



Financial Services Authority

Solvency II:

Internal Model Approval Process
Thematic review findings

February 2011

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1 Introduction

- 1.1 This report presents the findings of the Internal Model Approval Process (IMAP) thematic review. It includes:
- an explanation of the approach adopted for the thematic review;
 - an overall summary of the results;
 - a more detailed summary of the thematic review findings, including observed better practice; and
 - areas for firms to consider when preparing for internal model approval.
- 1.2 The information in this communication is not general guidance under the Financial Services and Markets Act 2000 but reflects our current thinking on internal models. Requirements relating to internal models are still being developed in level 2 implementing measures and in level 3 guidance. We also expect binding technical standards relating to internal models to be adopted in the future. Therefore, the content of this communication is subject to such measures that may be adopted in the future. It will also be superseded by any rules and guidance that we make in the future to transpose the Solvency II Directive, upon which we will consult in due course.
- 1.3 While awaiting the Level 2 implementing measures, firms should continue to take account of the Directive¹ and the final advice from the European Insurance and Occupational Pensions Authority (EIOPA) to the European Commission² on the proposed Level 2 measures. Although details of the Level 2 requirements are not yet finalised, the direction of travel is clear and firms should start planning and implementing the measures now. Firms should also read the EIOPA Level 3 guidance after it is released in 2011. This will help them understand how to demonstrate compliance with the Solvency II requirements.
- 1.4 We communicate key points from drafts of these documents to members of the Insurance Standing Group internal model expert group. This is open to all UK

1 <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0138:EN:NOT>

2 www.EIOPA.eu

insurance companies and meets monthly, although it is likely to be of greater interest to firms that intend to submit an internal model application. If you would like to be added to the mailing list for this group, please email solvency2@fsa.gov.uk.

2 Approach used for thematic review

2.1 The thematic review focused on four areas:

- risk management;
- use test;
- data management; and
- model validation.

2.2 The purpose of the review was to identify better practice in firms to help us understand the four areas in preparation for the pre-application phase of the internal model approval process. Firms were also able to use the review to help them understand our expectations and to evaluate how ready they are to meet the requirements of Solvency II where appropriate.

2.3 The thematic review was conducted using three different techniques between December 2009 and May 2010.

1. A questionnaire was sent to all insurance firms (approximately 100 in total) who had declared their intention to apply to use an internal model to calculate their Solvency Capital Requirement (SCR) under the Solvency II framework. Firms were asked to rate themselves according to what they needed to do to meet the required Solvency II standard. Firms were also asked whether they would be happy to discuss what they considered to be good practice for at least one of the four areas being focused on. 81 firms responded to the questionnaire.³
2. We visited a selection of insurance firms to discuss one or more of the four areas. We visited up to nine firms for each topic and covered a range of different firms (both life and non-life) of different size and complexity. In total we visited 25 firms.
3. We discussed with other stakeholders – such as consultants, specialist model providers and trade associations – what they considered to be good practice in these areas. We spoke to nine organisations in total.

³ A summary of the results of the questionnaire is provided in the February Solvency II IMAP update available at www.fsa.gov.uk/Pages/About/What/International/solvency/imap/index.shtml.

