external data set** used, managing agents should provide the following documentation:

- a description of the external data set
- details of the third-party supplier, publication date of the external data set, as well as details of any modifications made
- a description of how the external data set is used within the internal model and the specific risk modules and/or business lines it covers
- details of the validation and governance processes surrounding the external data set
- a description of the roles and responsibilities of the people or teams within the managing agent using the external data

As for internal models, agents will also need to demonstrate that board and senior management have sufficient understanding of the uses of external models and data and their limitations.

Suggested Pro-Forma for documentation

Background Information

- provide a description of the function and purpose of the external model:
  - external model name
  - third-party supplier
  - model version
  - model release date
- document any modifications made to the standard version of the external model

Role of External Model

- document the scope of the usage of the external model within the internal model
- document the specific parts of the specific risk modules and/or business lines covered by the external model
- document the specific outputs of the external model which are used within the internal model
- document how the outputs of the external model are used within the internal model

Using external models and data vs internal

Agents should document the reasons for using external models or data sets, as opposed to relying entirely on internal ones. To show compliance, managing agents should:

- provide details of the processes in place to compare the external model or data source with alternatives
- provide evidence of the processes in action
- document the output and decisions reached

This would include but is not limited to:

- description of the comparative analysis undertaken in choosing external models or data over internally developed models and data. This may include providing details of the strengths and limitations of the external model or data compared to those from developing an internal solution. Examples of such rationales are:
  - o lack of data or internal resources;
  - o economic considerations;
  - o efficiency in development;
  - o external model stability;
  - o reliability issues; and
  - o experience of the vendor
- details of the selection process used, i.e. criteria for assessment and measurement against them, frequency of review, decision making governance
- detailing what alternative external models or data were considered, including a comparison of the relative strengths and limitations of the alternatives

Managing agents may also wish to consider the following text from the FSA's DP08/4 (paragraph 5.66):

"External model usage can have several advantages, such as:

- *access to expert modelling techniques and experience, which might apply to any element of a firm's business or risks (e.g. asset models, natural hazard catastrophe models) and provide an enhanced understanding of risk;*
- *outsourcing of the modelling of specific risks, enabling a firm to concentrate internal resource on the development of critical risk modelling activities; and*
- *outsourcing of the modelling of minor risks, where a firm does not have the expertise or resource to develop such models itself."*

Demonstration of understanding

This section needs to be tied in with the understanding of the external models within the use test section. This section should relate to the collective understanding of the department or functional unit using the external model, the Use test section should relate to the senior management understanding of the external model.

Managing agents must document the level of in-house knowledge pertaining to external models or data used in their internal model processes. This may include being able to:

- demonstrate appropriate knowledge of the methodological underpinnings and basic construction of external models, including an understanding of the models' capabilities, limitations, and appropriateness for use in deriving internal model results
- demonstration of an appropriate understanding of the effect and significance of proprietary elements of external models, including the sensitivity of model output to different input assumptions or settings
- demonstrate appropriate knowledge of how external data sets have been constructed, including the methodological underpinnings, basic construction and capabilities of models behind them where relevant
- demonstrate appropriate knowledge of the level of accuracy and completeness of data sets and their appropriateness for use in deriving internal model results

- demonstrate a clear understanding of the rationale behind any material judgment-based overrides or any other adjustments made to external data sets or external model outputs

The documentation must cover any known circumstances under which the model does not work effectively. Managing agents should also document challenges made to external vendors, and how they have satisfied themselves that the response was appropriate.

Roles & Responsibilities

Demonstrating in-house knowledge could be achieved by summarising the members of the team using the external model and their relevant experience. Managing agents should provide an overview of the roles and responsibilities, including professional qualification and/or number of years' experience, of the people or teams using the external model. Additionally, a record of attendance at relevant training courses, seminars, etc, should be maintained.

Explaining why external models and data are suitable

This requirement relates to ensuring that the model is suitable for use within the specific portfolio, i.e. is relevant to the risks it is being applied to, and explaining any modifications that have been made to make it so.

Managing agents should keep in mind the principle of proportionality when considering the use of external models and data. If the managing agent's risk profile is materially influenced by a business area that is quantified using external models and/or data, the managing agent will be expected to demonstrate that these external inputs are well understood and managed by the business. External data and models that are used in less material areas, for instance where the outputs could not reasonably be expected to materially influence the SCR, will be subjected to a proportionately lower level of expectations with respect to documentary evidence.

