

# DeRisk

*CRISIL's insights and analyses of regulations, macroeconomic factors, guidance and trends affecting the insurance industry*

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## Model risk management 20 years in the making

Global Research  
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## Tracing two decades

Many events have shaped model-risk management (MRM) as we know it today.

The Gramm-Leach-Bliley Act of 1999 broke down the wall separating commercial and investment banking, giving the US banks greater autonomy. Another key event with wider repercussions was the crisis after the dotcom bubble, which marked the start of a strategic shift towards solid risk management practices, particularly with the growth of more complex financial models and systems.

This separation of commercial and investment banking created a period where the Financial Stability Board (FSB), the European Central Bank (ECB), the US Federal Reserve (Fed), the UK Prudential Regulation Authority (PRA) and other regulators were focused on establishing a new stability-focused monetary policy strategy and a broad operational framework.

A key trigger for the change was the US Office of the Comptroller of the Currency (OCC) Bulletin 2000-16<sup>1</sup> that provided guidance to mitigate 'model risk'. The focus of banks started to shift to model risk. The information revolution was followed by years of profits and prosperity for banks. Bank profits were strong for more than a decade with no bank failure until 2007. However, various warning signs started appearing in 2007, culminating in the 2008 global financial crisis. By 2009, G20 leaders had decided to fix the financial system. They tasked the Financial Stability Board (FSB) with addressing the challenges of 'too big to fail' companies (banks or insurers) and building a more integrated financial system worldwide.

Such events have transformed the way regulators and financial institutions in various countries deal with risk, particularly in the MRM area.

In the US, some insurers, especially the big ones, had adopted MRM practices by 2012, due to the pressure from the Federal Reserve in SR 11-7 (Figure 1). In 2014, the regulator classified some insurers as systemically important financial institutions (SIFIs). The same year the FSB introduced its own classification of global systemically important insurers (G-SIIs). While the SIFI insurance designation for insurers was diluted, the focus on MRM compliance and additional reporting remains.




In Europe, MRM adoption in 2015 was mostly influenced by the expected Solvency II directive that took effect in 2016. By 2016, the demarcation between SIFIs and G-SIIs had appeared to be diluted, but MRM practices gained traction.

While banks and insurers have adopted MRM at varying speeds, insurers accelerated their adoption of industry practices in 2016. Some of them were influenced by the actuarial practice and learning from banks in MRM. In Europe, insurers started to foresee the implications of risk management practices with the introduction of Solvency II by the European Insurance and Occupational Pensions Authority (EIOPA). The regulation aimed to review the prudential regime for insurance and reinsurance undertakings in the European Union. In particular, the Pillar II of Solvency II focused on governance and risk management, including internal-model development and validation requirements.

<sup>1</sup>Office of the Comptroller of the Currency's (OCC) on risk modeling: [https://ithandbook.ffiec.gov/media/resources/3676/occ-bl2000-16\\_risk\\_model\\_validation.pdf](https://ithandbook.ffiec.gov/media/resources/3676/occ-bl2000-16_risk_model_validation.pdf)