3 Summary of findings

- 3.1 We found that firms are working hard to understand the requirements of Solvency II and have already made good progress in some areas and have plans to improve in others. We understand that firms will not currently meet all the Solvency II requirements (particularly as some of the Solvency II requirements are still not known), but they need to have identified where the key gaps are and have a plan to close them by the end of the pre-application. Our review was designed to assess better practice, rather than assess the extent of gaps against the requirements.
- 3.2 Data management appeared to be one area where firms still have comparatively more to do to achieve the likely Solvency II requirements. Also, firms interviewed did not have a documented validation policy that clearly explained all the processes used to validate their internal model. We will be looking at these areas in more detail at a firm-by-firm level during the pre-application phase of IMAP.
- 3.3 In some cases, firms judged themselves to be already close to Solvency II standards, but on closer questioning were not able to provide evidence to justify this. An understanding of how prepared they actually are will be important as we begin the IMAP pre-application phase. Once firms enter pre-application, they will be asked to complete a self assessment explaining what evidence they plan to submit to support their internal model application, how that evidence will help to show that they meet the Solvency II standards and when that evidence will be ready for review by the FSA.
- 3.4 This self-assessment will help firms to ensure that they are clear about what evidence they need to include in their application as well as the evidence the firm will be able to provide on request to support the application. It is important to note that supporting evidence need not only take the form of documents. For example, supporting evidence could also take the form of a review of a firm's processes or an interview with key personnel to gain a full understanding of how the internal model is used in the firm.
- 3.5 The self-assessment will enable the FSA to take into account when evidence will be available for review, along with other factors, when planning its review and assessment work. Firms will be requested to provide the FSA with regular updates of the self-assessment in order to enable firms' progress towards submission of

their final application to be tracked. The FSA recognises that it will sometimes be necessary during the pre-application phase to conduct reviews before all relevant evidence has been finalised.

- 3.6 A summary of the findings relating to each thematic topic is shown below.

Risk management

- 3.7 **Risk management function:** Better prepared firms had an independent risk-management function. Such firms were able to provide strong evidence that the risk-management function held an aggregate view of risk across the organisation and provide timely and useful management information to the relevant risk committees and the board.
- 3.8 **Risk management system:** Better prepared firms had robust processes for identifying, measuring, monitoring and reporting risk and were able to provide strong evidence that the management of risk is a key element of their corporate culture and that each individual or team involved in day-to-day running of the business understood how their role impacted the firm's risk-taking activities.

Use test

- 3.9 **Senior management understanding, oversight and governance:** Better prepared firms showed evidence of senior management oversight involving discussion and sign-off of methodology, assumptions, model development and output results, together with evidence of significant challenge from the senior management and board.
- 3.10 **Integration of capital and risk management:** Better prepared firms were able to demonstrate that the internal model is at the centre of the risk-management framework by ensuring that all risks identified by the risk-management system act as inputs into the internal model. Examples of this include the use of the internal model output in setting risk appetite/tolerance/trigger points, allocating capital, pricing and development of risk-mitigation strategies.
- 3.11 **Decision making:** Better prepared firms demonstrated that the output of their internal model is used to inform key business decisions, assess different options objectively, rank risk, prioritise actions and inform business decisions at all levels of the management chain. For example, some firms were able to produce risk-adjusted rates of return for each class of business written and then made informed decisions about which classes they should increase or decrease exposure to.

Data management

- 3.12 **Data framework:** Better prepared firms had started to support their data framework by a comprehensive data policy covering data quality and data updates, approved by senior management.

- 3.13 **Data warehouse:** Many firms had invested in or are planning to invest in a centralised 'data warehouse' as a way of addressing the various data-management requirements of Solvency II. However, data warehouses are not a solution to the problem of combining data from disparate source systems, unless the data can be used in the destination systems in a meaningful way.
- 3.14 **Data dictionary:** Firms had started to create data dictionaries, which was seen as a good approach to understanding and classifying data. However, few firms could evidence the effectiveness of existing procedures to ensure the timely maintenance and consistent use of the data dictionary across the firm.
- 3.15 **Data quality:** Few firms provided sufficient evidence to show that data used in their internal model was accurate, complete and appropriate.
- 3.16 **IT systems:** In many firms, spreadsheets provide a key area of risk because they are typically not owned by IT, but by other business or control areas. They may not therefore be subject to the same IT general controls as firms' formal IT systems (i.e. change controls, disaster recovery planning, security etc).

