

Internal model

**CP No. 37 + addendum
CP No. 56**

**Seminář z aktuárských věd
23. října 2009**



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Solvency II

Process highlights

Solvency II adoption process

- Lamfalussy process: Who are the important stakeholders in the Solvency II debate?

	What is it?	What does it include?	Who develops?	Who decides?
Level 1	Solvency II Directive	Overall framework principles	European Commission	European Parliament, European Council
Level 2	Implementing measures	Detailed implementation measures	European Commission	EIOPC
Level 3	Supervisory standards	Guidelines to enhance supervisory convergence	CEIOPS	CEIOPS
Level 4	Evaluation	Monitoring compliance and enforcement	European Commission	European Commission

CP 37

The procedure to be followed for the approval of an internal model:
General provisions and some specificities related to partial internal model

Legal basis – Key extracts from the Level 1 text

General provision for the SCR

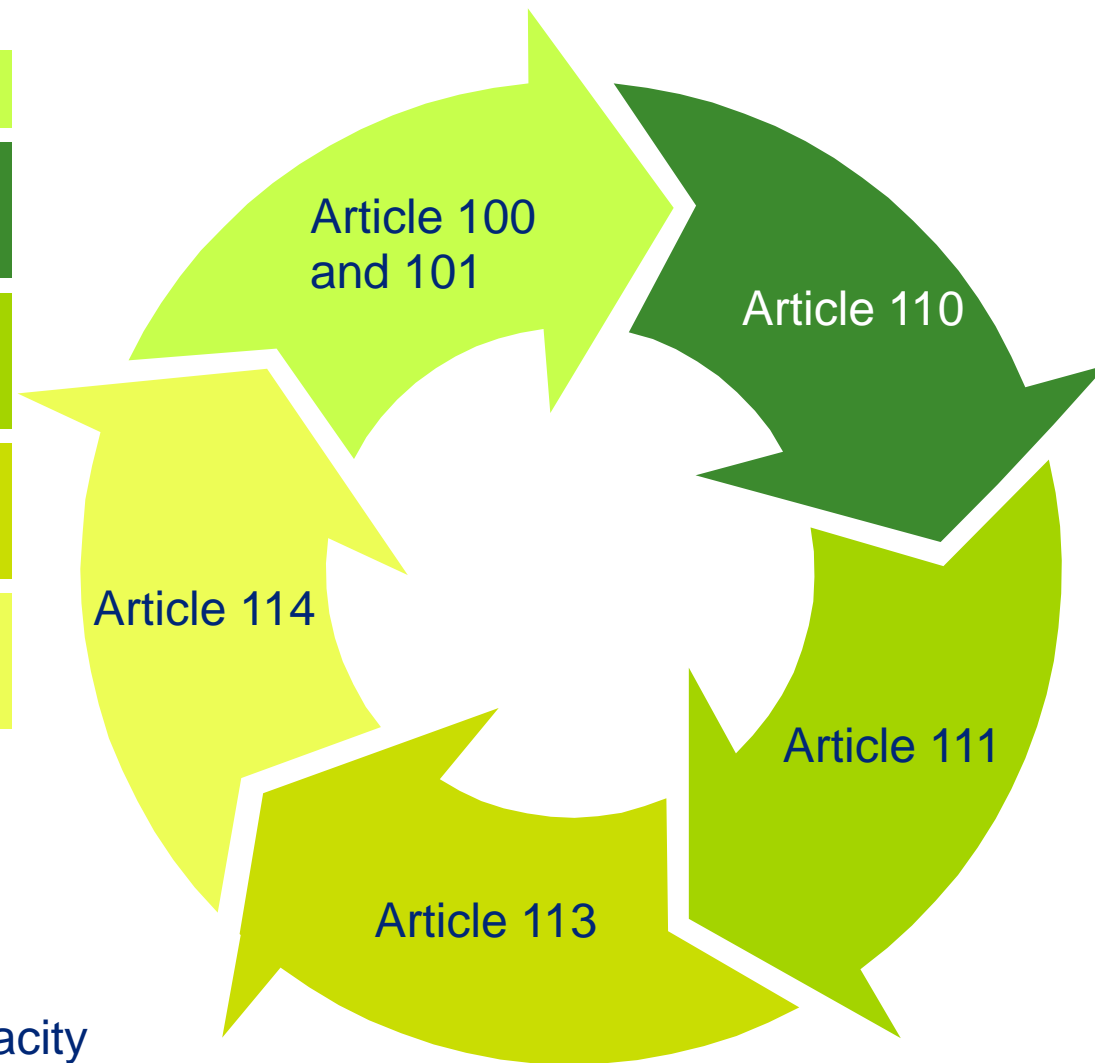
General provisions for the approval of full and partial IM

Specific provisions for the approval of partial IM

Policy for the changing the full and partial IM

Responsibilities of the administrative and management bodies

- Usage of IM:
 - One or more risk modules, or sub-modules, of the Basic SCR
 - Operational risk
 - Adjustment for loss absorbing capacity
- Application to whole business, or only to one or more major business units



... “insurance or reinsurance undertakings may calculate the SCR using a full or partial internal model as approved by the supervisory authorities” ...