**Figure 1: Regulatory timeline of key MRM guidance in Europe, the UK, the US and Canada**

|      |   |   |   |   |
|------|---|---|---|---|
| 1999 |    |    | R | The Gramm–Leach–Bliley Act (GLBA): This Financial Services Modernisation regulation triggered mergers and acquisitions, along with a wave of business transformation for banks and insurers.  |
| 2000 |    |    | R | OCC 2000-16: The first definition of model and model risk came into the picture, shifting the focus from process risk into model risk for financial institutions  |
| 2001 |    |   | O | The burst of the dot-com bubble lasted from March 11, 2000, to October 9, 2002  |
| 2002 |    |    | R | The Sarbanes-Oxley Act, or SOX compliance, for public company accounting reform introduced considerable model-development requirements for public companies and transparency for banks and insurers   |
| 2004 |    |   | O | The BIS speech by Malcolm D Knight at the International Conference of Banking Supervisors, looking for greater convergence and common challenges within the financial industry  |
| 2006 |    |    | R | BCBS and CEBS G10 new validation requirements: Capital Measurement and Capital Standards incorporates various aspects of internal model risk management   |
| 2007 |    |   | O | Global Financial Crisis. The collapse of the housing market was at the centre of the 2008 financial crisis (Lehman Brothers bankruptcy)   |
| 2008 |    |   | O | Global financial crisis. US government economic bailout of 2008   |
| 2009 |    |   | O | European debt crisis: Several Eurozone member states (Greece, Portugal, Ireland, Spain and Cyprus) were unable to repay or refinance their government debt  |
| 2010 |    |    | R | The Dodd–Frank Wall Street Reform and Consumer Protection Act. The law overhauled financial regulation, and various models were reviewed to ensure better transparency, particularly around liquidity risk  |
| 2011 |   |   | R | Introduction of the leverage ratio as a safeguard against model risk  |
| 2011 |  |  | G | OCC-Fed (SR 11-7): This SR 11-7 guideline opened the door to MRM practices that transformed the banking and insurance industry  |
| 2013 |  |  | R | EBA CRR and EBA RTS on Prudent Valuation: Capital Requirements Regulation (CRR) sets out requirements relating to prudent valuation adjustments of fair-valued positions. This regulation mandates the EBA to prepare draft regulatory technical standards (RTS) in this area.        |
| 2014 |  |  | G | EBA convergence in the supervisory review and examination process (SREP): Convergence starts. For example, banks in Spain need to consider valuation adjustments for model risk.  |
| 2016 |  |  | G | Polish Supervision Financial Authority: The Polish supervisor drafts Recommendation W. This includes MRM for banks  |
| 2016 |  |  | G | OSFI E-23: Guideline E-23 outlines the minimum prudent practices for internal-model development, review, approval, use and modification, which can be applied by financial institutions reliant on models.  |
| 2016 |  |  | R | EIOPA Solvency II: The project aims to review the prudential regime for insurance and reinsurance undertakings in the European Union. Particularly, Pillar II focuses on governance and risk management, including internal-model development and validation requirements.            |
| 2017 |  |  | R | PRA stress testing: Stress Test Model Management Principles and the first biennial survey research for insurers' stress testing practices   |
| 2017 |  |  | R | ECB TRIM: Targeted Review of Internal Models for Banks and structure of three lines of defense (3LOD)   |
| 2018 |  |  | R | APRA CPS 220: The Australian Prudential Regulation Authority (APRA) issued these requirements and included the need for an institution and group to have a risk management framework that is consistent and integrated with the risk profile and capital strength of the organisation |
| 2019 |  |  | G | MRM practice note: Various accepted practices for actuaries to follow in MRM are provided in the American Academy of Actuaries practice note issued in May  |
| 2019 |  |  | G | OSFI E-25: Internal-model guideline that applies to the risk oversight frameworks that property and casualty insurers need to use   |

 Banking / Insurance    Banking    Insurance   R: Regulation   G: Guideline   O: Other Event Type

In March 2017, the Australian Securities and Investment Commission (ASIC) issued the Regulatory Guide 259 to deal with risk management systems. RG 259 provides specific guidance to financial institutions to have in place a risk management system, as well as processes for identifying, managing and assessing risks. The guide relies considerably on the International Standard ISO 31000:2009, the objective of which is also risk management.

In July 2018, the Australian Prudential Regulation Authority (APRA) issued its Prudential Standard CPS 220 Risk Management in scope to authorised deposit-taking institutions, general insurers, life insurers and private health insurers to maintain an appropriate risk management framework. The framework would enable them to develop and implement policies and procedures to manage different types of material risks, and provide the board a comprehensive institution-wide view of material risks consistent with the business plan.

By the end of 2018, model risk management practitioners working for insurers had already put in place a broad set of accepted practices worldwide. In May 2019, the American Academy of Actuaries published a practice note detailing many MRM practices in the insurance industry. Although this note does not reflect fully a global practice for insurers, it is the most comprehensive guideline focused on actuaries practicing in model risk management, actuarial models typically represent 60% of the model inventory for an insurance company.

In late 2019, the independent agency of the Canadian government, Office of the Superintendent of Financial Institutions (OSFI), issued OSFI E-25 for P&C insurers to develop better controls and risk management practices for their internal models used in determining regulatory capital requirements. With this new guideline, the MRM adoption trend has intensified in North America, prompting multinational insurers to keep up with guidelines and regulations.