Validation

- 3.17 **Schematic:** Validation covers many areas of an internal model. We found it useful when firms showed us a schematic showing all the inputs (such as data, assumptions and methods) and outputs (quantitative and qualitative) from their internal model and then overlaid where validation took place.
- 3.18 **Alternatives:** The better prepared firms' validators understood the alternatives that could have been used in the internal model and its impact before agreeing that an input or output is reasonable.
- 3.19 **Criteria:** Few firms had set out criteria to validate whether or not the data/methods/assumptions/outputs are reasonable. It was usually left for the reviewer to exercise their own judgement. This is seen as poor practice.
- 3.20 **Validation policy:** Few firms had a stated validation policy. As a result most validation appears ad hoc and disparate.
- 3.21 **Key assumptions:** The better prepared firms' senior management were capable of explaining what the key assumptions are in the model and how they were derived, understood and challenged.

4 Risk management

What we were looking for

- 4.1 We were looking for examples of how the risk-management function was embedded within the business, integrated into decision-making processes and was involved in the design, implementation and validation of internal models. We were also looking for firms to demonstrate how an effective risk-management system could be set up to continually identify, measure, monitor, manage and report on risks.

Observed better practice – Risk-management function

- 4.2 Better prepared firms included an independent risk-management function. The function was supported by a system for managing risks that had clear and appropriate reporting lines throughout the business for risk escalation.
- 4.3 The risk-management function was operationally independent of the areas within the business from which risks originate. If not fully independent, better prepared firms showed how they had considered the potential conflicts that had arisen and could demonstrate how those conflicts were managed.
- 4.4 The person who is responsible for overseeing the risk management function is commonly, but not exclusively, referred to as a Chief Risk Officer (CRO). Examples of practice which fall short of what is expected include risk-management functions with no CRO type role, or the role has limited scope and decision-making authority. Where the CRO reports into actuarial, finance or operations, it is even more important to be able to demonstrate the independence of the CRO.
- 4.5 Better prepared firms, regardless of size, were able to provide strong evidence that the risk-management function oversaw risk across the organisation. The function gained a clear understanding of the risks the firm faces – including all financial and operational risks, as well as the interactions between risks – and was then able to report this information to the relevant risk committees and the board. For example, some firms had risk experts, sitting within each business unit, with strong links and reporting lines to the central risk team. Good practice also included having timely

and useful reporting of management information (MI), allowing the risk management function to take a comprehensive view of the risks – this is especially important for larger firms.

- 4.6 Better prepared firms also had rigorous processes for synthesising risk information into key metrics and commentary that enabled users to understand it readily and avoided providing vast amounts of data that was difficult to interpret by the intended audience. Better practice was also demonstrated by an active consideration of emerging risks and a process for assessing their impact on the risk profile of the firm. For example, we observed some firms that have set up emerging risk committees to discuss potential threats and how they might be mitigated or managed.

Observed better practice – Risk-management system

- 4.7 The risk-management function's understanding of risk of better prepared firms was based on robust processes for identifying, measuring, monitoring and reporting risks and included mature processes for loss data collection and reporting crystallised risks across all risk types. All of these processes formed part of the overall risk-management framework, which included well-documented risk policies, processes and minimum standards covering all risk types.
- 4.8 Better prepared firms, regardless of size, had appropriately skilled individuals with clearly defined responsibilities, accountability and reporting processes for managing risk. Such firms were also able to provide strong evidence that managing risk is a key element of their corporate culture and that each individual or team involved in the day-to-day running of the business understood how their role affected the firm's risk-taking activities. This was facilitated through strong communication plans and training programmes for all employees involved in the risk-management system. In one firm, the risk capture and reporting system was accessible to these employees. They were able to monitor performance and risk indicators relevant to their role and were alerted to tasks and actions that they needed to undertake.
- 4.9 Better prepared firms had a documented risk appetite, with associated tolerances and limits, and individuals and teams within the business areas understood how this risk appetite impacts affected them and the business decisions they make. For these firms, there was a clear relationship between the risk appetite and their firm's strategy and associated business plans. The risk appetite was understood by the business, with management information against the associated tolerances and limits being reported widely across the business and up to board level.