Pre-application – General Provisions

During preparation

- Period of engagement with supervisory authorities prior to the submission of their formal application

Supervisory decision

- Six months after receipt of a complete application of IM

CEIOPS

- Would not wish to specify the format of the pre-application (**Content may vary**)
- Initial discussion (At least)
 - Undertakings intent to apply for approval and when
 - Scope of the IM application (Risks / Entities / Lines of business units)
 - Self-assessment of IM readiness
 - Plan for meeting the IM requirements
 - Necessary and relevant information to understand the model at the provisional stage of pre-application
 - Access to any draft documentation
 - Other information that supervisory authorities may consider relevant
 - On-site inspection
 - Review of the information

“Several regulatory regimes have already introduced a pre-application stage with different levels of formality”

Pre-application – Summary

Benefit to undertakings	CEIOPS recommendation	Pre-application period
<ul style="list-style-type: none">• Opportunity to be in touch with supervisory authorities during development of IM• Preparation of IM application• Facilitation of the subsequent approval process• Enable supervisory authorities to start from an informed position when reviewing IM	<ul style="list-style-type: none">• Development by supervisory authorities• Application on a regular basis	<ul style="list-style-type: none">• Supervisory authorities understand the extent and nature of the use, scope of application and coverage of the IM• Undertaking familiarizes itself with the approval framework• Early identification and communication of any specific concerns or issues

Unspecified duration of a potentially compulsory pre-application phase

“A pre-application stage requires more resources from the supervisory authorities, but should prove more efficient in the long run as supervisory authorities will be better able to plan resources for assessing IMs.”

Application

Documents for supervisors

- Overview of the model
- Scope of application and coverage
- Plan how it will be implemented
- Procedures and risk management

Detailed information

- Construction
- Calibration of the models
- Database
- Technological environment

Application

- Adequate description of the model and its scope
- Documentation
- Official language of the Member State (Exception can be given by supervisory authority)

Six months period

- Starts as soon as the relevant supervisory authorities are satisfied
- They may request supplementary information

“Further guidance shall be provided at Level 3”

Application

Required minimum documentation

- **Cover letter requesting approval**
- Written declaration confirming that all supporting documents have been provided, and no material fact and/or details relevant to the approval have been concealed
- Copy of the application approval
- Results of the latest ORSA and details of the undertaking's business and risk strategies
- **Scope of application for full or partial IMs and model coverage**
- **Risk management process and risk profile**
- **Self-assessment:** Strengths and weaknesses of the IM
- **Technical characteristic** of the IM: structure of the IM
- **External models and data**
- **Model governance, systems and controls, including documentation**
- **Validation report:** either by internal group or by qualified external party
- **Policy for changing the full and partial IM** and other policies for IM governance
- **Plan for future model improvement**
- **Capital requirements**

Absence of a definition for the “reasonable period” which the internal model is required to be in operation

“The application should be signed by the administrative or management body of the undertaking”

Policy for changing the full and partial IM

Model change categories

- Major changes
 - Need for prior supervisory approval
 - Until approval is granted, the IM shall not be used for SCR
- Minor changes

Undertaking has responsibility for creating the policy for changing the full and partial IM
 Undertakings may use subcategories, policy shall contain specification for identifying

