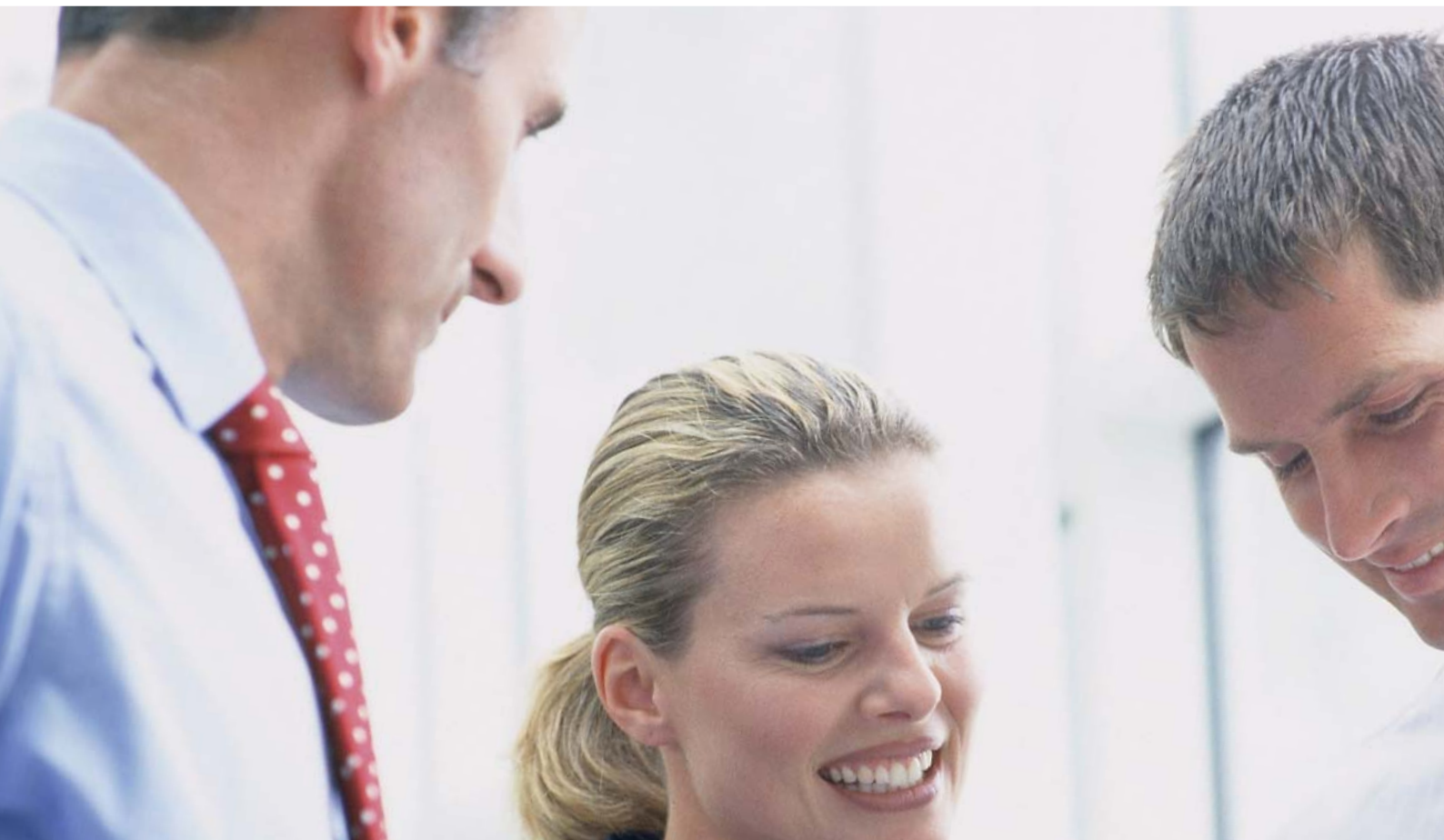




# Operational risk for insurers





## To our readers

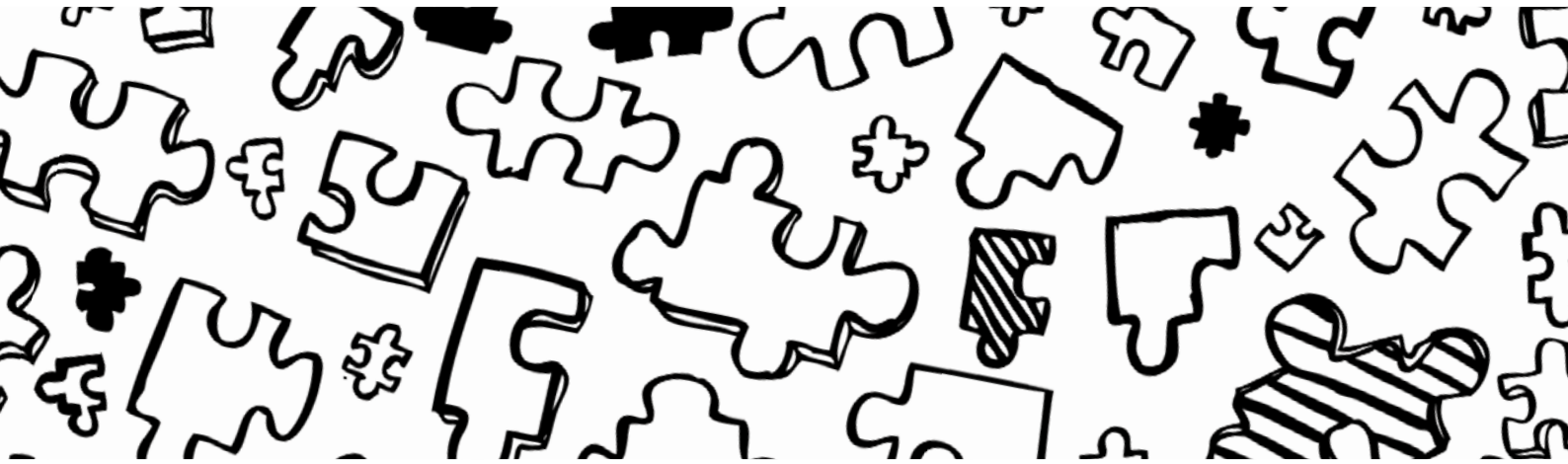
We are observing a new wave of demands for the quantification of operational risk. Given the assessment of model shortcomings in the last financial crisis, there is a need to explore capital optimization through more granular and risk-sensitive measurement approaches.