Observed better practice – Risk committees

- 4.10 In medium to large-sized firms with more complex business models, those that were better prepared had formalised individual risk committees (insurance risk, investment risk, etc) reporting to an overall executive risk committee. Typically, chairs of the individual risk committees were members of the overall executive

risk committee. The CRO (or equivalent) was also a member of the executive risk committee and had overall responsibility for risk within the organisation. The committee had defined reporting responsibilities to the executive committee, CEO, board risk committee and board. While we saw many variations within this structure, the key was that the firm has a thorough understanding of risk at an entity-wide level, as well as by risk category, and that the appropriate messages are communicated to and acted on by the board in a timely fashion.

Areas for consideration

- 4.11 Regardless of size, firms should consider how to carry out their risk-management responsibilities to achieve the Solvency II outcomes. The Solvency II Directive text ascribes certain activities to the risk-management function, and for firms with internal models, the risk-management function has certain additional responsibilities.
- 4.12 As discussed in EIOPA's advice on Level 2 implementing measures⁴, this does not mean that the risk management team has to perform all of these activities. Some activities may be performed by other parts of the company or be outsourced externally. In all cases, the firm will need to demonstrate how the risk-management function is fulfilled and meets the requirements of the Directive. Firms should also consider the role of other functions (e.g. the actuarial function) – which may play a role within the risk-management system – as well as whether their current internal audit functions operate in the way they are required to by the Directive and the way proposed in EIOPA's advice on Level 2 implementing measures.⁵
- 4.13 The above considerations have been framed mainly in a solo entity context. However, they must also be applied at group level. Firms need to consider the relationship between the risk-management arrangements at solo level and at group level and how these arrangements meet the requirements.

4 EIOPA' Advice for Level 2 Implementing Measures on Solvency II: System of Governance <https://eiopa.europa.eu/consultations/consultation-papers/2010-2009-closed-consultations/march-2009/consultation-paper-no-33/index.html> and EIOPA' Advice for Level 2 Implementing Measures on Solvency II: Article 120 to 126 Tests and Standards for Internal Model Approval <https://eiopa.europa.eu/consultations/consultation-papers/2010-2009-closed-consultations/july-2009/consultation-paper-no-56/index.html>

5 EIOPA' Advice for Level 2 Implementing Measures on Solvency II: System of Governance <https://eiopa.europa.eu/consultations/consultation-papers/2010-2009-closed-consultations/march-2009/consultation-paper-no-33/index.html>

5 Use test

What we were looking for

- 5.1 We were looking for examples of how firms could demonstrate that the internal model is widely used in and plays an important role in their system of governance. We were also looking for examples of good practice associated with the ten principles in the EIOPA's advice on Level 2 implementing measures.⁶
- 5.2 The better practice identified by the thematic review with respect to the use test is grouped together as follows:
- senior management understanding, oversight and governance;
 - integration of capital and risk management; and
 - decision making.

Observed better practice – Senior management understanding, oversight and governance

- 5.3 Better evidence of senior management oversight involved discussion and sign-off of methodology, assumptions, model development and results output. Engaged senior management were able to identify the key inputs and assumptions within the model and explain how they were derived, understood and challenged. Senior management use of additional stresses and scenarios for key risks also demonstrated engagement.
- 5.4 Better firms communicate the output of models as changes in the environment or business outcomes rather than simply as changes to assumptions. For example, one firm that wrote UK household insurance expressed the output from their internal model in terms of size of loss from combinations of historic weather events that had occurred (e.g. the storms in October 1987 and in January 1990). This approach helped senior management put into context the magnitude of the results from their internal model.

⁶ EIOPA' Advice for Level 2 Implementing Measures on Solvency II: Article 120 to 126 Tests and Standards for Internal Model Approval <https://eiopa.europa.eu/consultations/consultation-papers/2010-2009-closed-consultations/july-2009/consultation-paper-no-56/index.html>

- 5.5 Better prepared firms could evidence senior management understanding of the governance arrangements around the model and that sufficient and effective training on key workings and limitations of the internal model had been provided. This included how the model links into the risk and capital-management framework of the firm. Some firms have said that they are considering assessing the efficacy of their training regime with knowledge tests.