Managing agents should ensure that the external model or data is suitable for the use to which it is put in the internal model. If there are limitations to its suitability, the managing agent should identify these and consider modifying or augmenting the data or outputs appropriately. Examples to consider include demonstrating that the model's results are derived from studies on portfolios of risks or geographical spreads representative of those to which they are being applied in the internal model. An example to avoid would be the application of benchmarks derived from different markets to which they are being applied in the internal model.

When there is any adjustment made to ensure the model output is suitable for use, managing agents must justify such adjustments and explain the extent of expert judgement.

To ensure that the use of external models and data are appropriate and suitable for use, the managing agent must be able to demonstrate the following:

- an appropriate process exists to validate the external models and data to gain confidence over the results. This is to ensure the external model remains appropriate for the purposes intended.
- evidence that the external model or data fits the risk profile of the managing agent and produces results consistent with the time period, exposure and risk measure being used. Managing agents should also understand any diversification effects introduced into the internal model and the impact on the emergence of profit and losses.

Materiality of external model or data

For each external model or data source, managing agents must document the process they used to decide whether or not it plays a material role. For example, a table showing the derived loss contribution at the 99.5% percentile, both on a standalone and a diversified basis, could be used to compare these numbers with the overall totals for the relevant risk category and the syndicate overall. Where possible, these contributions should be explicitly evaluated, and reviewed on a regular basis to monitor if the contribution of an external product to the SCR has changed significantly over time.

For each material external model or data source, managing agents should document whether or not the use of the external model or data introduced any deficiencies into their internal model and how these have been addressed or mitigated.

The internal model requirements include the system of governance, the risk-management system or decision-making processes, the use test, the statistical quality standards test, the calibration standards test, the profit and loss attribution test, the validation standards test, and the documentation standards test. Rather than repeating these for external models, managing agents should ensure that each material external model or data source is explicitly mentioned as part of the overall internal model documentation. Managing agents are recommended to provide a summary mapping table for each material external model or data source showing where it is referred to in the overall documentation of the internal model.

Managing agents should ensure that the following topics are covered in respect of each material external model or data source:

Article 120: Use test

- is it used outside of the capital setting process in such areas as risk management, underwriting, reserving, and how?
- whether the external models are widely used in and play an important role in the system of governance
- correlation with other risks and the role of the external model in the capital allocation process
- board and senior management understanding of use and limitations

Article 121: Statistical quality standards

- the methods used to calculate the probability distribution forecast are appropriate
- material assumptions are documented and justified, including review by the relevant parties
- an assessment whether the data used is accurate, complete and appropriate
- the frequency of update of the external model or data source is at least annual
- the methods used to assess the correlation with other risks

Article 122 - Calibration standards

- the methods used to demonstrate that the external model is appropriately calibrated to the 99.5% probability level over 12 months
- the degree to which the external model is used to measure and understand risks at other tolerances than the 99.5% probability level

Article 123 - Profit and loss attribution

- degree to which managing agents can explain the contribution of the risk factors reflected in the external model or data source to the causes and sources of profits and loss

Article 124 - Validation standards

- this is dealt with in the following section – regular review and validation

Article 125 - Documentation standards

areas of the documentation standards where particular attention is needed for external models or data when their use is material

- managing agents should work with vendors to provide: a map of mathematical methods, including description of theories and empirical basis underlying the methods and any material implementation details; rationale for selecting a specific mathematical methodology; elaboration of the techniques used to meet the nature and complexity of each item under consideration
- managing agents should work with vendors to document any limitations & weaknesses of external products, in particular detailing any circumstances in which the internal model may become ineffective as a result
- managing agents should work with vendors to document: the rationale for decisions on assumptions, source data and parameters, including their development during the lifespan of the internal model
- where expert judgement has been applied managing agents should work with vendors to document: the use of that expert judgement in relation to the assumptions embodied within the model/data, including explanation of

why it was needed, the process used to apply it and its effects; how the expert judgement is evaluated; name, experience and qualifications of the persons making the expert judgement

For each material external model, the managing agent should explain whether they regard the data used to populate the external model to be internal data or external data and why. Examples include:

- the client exposure data fed into a natural perils modelling package
- the asset and liability data fed into an ESG package

Regular review and validation

In order to demonstrate their validation strategy, a managing agent must document the procedures for performance validation and the governance around this process, including explaining the approach to validation, roles & responsibilities, frequency of validation, and evidence of challenges made.