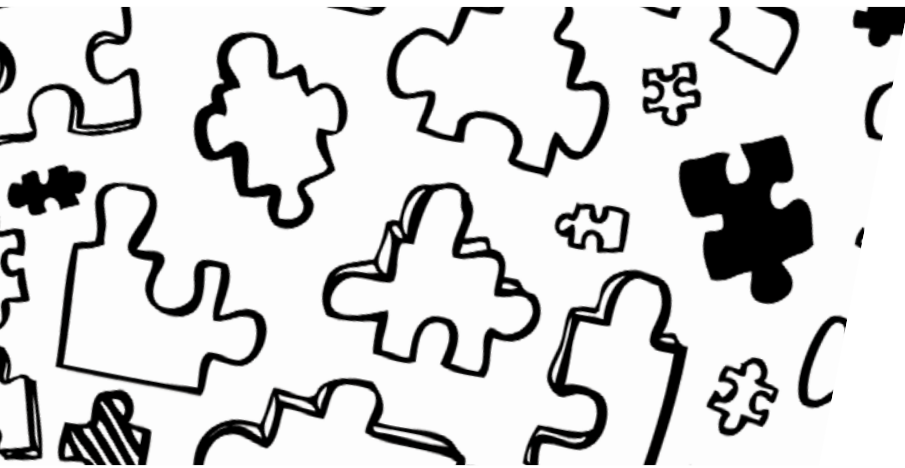
For insurance companies, current Solvency II requirements are triggering the development of internal operational risk models. At first glance, the less explicit requirements of Solvency II regarding methodology choice seem to be an advantage. However, the lack of insurance industry benchmarks and regulatory rules can result in lengthy and difficult-to-manage approval processes.

Operational risk extends well beyond the confines of a risk model or formula-based quantification. It encompasses a company's business activities and is an integral part of an efficient enterprise-wide risk management framework.

This paper provides an overview of the critical steps in the design, development and validation of a methodology. Through our experience with diverse companies across the globe, we determined that most strive for a light approach and are cost-conscious in curbing the excessive operational burden of service and maintenance. This is possible by combining and leveraging existing operational risk elements into a robust modeling framework.

We highlight the relevant issues for insurers that will contribute to a broader discussion of a viable approach. This will help them make a thorough assessment of potential risk and rewards, rather than viewing operational risk as a threat to their business.





# Content

1. Executive summary
2. Where is your value in operational risk modeling?
3. Challenges and difficulties for insurers' operational risk management
4. Elements of a sound operational risk quantification model
  - a. Model scope and motivation
  - b. Model components
  - c. Model governance framework
  - d. Loss data
  - e. RCAs and BEICFs
  - f. Expert judgment and scenarios
  - g. Model design and diversification effects
  - h. Results and risk allocation
5. Experience and future trends
6. Next steps for insurers

# Executive summary



As large operational risk losses continue to attract media coverage, regulatory concerns about insurance operational risk models are also on the rise. These factors are creating a new wave of demand for operational risk quantification. Internal requirements for better risk management, as well as higher capital requirements from new regulatory regimes (Solvency II), are leading companies to explore the risk sensitivity inherent in their methodology and to optimize capital consumption.

In this paper, we focus on insurance companies. In general, they lag behind the banking industry, which has implemented operational risk quantification models to take advantage of the Basel II advanced measurement approach (AMA) framework. Regulators' experience with Basel II AMA and Pillar II will significantly influence and shape the approach for Solvency II operational risk models.

## Operational risk model design

A sound operational risk model is definitely more than a formula. An insurer's underlying operational risk profile needs to be thoroughly reviewed across its range of business activities in order to identify and estimate the model input requirements. All components—data inputs (internal/external data or expert judgment), the calculation engine and the treatment of model output—must be managed and controlled under an appropriate governance framework.

The model design, which may range from purely expert opinion-driven to loss data-driven

approaches, must be supported by suitability analysis. This indicates, in particular, the material effect and applicability of key modeling assumptions of the insurer's risk profile. The principal challenge is to combine the merits of two essential sources of information: empirical loss data (objective, but backward-looking) and expert judgment (subjective, yet forward-looking). In our experience, data-driven approaches have many hidden assumptions that can have a massive effect and need to be documented.

To address these requirements, Ernst & Young developed a Statistical Tool for Operational Risk Modeling (STORM). This is based on collaborative experience gained from supporting companies across different industries in designing, assessing and validating internal operational risk models. The STORM methodology is designed to address regulatory concerns, provide valuable insights and optimize cost-benefit considerations of in-house model development. Furthermore, STORM implementation is designed to be flexible to allow for complete customization to company specification.

## Experience and future trends

A prominent market observation is the integration of the quantification model in the daily risk management process. Contrary to a stand-alone element for regulatory capital calculation, the model has a clear link to the risk and control assessments' (RCAs) framework and to company-wide risk appetite and quantification models. A solid and integrated RCAs approach for

identifying, collecting and processing bottom-up risk and control information, and allocation of results with similar granularity, is a cornerstone of operational risk quantification.

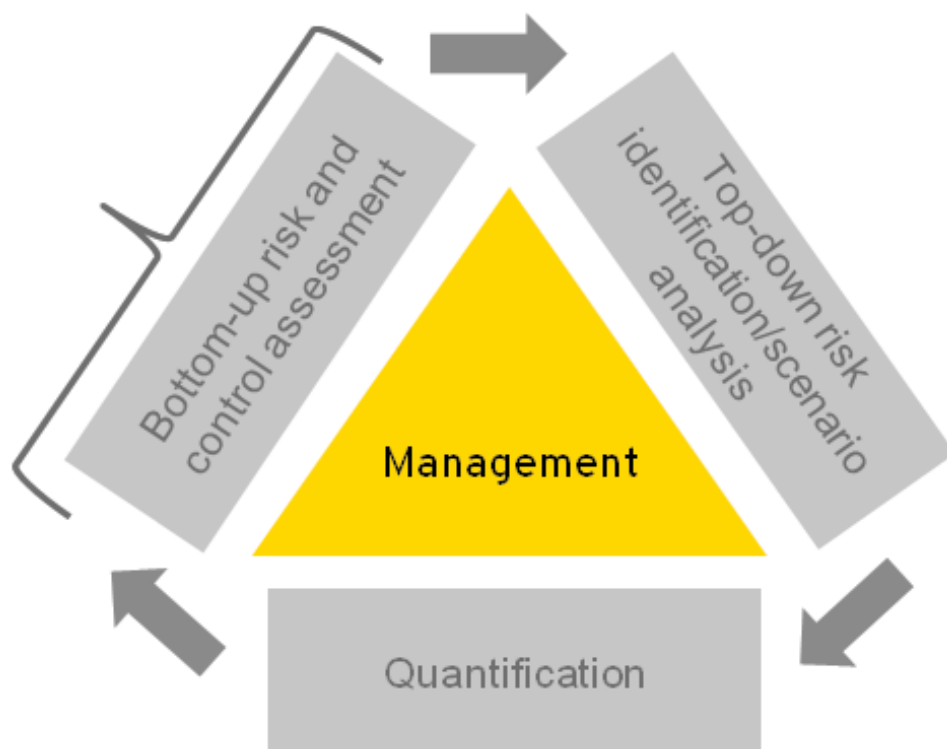
A continuous and circular risk management process links bottom-up RCAs, top-down scenario analysis and the quantification model (based on expert inputs and loss data) as process elements. This type of integrated RCAs framework has been implemented by Ernst & Young for many companies.