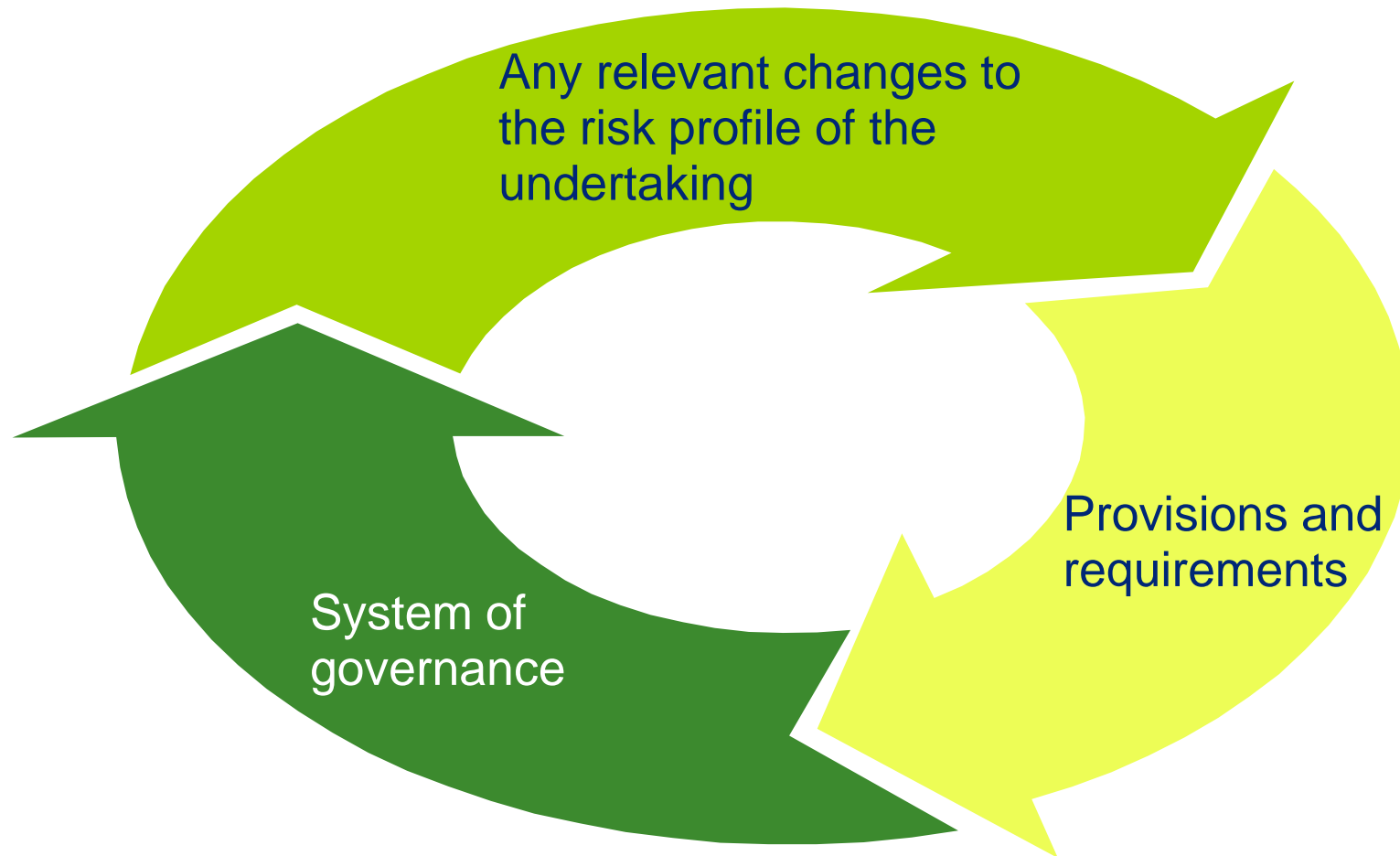
CEIOPS considered
five key issues

Scope of the model change policy (Which changes?)	Principles to differentiate model changes	Signoff procedures
Number of different model change categories	Reporting requirements Communication procedures Documentation standards	

“Abusing the system by changing material parts of their internal model through the use of a combination of minor changes, which individually are not subject to prior supervisory approval”

Policy for changing the full and partial IM – Scope of application

CEIOPS considers that areas of relevance for the IM include



“Model change policy shall cover any change which impacts these areas of relevance”

Policy for changing the full and partial IM – Model change categories

Option 1: Only two categories
Minor and major changes

Option 2: Separate different type of model changes
First level: Differentiation between major and minor changes
Second level: Differentiation between major model changes that require supervisory on-site inspection(s) and those that do not

Undertakings may assign model changes to the following **subcategories** (Major/minor changes with respect to the following subcategories)

- Calculation kernel
- Risk management
- Internal model governance
- Other aspects of the IM (e.g. the model change causes a significant increase/decrease of the VaR within substantial sub-portfolios)

“Changes to the approved IM change policy of the undertaking shall always be subject to prior supervisory approval”

Policy for changing the full and partial IM – Communication, documentation and sign-off

Major changes	Minor changes	Supervisory authority
<ul style="list-style-type: none">• Communicated for approval• Well in advance of intended implementation• Management body of the insurance undertaking shall approve the request	<ul style="list-style-type: none">• Report minor model changes quarterly or more frequently• Summarized report	<ul style="list-style-type: none">• Systems in place to record and track undertakings' notification requirements• May (on exceptional case-by-case basis) grant a prior conditional approval of the major change• May perform an in-depth review of minor changes