Specific examples include:

1. There should be a regular cycle of model validation, for example, the output of the external model must be regularly reviewed (at least once a year) and signed off by an experienced user.
2. Managing agents to generate results on a timely basis.
3. Managing agents to show an assessment of the accuracy, completeness and appropriateness of the data used, including how they measure the quality of the data they have input into the external model, and validating the percentage coverage of the portfolio included in model results.
4. Managing agents to demonstrate the impact of any material new data and information.
5. Managing agents to document and justify any expert judgements made.
6. Managing agents to show management information outputs are appropriate and informative.
7. Managing agents to show how they explain changes in their portfolio model results from one period to the next, for example by performing an analysis of change.
8. Managing agents to back-test the external model results, for example by comparing their model results to historical “as if” actual outcomes for reasonableness, where there is sufficient internal performance data. It is important that managing agents challenge periodically the External models and data given their own models and data, even if they are not as sophisticated, accurate or exhaustive as the external ones. Where there is a scarcity of internal performance data to perform back testing, managing agents should use approximate calculations as alternative validation techniques (“reasonableness checks”).
9. Managing agents to carry out and document reasonableness checks on the model results, e.g. second model analysis, deterministic analysis, and equivalent stress and scenario tests. Managing agent might consider using an alternative model to benchmark the output of the external model. Where material differences between the outputs arise, managing agents must document their understanding of the drivers of the difference and any resultant decisions or adjustments made, as appropriate
10. Managing agents to document how they assess changes in external models, for example following the release of a new version by the supplier. Demonstrate appropriate knowledge of future external model developments and the likely impact of any developments and changes on the results of the internal model.
11. Managing agents must regularly review the appropriateness of the external model and determine ongoing suitability for use. This must be done where there is an update or changes from the external model or there are material changes to the managing agent business and/or risk profile. This review should be evidenced through documentation. Such evidence could include regular communication between the user and the external model or data supplier to ensure the external model or data is suitable.
12. Managing agents should have a process to identify the potential for new external models or data sources to be determined as such. They should also have a process to identify if any external models or data sources currently in use change in their level of materiality, i.e. reviewing on a regular basis to monitor if the contribution of an external product to the SCR has changed significantly over time.

Risks arising from use of external models and data

The use of external models and data increase a managing agent's dependence on third parties, which in itself requires specific risk management. The level of risk management required is similar to that expected of key outsourcing arrangements.

In relation to each external model or data source that is used as part of the managing agent's internal model, the managing agent should evidence appropriate risk management through documentation of the risks and controls (including appropriate oversight, inadequate compliance by the service provider with agreed performance standards, identification of appropriate exit strategies, control of contractual risk and risks of not being able to provide information in a timely fashion, concentration risk) and the steps taken to manage and mitigate these risks.

Documentation should, for each material outsourcing arrangement in respect of external model and/or data, include clearly identified risk owners and a clearly articulated frequency with which the risks are reviewed and monitored. It should also explain how the future change of model version by the supplier is reflected in the managing agent's overall model change policy, and any specific risks arising from this.

Retention of in-house expertise on the external models and data for as long as these are used to derive internal model results

For any external model or data source that is material, the managing agent should explain how it manages the risk of the supplier ceasing to offer their services while the external model or data continues to from part of the agent's internal model.

Examples of risks that the managing agent may wish to consider include the following:

- strategic risk (for example, failure to implement appropriate oversight of the service provider, inadequate expertise to oversee the service provider, intellectual black box),
- reputational risk (for example, poor service from the service provider, service provider practices not in line with practice of the managing agent),
- compliance risk (for example, service provider does not adequately comply with standards and practices, inadequate compliance systems and controls by the service provider),
- operational risk (for example, technology failure, fraud or error, risk that managing agents find it difficult or costly to undertake reviews of the service provider, the service provider might fail to perform),
- exit-strategy risk (for example, the risk that appropriate exit strategies are not in place, over-reliance on the service provider, the loss of relevant skills in the managing agent itself preventing it from bringing the activity back in-house, contracts which make a speedy exit prohibitively expensive, limited ability to return to an in-house approach due to lack of staff or loss of intellectual history),
- contractual risk (for example, the ability to enforce contract, settlement of disputes),
- access risk (for example, the outsourcing arrangement hinders ability of the managing agent to provide timely data and other information to Lloyd's/FSA, additional layer of difficulty in regulator understanding activities of the service provider) and
- concentration and systemic risk (for example, the overall insurance industry has significant exposure to a small set of service providers and systemic risk to the insurance industry as a whole.)

The managing agent should explain how any significant residual risk has been factored into the SCR calculation.