Another important trend that we see in the market is the need for organizations to allow a positive feedback loop in their operational risk management. Companies recognize that if they are able to improve their control, they should be able to reduce their capital requirements. This positive feedback is a great incentive for business units to devote time and resources to improve key controls and reduce operational risk exposure.



## An integrated operational risk model

**Key requirement:** a sound RCAs process, inclusive risk catalog (i.e., resulting from risk convergence)



# Where is your value in operational risk modeling?

Operational risk potentially exists in all activities and usually shows its principal characteristic of highly skewed or fat-tailed risk profiles in all market segments. This is the most dangerous type of risk for a company's survival. Insurers are usually affected by material operational risk exposure, which may reach the same scale of other risk types (such as insurance market and credit risks), depending on the specific business. Many of these "primary risks" are operational risk and are misunderstood (e.g., losses due to incorrect or mis-calibrated pricing models, or contracts with marketing features that turn out to be real options with economic value).

Assuming that effective operational risk management is built on both qualitative and quantitative management, the quantification step always begins by identifying the principal risk types. Even if some common operational risk categories are specific to the company's activity, many others are shared across industry sectors. For example, natural disasters and business continuity or execution and delivery usually affect all companies. This is an important element for leveraging on modeling experience across application fields and compliance with existing or upcoming regulations.

Despite the common nature of operational risk, the relative importance of each single category is often market-specific. Regulations and market loss events define trends that may drive risk categories to the top of the list; for example, investment suitability (consumer protection) has substantially increased in the past few years.

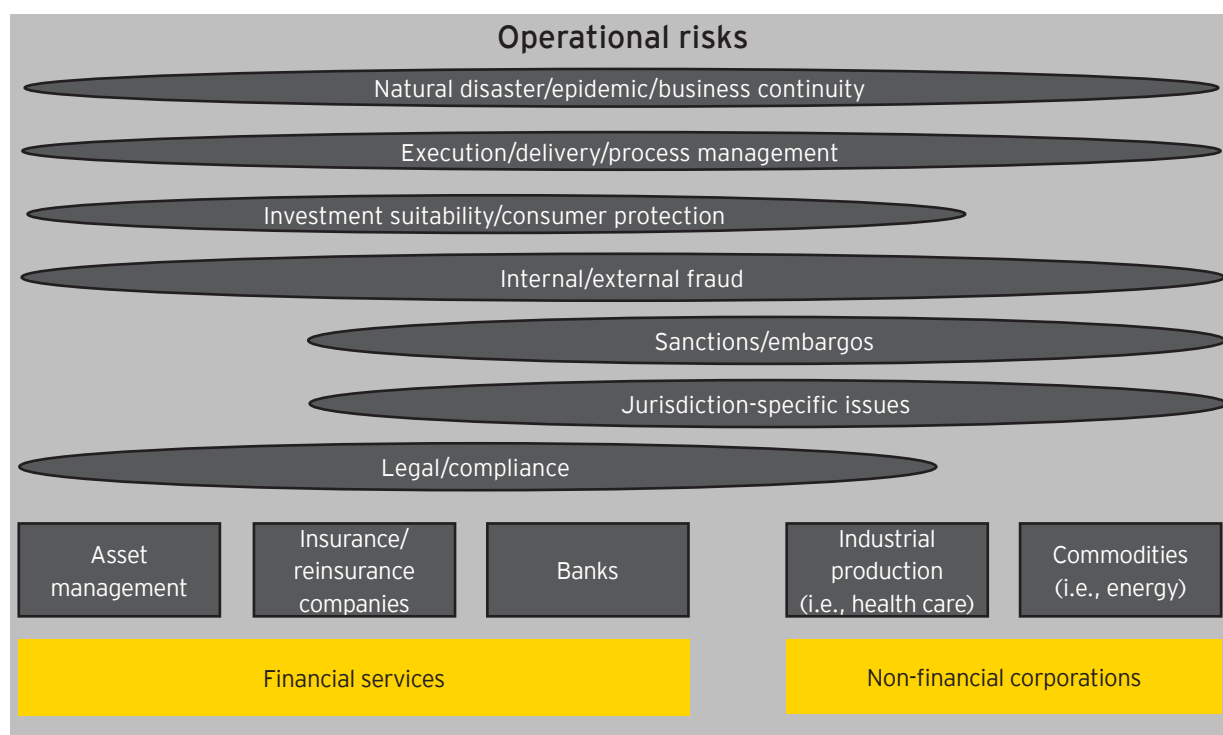
In the following sections, we discuss in more detail how insurance companies are affected by Solvency II requirements for operational risk quantification.

## The impact of Solvency II

The internal model approach under Solvency II requires a model-based quantification of operational risk for insurance and reinsurance companies. The increased degrees of freedom in relation to the model development represent only a superficial advantage. In addition to the difficulties of developing a robust model design without specific expectations, the most prominent project risk is linked to the local regulator's approval of the model. Different regulators may have varying expectation levels, for example, more or less emphasis on the importance of specific model components.

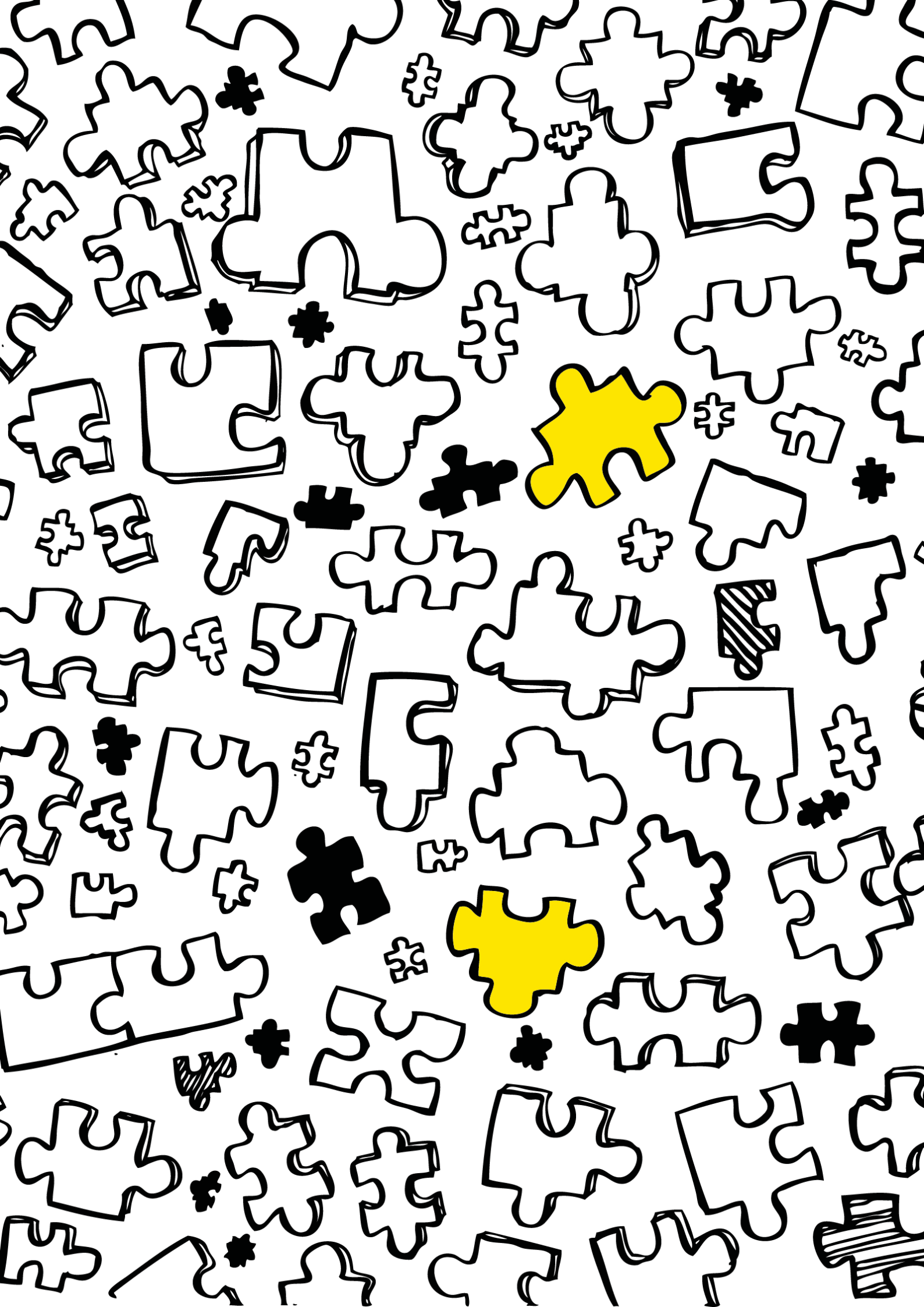
Insurance and reinsurance companies currently recognize the potential of a model-based quantification of operational risk. This, in particular, is derived from the possible benefit of diversification effects, which may be very significant for the typical company structure (i.e., several operating entities active on different markets and with diversified product offerings).