Twenty years of MRM have influenced the financial industry to look into risk management with a different perspective. The approach has become more model-centric without losing the focus on governance and practices. The model-centric approach may continue, even as MRM continues to transform the industry.

## Leveraging MRM in internal models

The adoption of MRM practices will remain a priority topic in the modelling agenda for insurers, as they spread at a faster pace across the industry due to the increased interest of the regulators and practitioners in executing model development and validation activities more efficiently and transparently. Internal models are immediate candidates for increased MRM oversight by technical (actuarial) and corporate business units. This model-centric approach is understandable, because internal models are critical to perform an assessment of risk and capital requirements for insurers that regulators use to measure insurer strength.

Many regulations worldwide require MRM activities for internal models. In fact, Solvency II requires model validation for several model components. Under these circumstances, it is clear why there is an increased interest in the adoption of MRM practices by the insurance industry, as they have proven to be a good modelling practice. Additionally, over the 20 years that MRM has evolved, computing capabilities to develop internal models has changed too, including the rise of large-scale technology, the emergence of comprehensive insurer risk management practices and the development of increasingly sophisticated risk-based insurance regulatory capital requirements.

Just from the MRM perspective, regulators have laid more emphasis on customer protection. The long genealogy of legal initiatives to address risk management that emanated in the past 20 years worldwide support this. The most relevant change for insurers is probably Solvency, which brought a solvency ratio as an important metric to measure an insurer's financial strength. This has increased the focus of regulators to measure the strength of insurers by looking into the internal models and different levels of risk-factor componentisation.

Regulators allow the safe harbor standard formula and a customised internal model that, in many situations, is preferred by the insurer. There are differences between internal and standard formula approaches. Notably, the potential risk-capital requirements are lower when using internal models, because specific risk components are developed, quantified and mitigated by the insurer. With the use of internal models, increased use of digitisation



and automation, more models are being integrated into business processes and functions, exposing institutions to greater model risk and consequent financial losses. The standard formula is a more 'one size fits all' type.

The harmonisation of MRM and Solvency requirements is something we will continue to see, including differences across geographies. In Europe, for example, under Solvency II, capital requirements can be calculated based on: (1) an internal model, developed by the insurance company itself, requiring the approval of the supervisor; (2) a standard formula, in accordance with Solvency II rules and guidelines; or (3) a combination of an internal model and the standard formula, a partial internal model.

Insurers apply specific strategies to receive approvals depending on their level of adoption of MRM practices. In many circumstances, they can make the approval process efficient, such as, for example, the regulatory approval to use a partial internal model to measure and aggregate the risks related to an insurer's exposures in the European Economic Area (EEA) and calculate its Solvency Capital Requirement (SCR) under Solvency II. In this example with MRM practices, partial application of Solvency requirements may respond to different materiality, exposure and diversification of risks in business units from its jurisdictions.

A mature MRM approach for an insurer with multiple jurisdictions is essential. For instance, the US, Australia, Brazil, Canada, Japan and Mexico were granted equivalence under Solvency II. It means insurers can continue to calculate their capital positions as they have been doing, because their statutory requirements in force are equivalent to Solvency II. Moreover, the capital, after conversion of the capital requirements into a Solvency II-equivalent, can be aggregated to the European financial figures of European-headquartered insurers. European insurers typically do not apply Solvency II to their businesses outside Europe.

Regulatory differences in geographies may be a burden. In the US, the risk-based capital (RBC) framework is accepted by the group regulator to be equivalent at 150% RBC after reducing own funds by 100% RBC requirement to reflect transferability restrictions. Other equivalence-granted countries have their own definitions of RBC or SCR. In Canada, the minimum capital requirement is substantially higher than in other countries, which contribute to

the low frequency of insolvency. Minimum-capital requirements are more than double those of insurers in the UK, Germany, France and Japan. Although higher capital requirement may provide a cushion of security, it has its downside. It tends to increase the cost of entry into the market, limiting competition and customer choice.