Observed better practice – Integrating risk and capital management

- 5.6 Better prepared firms showed that the internal model is at the centre of the risk-management framework and that risks identified by the risk-management system are inputs into the internal model. Such firms were also able to demonstrate that the internal model output was used to gain deeper insight into their risk profile and improve the risk-management framework. This included using lessons learned from past events to improve and enhance both the internal model and the risk-management framework.
- 5.7 Better prepared firms were using the output of the internal model to influence the setting of risk appetite/tolerance, to calculate risk exposures against risk tolerances, to allocate capital, to price, develop reinsurance strategies and inform the use of other risk-mitigation strategies.
- 5.8 In addition, some better-prepared firms projected their income statement and balance sheet periodically over their entire business-planning horizon. This enabled a forward-looking view to be taken, the impact of different strategic decisions to be examined, and the impact of possible future economic and non-economic environments on their financial position to be explored. The projections gave senior management a greater understanding of their risk profile and assisted with the strategic management of their business.

Observed better practice – Decision making

- 5.9 For better prepared firms, the use of the output of the internal model in decision-making aided the comparison of risk-adjusted returns for alternative strategies available to firms. Such firms could demonstrate, for example, that they had decided to reduce exposure to particular lines of business that had higher capital requirements, but generated similar potential returns to other types of business as a direct consequence of the internal model output.
- 5.10 Better prepared firms were able to demonstrate that the output of the internal model was well aligned with the framework of accountability within the organisation – i.e. the internal model is closely mapped to the firm's actual business model and to the people making the decisions. Better prepared firms demonstrated that the output of a comprehensive and responsive internal model is used to inform key business decisions, assess different options objectively, rank risk, prioritise actions and to

inform business decisions at all levels of the management chain. For example, using their internal model, one firm demonstrated that a potential acquisition reduced earnings volatility; this was a key consideration in pursuing this transaction further.

- 5.11 Better prepared firms identified a wide range of uses for the output of the internal model, covering many areas including risk management, capital management, financial management, strategic planning, risk mitigation and investment management. This assisted in obtaining buy-in from key stakeholders regarding the output of the internal model and its fitness for purpose. For example, valuation principles for regulatory and internal capital management purposes may be different, but in order to use the model for both purposes, better-prepared firms ensure that the calculation kernel is flexible enough to run on both bases.
- 5.12 Better prepared firms used the internal model when allocating capital down to at least business-unit level and linking risk strategy with remuneration structures, and were able to articulate the methodology used for capital allocation and the extent to which capital allocation is responsive to increased risk taking.
- 5.13 Further evidence of better practice included designing the model to be sufficiently flexible so that a firm has the ability to adapt it to evolve with its business in line with its strategic plans/goals. Strong evidence that firms were using the internal model to add value to the business included plans to improve the model so that it provided a more accurate and realistic assessment of the underlying business and its risk profile.

Areas for consideration

- 5.14 Regardless of size, firms should consider how to ensure that their internal model, as required by the Directive and elaborated on in EIOPA's advice for Level 2 Implementing Measures on Tests and Standards for Internal Model Approval⁷, is widely used and plays an important role in their system of governance, in particular:
 - their risk-management system and their decision-making processes; and
 - their economic and solvency capital assessment and allocation processes, including their own risk and solvency assessment (ORSA).
- 5.15 Many firms were not able to demonstrate that the frequency of calculation of the output of the internal model is consistent with the frequency with which the model is used within the systems of governance. Firms should consider how they might evidence that the frequency and use of the internal model is appropriate for them, given their nature, scale and complexity.

⁷ EIOPA' Advice for Level 2 Implementing Measures on Solvency II: Article 120 to 126 Tests and Standards for Internal Model Approval <https://eiopa.europa.eu/consultations/consultation-papers/2010-2009-closed-consultations/july-2009/consultation-paper-no-56/index.html>

6 Data management

What we were looking for

- 6.1 We were looking for examples of how the data used within an internal model is collected, stored and maintained and how the firm's data architecture and data governance helps to ensure that the data is complete, accurate and appropriate.