## Application fields - financial and non-financial services companies



## How can Ernst & Young help?

- ▶ Establish a project plan for model development and determine its application for the regulator
- ▶ Support model development by leveraging recent implementation with Solvency II models. If required, customize our packaged tool services (STORM)
- ▶ Manage the different regulatory requirements for a multinational organization
- ▶ For models already in an advanced development phase: review concepts (model design) and gap analysis for approval based on current regulatory feedback from the market
- ▶ Validate models; benchmark results and calibrations
- ▶ Support development of the required governance framework (e.g., policies and scenario templates)
- ▶ Manage scenarios and develop workshops



# Challenges and difficulties for insurers' operational risk management

Historically, insurers have attributed company failure to under-pricing, under-reserving, under-supervised underwriting, excessive expansion into new unfamiliar markets, irresponsible management, reinsurance abuse, internal control shortcomings, or a lack of segregation of roles and responsibilities. This is because operational risk losses are the result of complex and non-linear interaction among risks derived from business processes. By unbundling operational risk from all other risk types, risk management has the means to mitigate future failures. Given the media attention and reputational damage from high-profile events, insurers need to be increasingly aware of the commercial significance of operational risk.

In the past, companies have not collected operational risk data properly (inability to connect losses resulting from a unique event) or across the full spectrum of their business activities. Consequently, the forthcoming Solvency II regime will present a number of challenges and difficulties for insurers and reinsurers alike. The main issues, for the most part, are related to identifying and estimating operational risk exposure.

Internal loss data is the fundamental data source to measure operational risk. What insurers lack in amount or quality, they can supplement with external data from industry sources, such as Global Operational Risk Database (ORX) and Operational Risk Consortium (ORIC); however, incorporating internal and external data raises other methodological issues, such as reliability, relevancy, consistency and aggregation. As a result, insurers need to improve the quality of their data and data-gathering techniques and processes.

Risk scenario analysis is an effective and practical way to overcome problems arising from internal and external loss data. Furthermore, it is an extremely useful alternative in the event that it is impossible to construct a probability distribution, either because of technical difficulties, internal and external data issues, regulatory requirements, the uniqueness of an event, or any resources and cost implications. Because risk scenario analysis is forward-looking, it is needed even if the insurer has good loss data.

Furthermore, risk scenario permits insurers to capture risks that are not recorded by historical loss data, for example, risks related to new products, process, or technology. Nonetheless, the current practice in scenario analysis adopted by insurers is often too complex. It is inconsistently applied throughout the group, without adequately considering the strategic direction, business environment and risk tolerance. Other considerations are the alignment between the risk and actuarial department, and the risk management governance framework. Finally, the existing techniques and tools insurers use for risk self-assessments are often ineffective, inefficient, not successfully implemented and not considered meaningful by the business lines.

# Elements of a sound operational risk quantification model

## Model scope and motivation

The first step in any model development is to define the model scope and motivation. Besides the obvious purpose of quantifying operational risk, it is important to determine if the need arises from internal requirements (e.g., earnings at risk - [E@R] or scenario analysis for risk appetite) or if model development is also driven by regulatory requirements (e.g., Solvency II internal model or standard formula approach). The basic scope definition is the first step to develop key information for a suitable model design, for example, the appropriate percentiles of measurement, the calculation frequency and eventual constraints in the choice between different approaches.

From a regulatory capital requirement perspective, the standard formula approach can be conservative and is insensitive to operational risk profile, as compared to an appropriate internal model. This helps explain why an increasing number of insurers are showing interest in using an internal model to assess the operational risk capital.

## Model components

Thorough operational risk model building requires both an overarching governance framework and a robust basis of components, such as RCAs and Business Environment and Internal Control Factors (BEICFs). The chart below shows how these components interact in our STORM methodology. We will briefly discuss these elements and outline issues and respective alternatives. The model components are explained in a flow model of inputs, calculations (methodology and engine) and outputs.

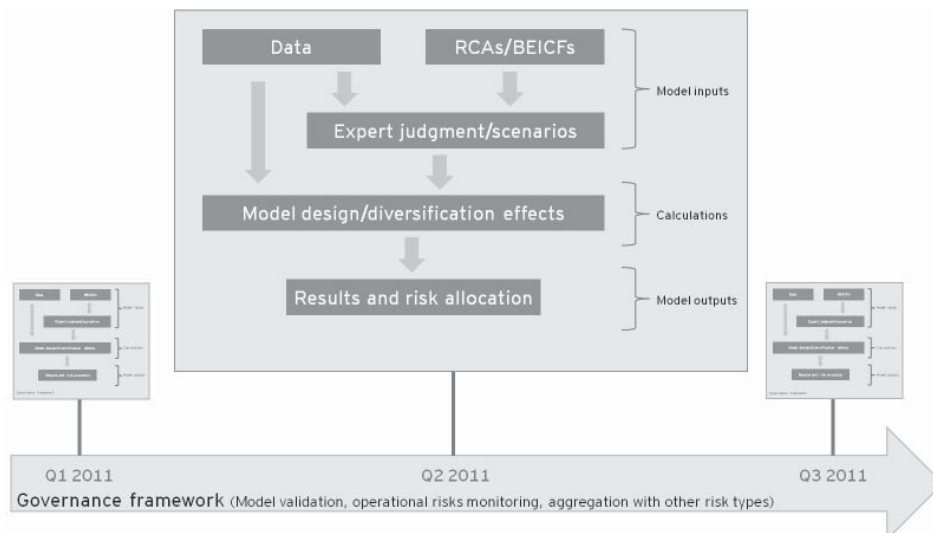
Regulators require the company to calculate the independent contribution of each component to the total capital. The stronger the link between the different components, the better the model will be. Good component architecture (such as our STORM methodology) is needed to address these requirements and take advantage of a strongly linked model.