“Major changes, as well as changes to the model change policy itself, may be subject to a supervisory on-site inspection prior to approval”

Assessment

General Provisions

Approval process cannot be delegated to third parties

Assessment basis

- Information submitted by undertakings as part of the application
- Supplementary information
- External models and data (if used)

Assessment

- How the internal model meets the requirements
- Consideration of interrelation between requirements
- Concentration on satisfaction with the systems concerned identifying, measuring, monitoring, managing and reporting risk
- Compliance of the IM with the requirements

Modifications

- **Minor modifications:** Communication immediately; requirement to apply the modification within a deadline; 6-month period will be suspended
- **Major modifications:** Evaluated as new application; 6-month period will be stopped. New will start to run upon receipt of the new application

Lack of detail under which the 6-month review period can be temporarily halted

“Assessment is an iterative process, with feedback to undertakings resulting in modifications to their models”

Assessment

General Provisions

Approval process cannot be delegated to third parties

Minimum

- Technical review (scope, design, integrity and applications)
- Coverage and ability to calculate the SCR
- Documentation
- Risk management process
- Senior management role

Issues to be assessed

- Scope and model coverage
- Methodology and documentation
- Data quality
- Quantitative procedures
- Qualitative procedures
- Technological environment

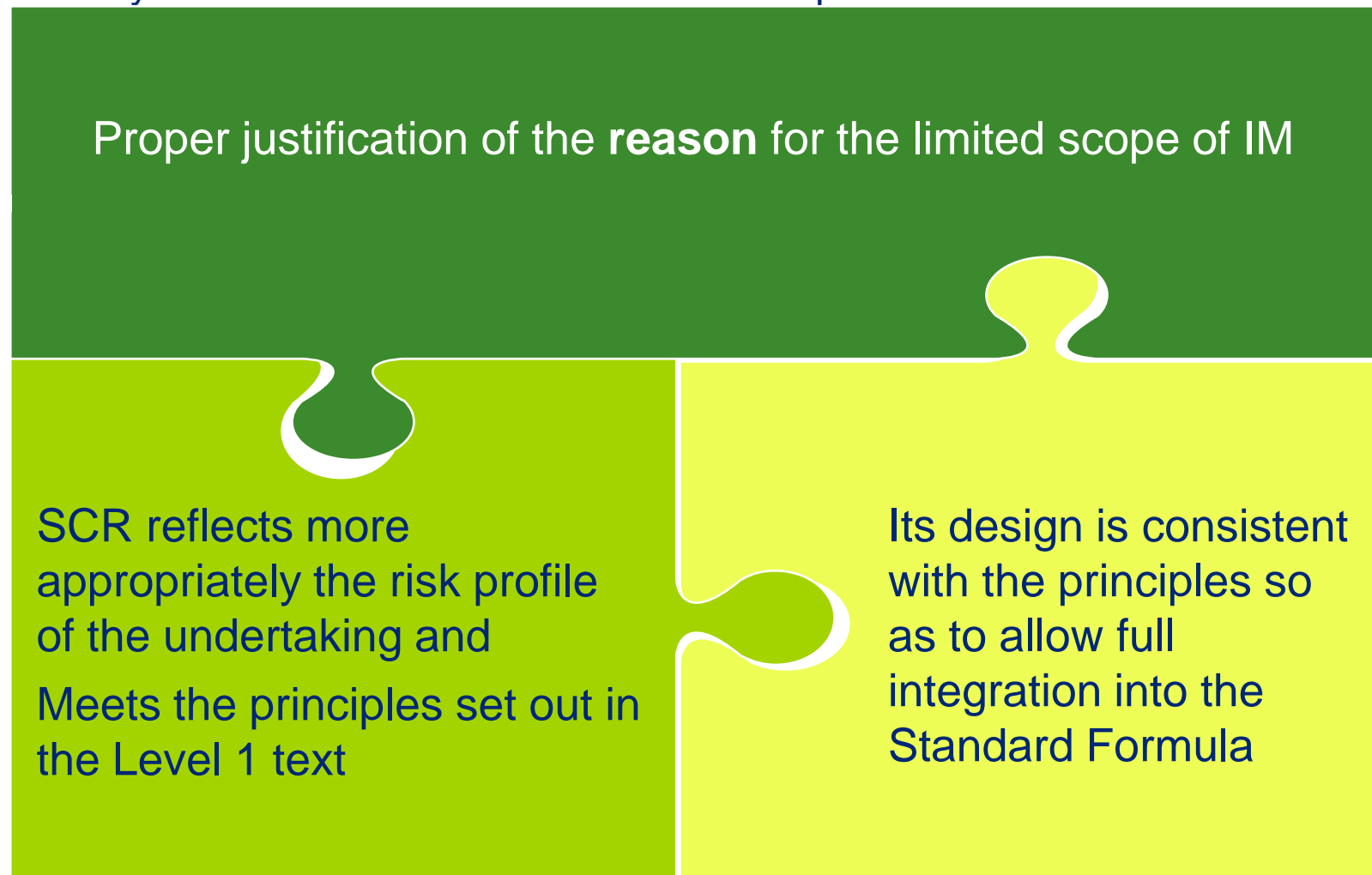
May include

- Desk-based review
- On-site inspection(s)
- Requests for further information
- Ad hoc conversations by phone and email

“The assessment stage will conclude with a final evaluation and decision by supervisory authorities on the appropriateness of the full or partial IM”

Assessment – Specificities related to partial IM

Supervisory authorities' focus on whether the requirements are met



Partial IMs will be discussed in CP to be published in December 2009

“Both full and partial IM do not need to follow a modular structure”

Decision making process – Approval

All requirements have been met => supervisory authority shall **approve** the use of the IM for SCR calculation

Approval may or may not be subject to terms and conditions

Supervisory authorities may take into account

How realistic is to fulfill the terms and conditions within particular term

Whether compliance can be assessed in an objective and straightforward way

May require to submit a plan indicating steps to meet the terms and conditions

“Once the decision has been made by the supervisory authorities, the on-going compliance with the requirements is considered by the SRP”

Decision making process – Rejection

IM has **not met** the requirements => the approval **shall not** be granted

- If the undertaking intends to use a partial or full IM, it has to submit a new application

Waiting period may be enforced before submitting new application

- Time to appropriately address the shortcomings in the original application
- Waiting period may apply also when the application was withdrawn

Decision making process – Limited Approval

Supervisory authority