Observed better practice

- 6.2 Better prepared firms had an integrated process for the capture, storage and processing of data within the organisation, without gaps or inconsistencies in the way the data was sourced, controlled, defined or used. An integrated process of this type is known as an 'end-to-end' process. The process included data management, structure and quality controls, with assessments and incentives. Data warehouses were used or planned by a number of firms, which can assure data integrity if combined with 'end-to-end' processes and controls. However, it should be noted that data warehouses are not in themselves a solution to the problem of combining data from disparate source systems, unless the data can be used in the destination systems in a meaningful way. Better-prepared firms also presented a comprehensive data policy alongside an IT solution.
- 6.3 Data governance was another key area highlighted by firms. Almost all firms had established individual process and system owners. Better prepared firms presented evidence of dedicated resources and governance to manage data. This was supplemented by data experts that act as custodians distributed throughout the firm. Better prepared firms also involved IT personnel in key data committees and prepared management information on data quality, such as exception and error reports, and key performance indicator reports.
- 6.4 The scope of data quality standards was reported by many firms as being driven by the current requirements of individual systems, processes and modelling techniques. Some firms reported that this approach had led to the scope of their data governance being arbitrary and disjointed and were considering solutions for the Solvency II standard that were more 'holistic'. The more advanced firms had introduced a data dictionary to better understand and classify data for use in their internal model.

Areas for consideration

- 6.5 Many firms were using the QIS4 framework and/or Sarbanes-Oxley (SOX) requirements to develop their 'data management' framework. Whilst the re-use of existing control frameworks, where they exist, may be a sensible starting point it is important firms recognise there are differences and focus their attention on meeting the specific data management requirements of Solvency II.
- 6.6 The Directive text requires data used for the internal model to be accurate, complete and appropriate and that an assessment of data quality should be an integral part of the firm's model validation activity. EIOPA's advice for Level 2 Implementing Measures on Tests and Standards for Internal Model Approval require firms to adopt a data policy that includes a requirement for the firm to specify its concept of data quality.
- 6.7 Data quality is therefore a key area for the successful introduction of Solvency II. Most of the firms we observed have overstated their current level of preparedness against Solvency II criteria. Those firms that assessed their preparations as well advanced were generally found to have taken credit for work planned or envisioned as part of their Solvency II implementation projects, but not yet done. It is important that firms ensure they have the resources to meet the challenges of documentation for data management purposes and the ensuing data governance requirements under Solvency II.
- 6.8 Similarly, firms should consider their overall strategy to data management and data quality. If their current approach is uncoordinated, a more structured solution may be appropriate given the importance of this area for model approval.
- 6.9 In many firms, spreadsheets provide a key area of risk, because they are typically not owned by IT, but by other business or control areas, such as the actuarial function. They may not be subject to the same general IT controls as the firms' formal IT systems (i.e. change controls, disaster recovery planning, security etc) and firms need to develop a control system around this.
- 6.10 We witnessed little challenge or discussion on data quality at board level. We expect issues and reporting on data governance to find a regular place within board and committee discussions. Firms need to ensure that adequate and up-to-date quality management information is produced. It is important that the board has the necessary skills to ask probing questions.
- 6.11 Firms have started to understand the need to have dedicated resources to oversee data management and data quality across the whole firm. While there might be single accountability, it is impractical to expect one person to take responsibility for a firm's whole data policy. Instead, a more practical framework would include several 'data experts' or 'data custodians' throughout the firm as necessary to support the firm's data policies and data framework.

7 Model validation

What we were looking for

- 7.1 We were looking for examples of effective ways to validate internal models, including examples of validation policies that existed. We were also looking for examples of good ways to validate the valuation of assets and liabilities.