## Model governance framework

Model inputs, calculations and outputs are embedded in a governance framework that defines all key elements for the sound development, use and maintenance of the model. There is also a section covering how the model aids higher level calculations or further modeling features (e.g., aggregated capital charge across risk types and E@R). The framework includes:

- ▶ Appropriate validation procedures at inception and ongoing compliance
- ▶ Monitoring changes in the company operational risk profile or in regulations
- ▶ Roles and responsibilities, as well as guidelines for model use and reporting

## Governance framework

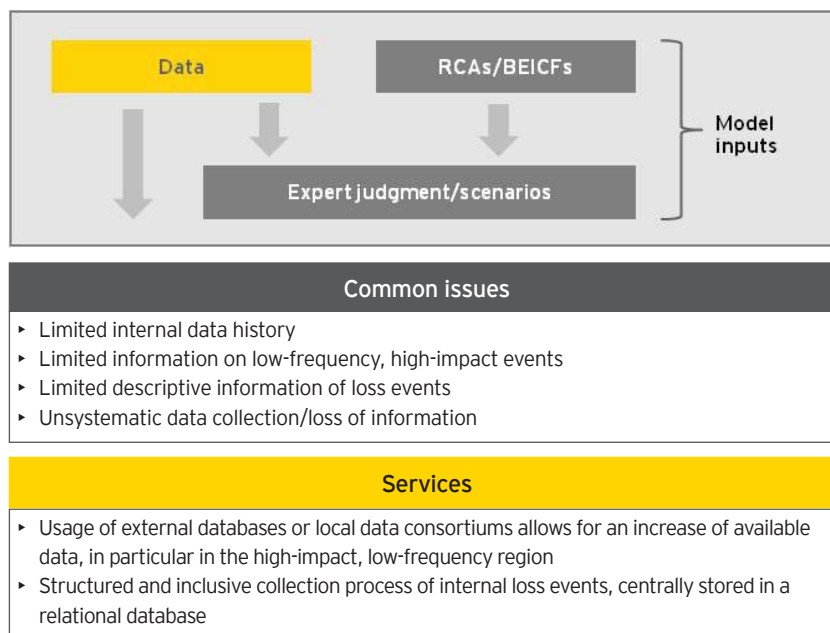


## Loss data

Loss data can encompass information on loss events experienced directly by the insurer (internal data) or by peer companies (external data). The information required for appropriate integration into the operational risk model is quite extensive. It could include the definition of an event date convention (i.e., event reported date), a clear description of the event or the eventual loss amounts and capability to map events to previous transactions and controls (i.e., several transactions resulting from the same event).

- ▶ Internal loss data is generally scarce, particularly in the tail of loss distribution, and estimated risk capital is mainly driven by tail loss events.
- ▶ External events are one way to overcome the scarcity of internal loss data, and they represent industry-wide operational risk experience. The process for selecting, filtering and scaling external data has to be transparent, consistent, systematic and replicable. Some insurance companies find external data to be of limited relevance, since external data on public losses is not necessarily representative in terms of scale and specific industry origin.
- ▶ Public external data is good for scenario construction, but has a size bias; whereas consortium data is checked and more consistent. Furthermore, legally sensitive events will not be publicly available.
- ▶ Data may be collected locally (i.e., by the business division or subsidiary); however, it should be merged in a central database where quality checks are applied.
- ▶ Models can be very sensitive to input assumptions; changes in external data can result in significant swings in capital requirements each time the model is run. Managing this volatility has been a key priority for second-generation models and STORM.
- ▶ Finally, external loss data provides valuable information on potential scenarios that could affect insurers and that can be used, if the information is precise and detailed, to implement specific mitigation measures.

## Common data issues





## RCAs and BEICFs

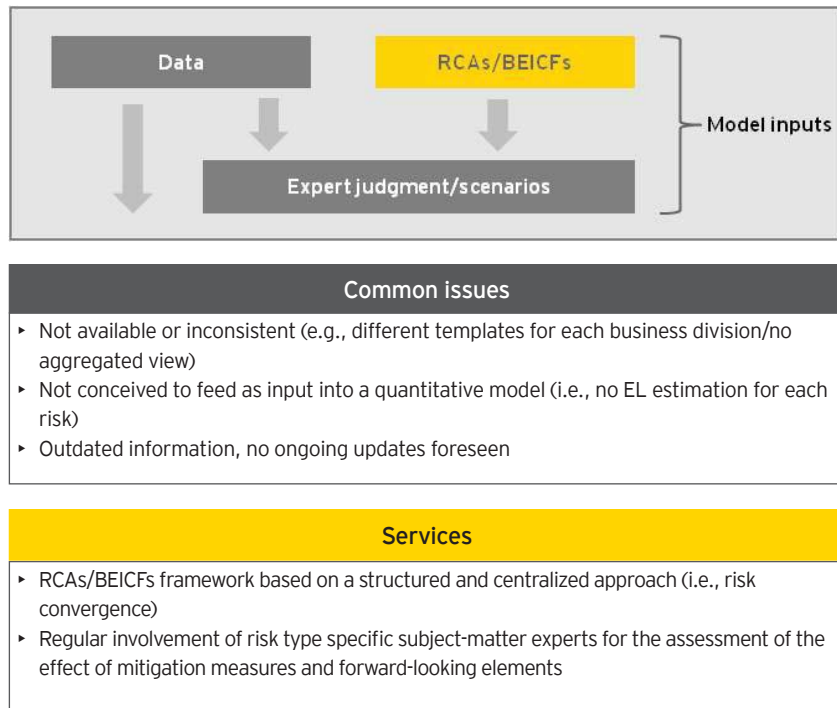
These both represent another source of important input for the quantification model. They deliver information gained by monitoring the company's business and control experience (similar to loss events information) and extend the range of information to forward-looking elements (e.g., trends in the industry and anticipated new risks, as well as current residual risks after the application of controls).

Typical key information can be obtained from a well-structured RCAs/BEICFs framework, for example:

- ▶ A complete risk catalog can help to structure the loss data analysis in order to model the body of the overall distribution of operational losses
- ▶ Identification of emerging risks and increase or decrease of already identified risks
- ▶ A subset or condensation of the risks in the catalog can inform about potential high-severity losses (for which scenarios are defined), and have to be analyzed for tail distribution calibration
- ▶ Common controls and triggers are strong indications of potential risk/scenario dependencies, which have to be considered for appropriate model design

Leveraged use of such information within a quantification approach is possible only if the RCAs/BEICFs framework is sound, centralized (company-wide approach) and updated regularly.