- May approve only those parts of the IM that satisfy the Level 1 requirements
- Consider risk of cherry-picking
- May require submission of a realistic transitional plan to extend the scope of the IM

Undertaking

- Uses IM for those parts that have been approved
- Uses standard formula for rest (remaining business units and/or risk modules)

“If the undertaking’s application for approval is rejected, it shall use the standard formula to calculate the SCR”

Decision making process – Decision or permission document and disclosure

"Approval is officially notified in the form of a decision or permission document"

Document shall at least indicate

- Scope of application and coverage
- Terms and conditions (if any)
- Requirements for on-going compliance
- Policy for model changes
- Any other IM governance policy
- Other requirements
- Roll-out plan (if required)

Decision or permission shall be disclosed by the supervisory authorities

Disclosure must be suitable for bringing the decision or permission to the attention of

- Those most likely to be affected by it
- Others who may likely to make an application for a similar decision

Careful consideration of public disclosure effects

"Supervisory authorities shall consider whether the disclosure would prejudice to an unreasonable degree the commercial interest"

"If supervisory authorities reject the application, they shall provide reasons"

Decision making process – Specificities related to partial IM

The supervisory authority approves the application for a partial IM subject to submitting a transitional plan to expand the scope of the model

Reasons of this decision shall be explained

Minimum scope that the IM should cover after the implementation of the plan shall be set

- Time frame
- Extension of scope
- Measures to extend the scope and the respective resources

The undertaking fails to implement the transitional plan to extend the scope of the IM, the supervisory authority will be faced with several options

- Extend the time period to implement the plan
- Extend the time period to implement the plan but require amendments to it
- Impose a capital add-on where permitted
- Require the insurance or reinsurance undertaking to fully revert to the standard formula (as a final resort)

“Supervisory authority shall evaluate the plan presented by the undertaking, and propose and discuss amendments in case they are not fully satisfied”

Addendum to CP 37

The procedure to be followed for the approval of an internal model:
some specificities related to group internal models

Pre-application

Format of the pre-application consistent with the solo requirements

- Five stages of model approval:
 - Pre-application
 - Application
 - Policy for changing full and partial IMs
 - Supervisory assessment
 - Approval

CEIOPS expectations

- Pre-application will assess the scope of the group IM and its consistency with the scope of group supervision
- All supervisory authorities establish a cooperative and consultative framework
 - Supervisory authorities involved
 - Respective roles
 - Communication strategy and escalation process
 - Procedures to reach a joint decision
 - Overall supervisory plan of approval process for each individual pre-application

“The paper does not however go into the details of how this may work in practice.”