Observed better practice

- 7.2 Better prepared firms presented a systematic approach to identifying points in the internal model where validation was required. Examples for the validation of the calculation kernel included a schematic showing all the inputs (such as data, assumptions and methods) and outputs (quantitative and qualitative) from their internal model. They then overlaid where validation currently took place and highlighted where gaps existed.
- 7.3 Firms presented a wide range of tools for validation. Commonly used tools included analysis of change, sensitivity testing, stress and scenario testing, independent reviews and back testing.
- 7.4 Firms were able to apply tools throughout the process and at a more granular level. For the analysis of change, better prepared firms were able to explain the individual impact of changes in data, methods and assumptions. These firms also presented a process for focusing validation on the most material elements.
- 7.5 Better prepared firms ensured that scenarios used to validate the internal model were continually updated and clearly explained how new risks identified in the risk register were used to either form new scenarios or to update existing scenarios.
- 7.6 The setting of assumptions was an area where the more advanced firms actively sought contributions from other parts of the business with specialist experience. For example, we observed one firm that provided training and tools for specialists within the business to determine their own assumptions. These were then validated by a central team. In another case, objectives from specialists within the business clearly reflected the need to validate parts of the internal model relevant to their area.

- 7.7 Where expert judgement was used, firms could explain why the judgement was needed and why the person giving the opinion could be considered an expert. In addition, they had a process for validating the expert judgement itself, including maintaining a track record.
- 7.8 Demonstrating the robustness of the model assumption setting was considered to be a key challenge particularly where a wide range of data sources were available. Advanced firms presented a range of alternative data sources, assumptions and modelling choices that could be considered reasonable. Advanced firms also presented the capital impact of each choice.
- 7.9 Many firms had used a combination of internal and external review to validate parts of their internal model. However, only the most advanced could provide strong evidence that senior management adequately understood the scope of the review. Similarly, limitations of the model often appeared to be given little weight in the presentations to senior management.
- 7.10 Regarding valuing assets and liabilities, better prepared firms formalised and documented processes, procedures and pricing methodologies for the asset portfolio. Better prepared firms' processes and procedures had been independently reviewed and been subject to appropriate internal approval processes. For non-standard assets (e.g. private equity, OTC derivatives, etc) better prepared firms ensured that the methodologies used were approved by suitable committees, and there was ongoing independent price verification where appropriate, with a clear route for escalation of differences.
- 7.11 When using external models in valuations, advanced firms were able to demonstrate how they took ownership of the assumptions used in the models and did not overly rely on vendor parameterisations or modelling choices. Several firms were able to link their practices in this area with their validation standards, such as the independent review of internal model assumptions.
- 7.12 Many firms used proxy techniques, such as replicating portfolios, as a way of providing timely but less accurate information to management. Better prepared firms used pre-defined criteria for error tolerances in these cases and followed a process that avoided validating the proxy, using information used to fit it. Better prepared firms monitored the likely error of using a stale proxy and agreed a timescale for recalibration. Back testing was also used by good firms in the validation process.

Areas for consideration

- 7.13 In our opinion, the validation policies that we observed during our review fell below the standard that the Directive requires. Poor practice was also shown when firms could not articulate the criteria used to validate parts of the internal model. We observed some instances when persons responsible for validation asserted that results were reasonable but were unable to specify what an unreasonable output would be.

7.14 The Directive text and EIOPA's advice for Level 2 Implementing measures on tests and standards for internal model approval⁸ require a regular cycle of model validation and lists a wide range of methods and techniques that should be considered as part of pre-application. Firms should produce a validation policy that clearly sets out how the internal model will be validated and how frequently – including, in particular, defining pre-set criteria that will determine whether the results should be escalated.

8 EIOPA' Advice for Level 2 Implementing Measures on Solvency II: Article 120 to 126 Tests and Standards for Internal Model Approval <https://eiopa.europa.eu/consultations/consultation-papers/2010-2009-closed-consultations/july-2009/consultation-paper-no-56/index.html>

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