## Common RCAs/BEICFs issues

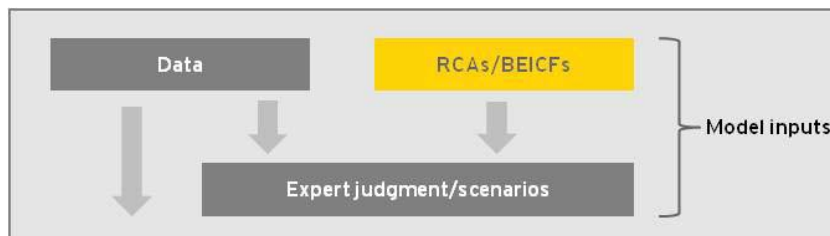


## Expert judgment and scenarios

The scenario component of an operational risk model is predominantly determined by two steps: the definition of scenarios and their calibration. For both, integration of expert judgment for tailoring the scenarios to the company's operational risk profile is a common approach. Expert judgment should complement industry information but not totally replace it. In particular, industry information on loss severity tail distribution characteristics of common scenarios contains significantly more robust information than an often arbitrary expert calibration at high-severity quartiles. For example, investment suitability and customer documentation event severity distributions are typically fat-tailed, while the severity distributions for disaster and technical systems are usually thin-tailed (see Ernst & Young STORM tool).

The definition of scenarios should cover all potential high-severity risks and change only slowly over time. The tail calibration of scenarios is also a parameter that is not expected to change frequently. However, scenarios should be refreshed quarterly based on the current business environment and new information. Expert judgment and scenario analysis should be clearly articulated in the documentation, taking into account changes of risk exposures and any implemented risk reduction measures.

## Common judgment and expert issues



### Common issues

- Not fully transparent inclusion of expert judgment leads to untraceable process
- The calibration of scenarios is neither challenged nor validated appropriately; experts are not fully conscious of the effect of their judgment to the overall result

### Services

- Guidelines describing in detail the scenarios calibration process (inputs, initial calibration and validation)
- The inclusion of expert judgment (deviation from pure data analysis) is well-documented and justifiable; the effect on results is discussed in dedicated workshops

## Model design and diversification effects

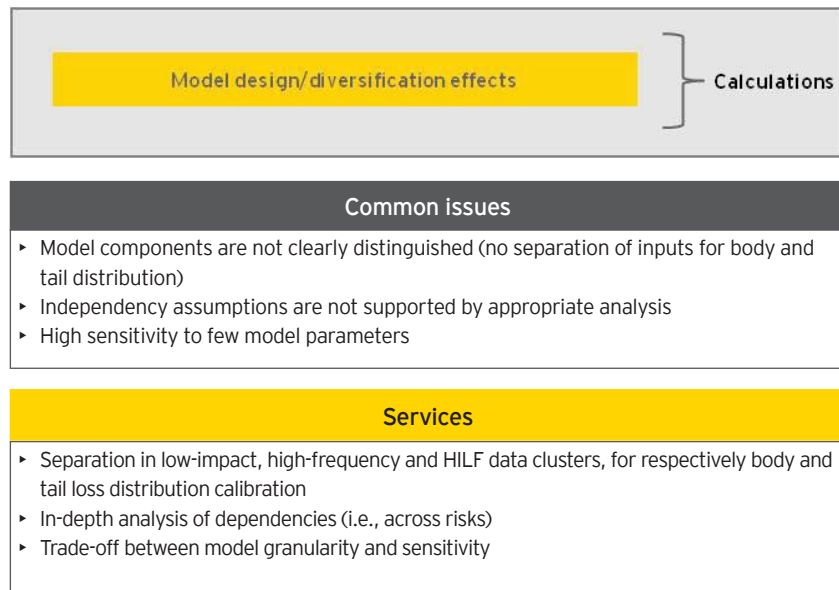
The two most common modeling approaches are the loss distribution approach (LDA) and scenario approach (SA). Ideally, both are combined to build the overall operational risk quantification model. Different weights for the relative contribution of these elements may be applied (based on the quality and quantity of loss data information). Given the nature of operational risk, where the tail behavior is dominated by high-impact, low-frequency (HILF) events, extended reliance on SA approaches may be an appropriate choice (especially when LDA information is marginal) if no specific regulatory requirement conflicts with such a choice. One of the most challenging steps in the model design is the definition of a sound linkage of LDA and SA components. This ranges from a simple sum to aggregation by simulation. Again, the analysis leading to a specific method must be justifiable and well-documented (no material model assumption with an impact on required capital can be based on arbitrary decisions).

As opposed to the LDA approach, which is purely data driven, most insurers are using the SA approach, with only a few of them incorporating external and internal data. By contrast, most banks use hybrid approaches incorporating both scenarios and data. Opinions between regulators varies on best approaches. For example, the Federal Services Authority (the UK insurance regulator) is very keen on the use of scenarios to drive capital results, while the US regulator emphasizes a data-driven approach. There is an expectation that operational risk models used by insurers will converge towards the hybrid approaches currently being used by banks.

Accounting for the diversification effects (i.e., across risk types) is one of the principle-added values of an internal model. Diversification has to be modeled according to the company's structure and granularity level of inputs and outputs. In modeling risk dependence, non-Gaussian copula approaches are quite commonly used to model the dependence structure between marginal risk distributions. These appear to be less critically questioned by regulators than the variance-covariance approach because they can take tail dependencies into account.

Finally, the choice of the calculation engine (capability, vendor models) must be consistent with the model requirements in terms of required flexibility for ease of ongoing adaptations and improvements, frequency of use, number of users and their quantitative operational risk expertise. The system must also be transparent and auditable.

## Common model design/diversification effect issues



## Results and risk allocation

What happens to the calculation results? This apparently trivial question is one of the most important. Models only conceived for regulatory compliance are often inefficient, because outputs are not leveraged by the risk management or the company's top executives and may fail to use test requirements.