Application

Additional documents

- List of the **undertakings**
- Major **business units included** in the scope of the model
- List of their relevant **supervisory authorities**
- Method used to derive the **consolidated accounts**
- List of the undertakings which will use an IM
 - Reasons and alternative methods to assess risks for those that will not use an IM
- **Capital requirements** for the group and each of the related undertakings
- Description of the **structure of the group** and of the intragroup transactions
- **Transitional plan** to include undertakings not yet in the scope of the IM
- Regulatory capital requirements for related undertakings included in the scope of the group IM, but subject on a solo basis to **other solvency requirements**

Language and Signatory

- **Cover letter** approved and signed by all the administrative or management bodies
- Application sent to the group supervisor in an **official language**

“The group should submit a list of a additional documents (compared to the solo documentation requirements) potentially in numerous languages.”

Policy for changing the full and partial IM

Consistent with the general provisions, follow the same process

Assessment

Supervisory authorities may

- **Exclude** some related undertakings **from the scope** of group supervision
 - Assessment whether the exclusions are appropriate with respect to IM scope
- Force the group to use the **deduction and aggregation method** (exceptional)
- Impose an add-on or require the group to extend the group IM to risks not yet considered

Group shall take into account **all material risks** faced in the undertakings included of the scope of the supervision

CEIOPS recommends that the right to **consult CEIOPS** before the end of the six-month period **shall not be restricted to precise situations**

“Supervisors have the authority to impose changes to IMs and exclude some related undertakings from the scope of the IM.”

Decision making process

Decision

- Decision is sent by the group supervisor to the group and to all the concerned supervisory authorities

Transitional plan

- Consistent with the general requirements

Potential difficulty with these procedures is the possible large number of supervisory authorities involved
It is not obvious how the procedure can be streamlined

In practice this will be an interactive process

Group seeking approval will usually have a central unit responsible for IM development

Process will be best served if there can be a clear dialogue with one representative of the supervisors responsible

Correct assessment of materiality

“The level 1 right to consult CEIOPS should not be limited to precise situations.”

CP 56

Tests and Standards For Internal
Model Approval

Use test

Foundation principle

- Undertaking's use of the IM shall be sufficiently material to result in pressure to improve the quality of the IM

Principle 1

- Senior management, ..., shall be able to demonstrate understanding of the IM

Deep understanding of IM should be required for those responsible for the areas where the IM is used

Principle 2

- IM shall fit the business model

Principle based guidance to the level of detail IM needs to fit the business model

Principle 3

- IM shall cover sufficient risks to make it useful for risk management and decision-making

Principle 4

- IM shall be widely integrated with the risk-management system

Some undertakings allocate capital and diversification benefits between risks and business lines but others do not
CEIOPS's role is not to mandate particular method of running the business

“Use test: Demonstrate that the model plays an important role.”

Use test

Principle 5

- Integration into the risk-management system shall be on a consistent basis for all uses

IM as defined for SII should not be required to cover different accounting systems
However, significant inconsistencies should be avoided

Principle 6

- IM shall be used to support and verify decision-making in the undertaking

Expected profit and loss is not necessarily primary decision making metric

Principle 7

- SCR shall be calculated at least annually from a full IM run, and also when there is a significant change to the undertaking's risk profile, assumptions underlying the model and / or the methodology arising from decisions or business model changes, and whenever a recalculation is necessary to provide up to date information for decision making or any other use of the model, or to fulfil supervisory reporting requirements

Principle 8

- IM shall be used to improve the undertaking's risk-management system

Principle 9

- Undertakings shall design IM in such a way that it facilitates analysis of business decisions

Emphasis should be given to the communication of the results to the management

“Use test: Demonstrate that the model is widely used.”

Internal model governance

Internal model governance issues are closely linked to CP33 issued in March 2009

Responsibilities are split between

- Administrative / management body – collectively possess the required professional qualifications, knowledge and experience to provide sound and prudent management
- Risk management function

Administrative/
management
body

- Approve the application for the IM approval
- Set the strategy and framework for the development of the IM
- Monitor on-going compliance with the IM tests
- Ensure that the outputs of the IM are aligned to the key uses
- Ensure that there is adequate independent review in place

Risk
management
function

- Design, implement, test, validate and document the IM
- Analyze the performance of the model
- Provide a report to the high-level governance
- Suggest areas for improvement
- Develop a communication loop with the actuarial function

High level governance should decide on any necessary **material** changes to IM

More details on the “adequate independent review procedures” to avoid misunderstandings of the supervisor’s expectations

Statistical quality standards

Should apply to the risk model used for projection, the valuation model, and all related processes

Calculation methods for the SCR will need to be consistent with those used to calculate technical provisions

Number of criteria to consider

- Seven criteria for a **probability distribution function** to be considered adequate
- Four criteria to demonstrate that **credible information** is being used to design the IM
- Four requirements to meet for supervisors to be convinced of **assumptions** used in the model. A quantitative approach is preferred to a qualitative approach
- Three conditions to meet in respect of "**expert judgement**" applied to data
- Four criteria to assess the "**risk-ranking**" **capability** of a model. Risk-ranking is the ability to compare risks across risk categories

Both the undertaking and the supervisor should know the limitations of the model

Conflict between accuracy and transparency

It can be never proven that the data is free from material mistakes

“Statistical quality standards: requires the use of adequate techniques and accurate, complete and appropriate data.”