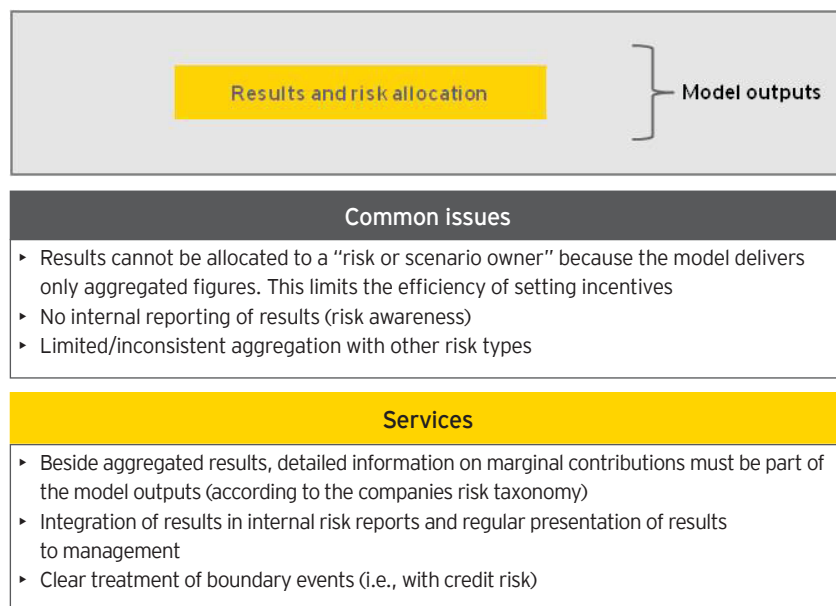
It is essential to have a closed feedback loop, where model outputs are shared with company management at different levels. There is a need for consistency between granularity of the inputs-gathering process and the model outputs' ability to describe marginal contributions to the total result (e.g., at business division, unit or local entity level). This is a key requirement for targeted and cost-efficient risk mitigation planning of available resources. Furthermore, it gives senior management the ability to assess and prioritize key loss events in their decision-making sphere. It can also help the operational risk units to set limits, trigger points and mitigating actions for potential loss events if they understand how different scenarios contribute to the operational risk capital requirement. Only companies with an adequate model to attribute operational risk contribution to the operative entities can benefit fully from improvements in their risk management.

Detailed results can also be used to manage the risk appetite of the company and its different entities. Knowing whether exposure to risk lies within risk appetite and tolerance is important. From our experience, the insurance industry has not come up to speed with the banking industry in understanding the meaning of operational risk appetite.

At the top management level, scenario analysis and model results can provide material information about strategic questions. For example, the choice of product offerings and markets could also be evaluated based on key risk information – in order to be consistent with the firm's overall risk appetite at all times. Risk assessments (qualitative and quantitative) in strategic decision-making processes are high on the agenda (i.e., capital optimization) because of the new regulations for Solvency II capital requirements.

The quality of the results and their usefulness can be increased by adding stress testing to the scenario analysis. This makes the modeling framework also a natural solution for Pillar II modeling and greatly increases its effectiveness.

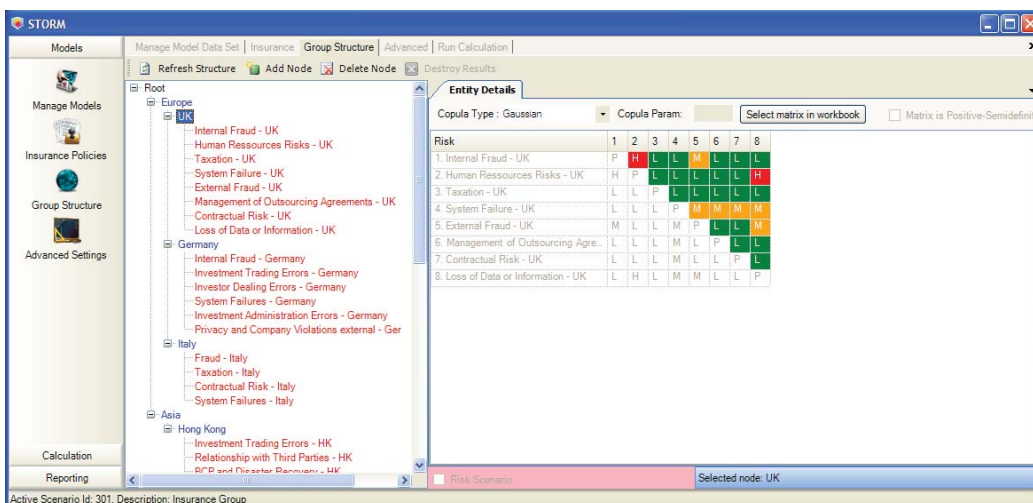
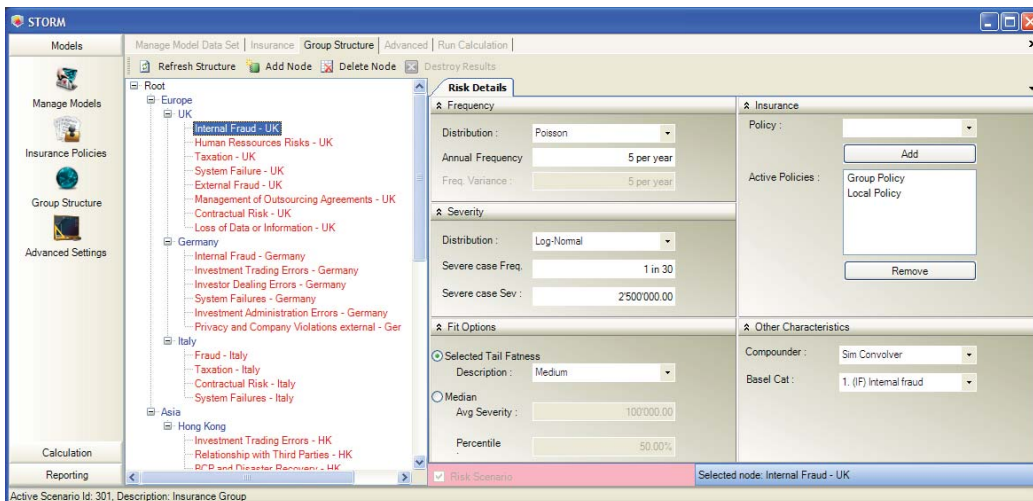
## Common results and risk allocation issues



## Ernst & Young's STORM

A practical multi-purpose risk quantification framework:

- ▶ Effective method to combine external consortium data with internal scenario assessment to produce a robust capital calculation with limited internal data
- ▶ Simple and user-friendly graphical tool for creating, validating and managing scenarios by translating them into loss distributions and facilitating a meaningful comparison with reference data
- ▶ Aggregation of loss distributions across risk types and business unit, based on a range of widely used copula models
- ▶ Allocation of diversified capital (net and gross of insurance) back to organizational unit and risk type, based on contributions to VaR
- ▶ Comprehensive reporting of diversified and undiversified capital allocation at various levels, as well as useful statistics on the effectiveness of insurance