Calibration standards

Different risk measure or time period might be used, it needs to be shown that it provides at least the same protection as the standard measure

Companies will need to **reconcile (at least annually) the outputs** of the IM using the different risk measure and/or time horizon to the standard measure

When the group IM is used to assess the solo SCR of one entity, the calculation **will not be able to take into account any group diversification**

Supervisor may require **runs of the IM for benchmark portfolios** and external assumptions in order to verify the calibration

It is not generally possible to reconcile directly any other choice of confidence level, time horizon or risk metric to the 1 year 99.5% VaR

Assessment of diversification based on IM should be justified against relevant statistical quality standards and not by comparison to the standard approach

Benchmark portfolios should be limited to exceptional and justified cases

“Calibration standards: requires an equivalent level of protection to the one provided by the standard formula.”

Profit and loss attribution

Needs to be carried out at least annually for each major business unit

- Explain the sources of profit and loss and in this way help validate the IM
- Should be granular enough to allow the weaknesses of the IM to be identified

Importance to show the attribution being used as a part of the use test

- Information on the risk profile, understanding of the portfolio exposures, appropriateness of the risk management framework

May also assist for internal purposes such as budgeting, forecasting and reinsurance-program testing

Quantitative assessment will use results from the IM for all material risks

- Qualitative assessment of non-material risks or non-quantifiable risks will be required

Definition of profit and loss has not been set yet but CEIOPS' advice is to use internal definitions, which should be consistent with the risk model and appropriate for the system of governance

At least one internal performance measure definitions is expected to be very closely aligned with SII definition of own funds
Profit and loss attribution should be done on this measure

“Profit and loss attribution: requires P/L to be split per business units.”

Validation standards

Process should cover the **qualitative and quantitative processes** of the IM and should include at least the following areas:

- Data, Methods, Assumptions, Expert judgement, Documentation, Systems/IT, Model governance, Use test

Different validation tests can be run with different frequencies

Documentation is required on the validation process and will need to include the limitations and governance of the validation processes

In the trigger event, back-testing will be required by comparing the actual data to IM predictions, in order investigate any areas of weakness

Comprehensive stress- and scenario-testing program should be used to provide information on the model performance in various stress situations

- Reverse stress tests should also be considered to understand what stresses could seriously threaten the viability of the business model

Proportionality should be applied throughout the validation process

It might be difficult to demonstrate high level of degree of independence between the construction and validation team, particularly with respect to required skills

“Validation standards: requires to have an own validation process.”

Documentation standards

Documentation would allow an independent, knowledgeable third party to form a sound judgement as to the reliability of the model and compliance with articles 118-124

- Ability to **reproduce the model outputs**

Consider both **design and operational details**

- Management has a **good understanding of the key parts** of the IM and its limitations

All model weaknesses and drawbacks should be identified

- All **major changes** to the model need to be accompanied by a recalculation of most recent valuation results

Documentation requirements also include:

Documents and data considered as relevant

- Including a data flow chart, and how to access those resources

Theories, empirical basis and algorithms used

- Rationale for their selection

Use and rationale of expert judgement

- Data and parameters
- Experts making the judgements

Reproducibility of results based on documentation should not be required

Documentation of each use of expert judgement might be impractical

“Documentation standards: requires to document the design and operational details of IM.”

External models and data

Relationship of external models and data to the internal model

Various requirements in respect of an external model / data used within IM

- Explanation of the external model and data usage in the internal modelling process
- Explanation of importance of the external model/data, including the impact on the SCR
- Explanation of the rationale for choosing an external model over an internal model
- Demonstration of an in-depth knowledge of the methodology and construction of the external model
- Knowledge of model's limitations

Documentation is required

- Around any **manual adjustments** to the **external model, data** or **output**
- To risks arising from the use of external models

Validate the external model at least annually to ensure that the model is still working in the way it is intended to work

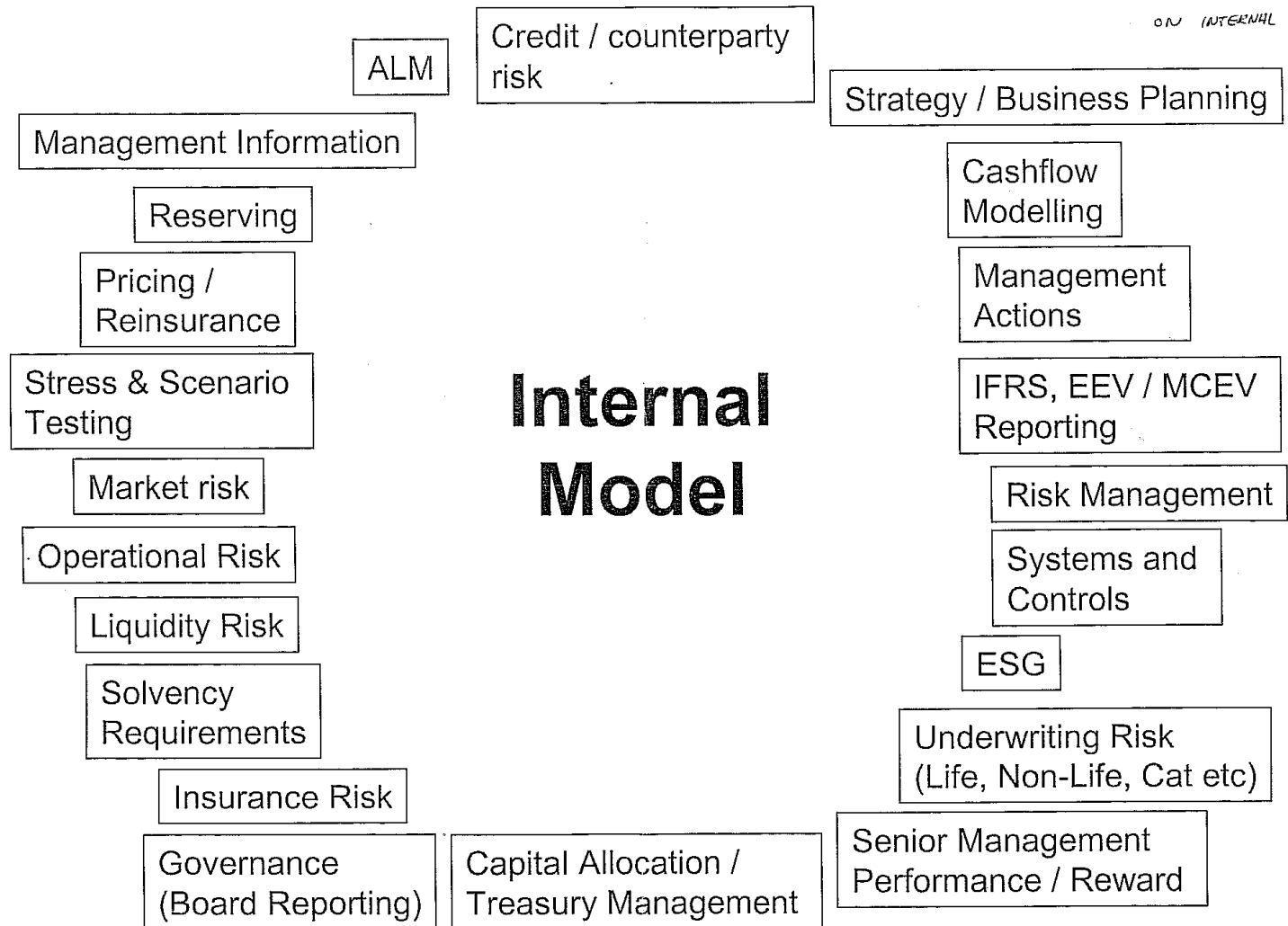
External models / data should not be subject to higher standards than IM

“External models and data: obtained from a third party are not exempted from requirements.”

Closing remarks

Model is a model is a model ...

ILLUSTRATIVE DRAFT 20/11/07
FSA TO CEOs
ON INTERNAL MODELS



There is no such a thing as a perfect model

Questions?

Thank you for your attention!

Kamil Žák

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Abbreviations

- CEIOPS Committee of European Insurance and Occupational Pensions Supervisors
- EIOPC European Insurance and Occupational Pension Committee
- IM Internal Model
- ORSA Own Risk and Solvency Assessment
- SCR Solvency Capital Requirement
- SRP Supervisory Review Process
- SII Solvency II

Source

- Solvency II directive – European Union
 - http://europa.eu/index_en.htm
- Consultation papers – CEIOPS
 - <http://www.ceiops.eu>
- Comments to consultation papers – Groupe Consultatif
 - <http://www.gcactuaries.org>

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