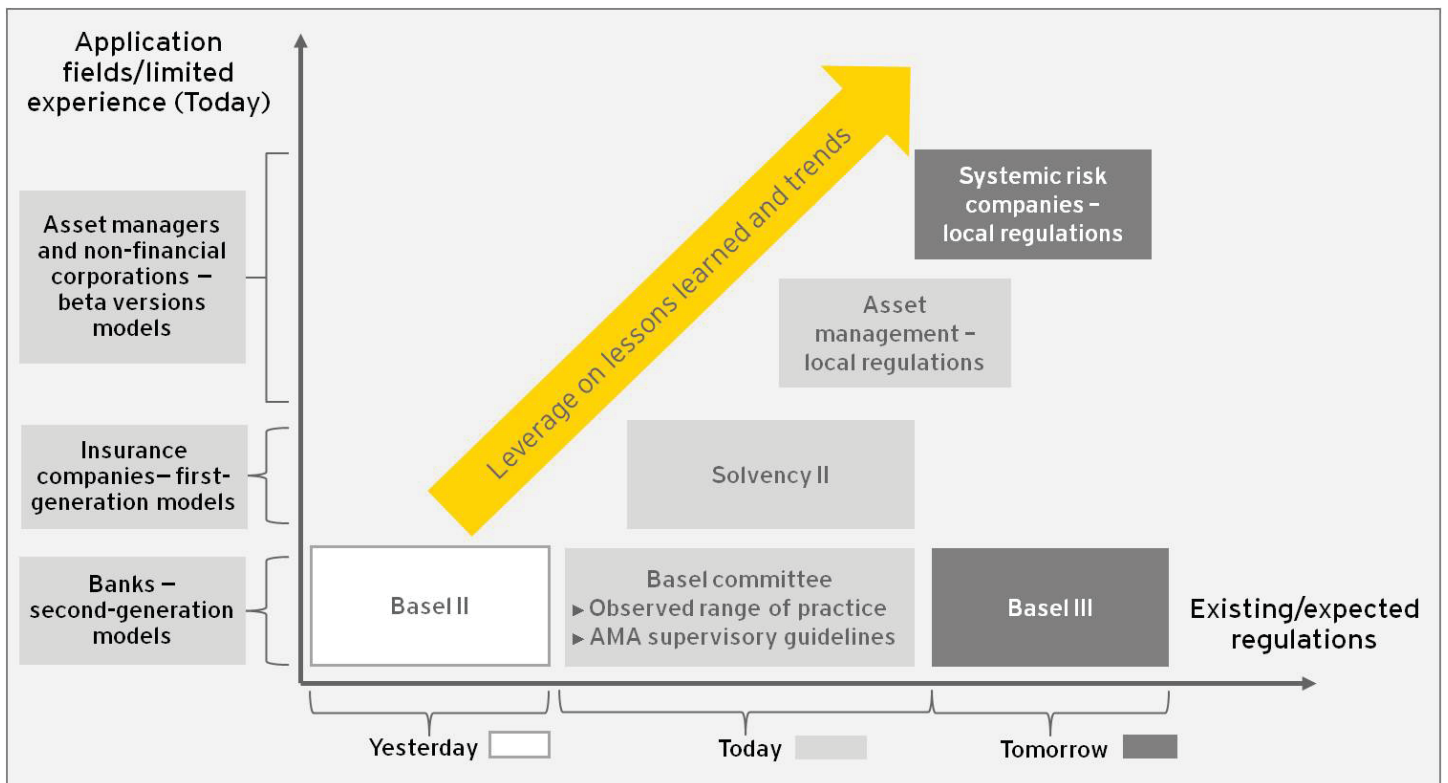
# Experience and future trends

A natural leverage on lessons learned in relation to operational risk quantification can be gained from experience with ICA, ICAAP, Basel II and, more recently, Solvency II and other new regulatory standards. Insurers should consider such experience in developing their own quantification models.

## Regulations

- ▶ Regulatory requirements are increasing, not only for overall operational risk quantification (i.e., Solvency II) but also for specific operational risks such as mis-selling (i.e., MIFID II), which might affect worse-case loss estimates for the respective scenarios.
- ▶ Regulators are increasingly pushing firms toward modeling operational risk instead of using a standard formula approach. Companies adopting the basic approach for Pillar I are being asked to perform modeling to support their Pillar II assessment.
- ▶ In addition, regulators have raised their expectations for transparency in model design, data flow and calibration. Internally or externally developed “black boxes” are no longer considered appropriate services.
- ▶ It is easy to criticize operational risk models, and regulators frequently do; however, the bar has also been raised on regulator expectations.

## Leveraging experience and lessons learned





## Model design

- ▶ Market practice is moving towards hybrid model approaches, which combine relative merits of internal and external data with scenario-based analysis and expert judgment.
- ▶ Expert judgment inclusion has to be transparent and structured in a traceable process.
- ▶ The relative contribution of data and judgment may substantially differ across companies; however, this must be justifiable and may evolve over time (i.e., with increasing loss data experience).

## Structural requirements

- ▶ In addition to cumulated qualitative skills, operational risk management teams also need to develop appropriate technical and quantitative skills.
- ▶ These requirements might be facilitated by the purchase of appropriate tools. However, a delegation of knowledge is not possible – the internal validation and use tests requirements would only lead to transferring the required knowledge from development teams to independent validation units.

## Governance framework

- ▶ Another consolidated market trend is the integration of the quantification model in the daily risk management process. As opposed to a stand-alone element, the model is interlinked to the RCAs' framework and to company-wide risk appetite quantification models. Incentives from legal entities are giving rise to the appropriate granularity of risk allocation to business units and risk mitigation initiatives.
- ▶ The governance framework needs to be amended with appropriate documentation and guidelines. Policies should detail roles and responsibilities, as well as the timeline of key process steps. Regulators and audit firms, which predominantly rely on the quality of such documents, regard them as material evidence of transparency and traceability of the overall quantification framework.



# Next steps for insurers

New demand for operational risk quantification is being driven by regulatory initiatives that focus on better risk management and higher capital requirements, such as Solvency II. Insurers are recognizing the benefits of an integrated operational risk model that combines bottom-up risk and control assessment with top-down risk identification and scenario analysis. As companies consider next steps, they need to explore the risk sensitivity in their approach; develop and manage the model design within an appropriate governance framework; and address the data, scenarios and risk allocation that are critical to a sound operational risk platform.



Ernst & Young

Assurance | Tax | Transactions | Advisory

**About Ernst & Young**

Ernst & Young is a global leader in assurance, tax, transaction and advisory services. Worldwide, our 152,000 people are united by our shared values and an unwavering commitment to quality. We make a difference by helping our people, our clients and our wider communities achieve their potential.

Ernst & Young refers to the global organization of member firms of Ernst & Young Global Limited, each of which is a separate legal entity. Ernst & Young Global Limited, a UK company limited by guarantee, does not provide services to clients. For more information, please visit [www.ey.com](http://www.ey.com).

**About Ernst & Young's Global Insurance Center**

Insurers must increasingly address more complex and converging regulatory issues that challenge their risk management approaches, operations and financial reporting practices. Ernst & Young's Global Insurance Center brings together a worldwide team of professionals to help you achieve your potential – a team with deep technical experience in providing assurance, tax, transaction and advisory services. The Center works to anticipate market trends, identify the implications and develop points of view on relevant industry issues. Ultimately it enables us to help you meet your goals and compete more effectively. It's how Ernst & Young makes a difference.

© 2012 EYGM Limited.

All Rights Reserved.

EYG no. EG0077

1112-1312417 NY

This publication contains information in summary form and is therefore intended for general guidance only. It is not intended to be a substitute for detailed research or the exercise of professional judgment. Neither EYGM Limited nor any other member of the global Ernst & Young organization can accept any responsibility for loss occasioned to any person acting or refraining from action as a result of any material in this publication. On any specific matter, reference should be made to the appropriate advisor.

[www.ey.com/insurance](http://www.ey.com/insurance)