## Actuarial talent in the new MRM era

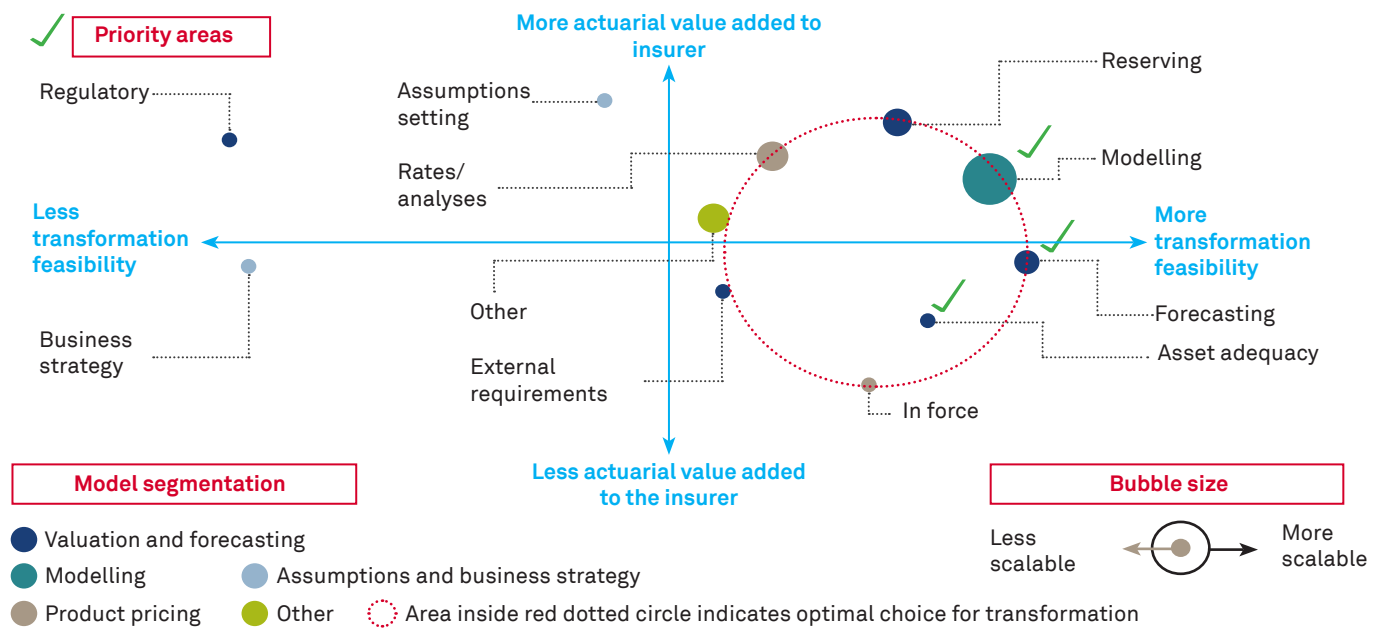
Innovative insurers understand the need to deploy their talent more efficiently to keep up with their MRM strategic agenda, demanding market conditions and consumer preferences. This includes professionals such as actuaries, who are essential to several MRM activities, including model development and internal models. This is a complex task for talent because it would mean accepting that future functions will be completely different from the past 20 years.

As insurers maintain rework models, it is appropriate to recognise that ~60% of model inventory depends highly on the actuarial function. This includes on reserving models, rates making, valuation, capital requirements and assumption setting. The nature of the insurance business and the traditionally rigorous professional practices of actuaries have established this.

As MRM practices evolve with technology and the use of artificial intelligence, insurers are looking at ways to transform the actuarial function. The high reliance on the actuarial function and the maintenance cost involved have triggered actions to allocate actuarial talent to more value-added activities. Insurers are optimising their involvement in areas that are more suitable for business transformation, including initiatives on MRM and internal models, particularly components (see Figure 2).

- Areas more suitable for transformation are more scalable, easier to componentise and require less actuarial oversight; e.g., certain modeling components and asset-related activities (forecasting and asset adequacy)
- Value-added activities include dealing with areas such as regulatory change, liquidity, reserving and analytics initiatives.

Figure 2: Model segmentation and value added by actuaries



## Preparing for the future

MRM will continue its evolution and push boundaries at the enterprise level. Insurers will need business accelerators and partnerships to leverage innovation and reduce costs, while remaining relevant.

The past year has reaffirmed the value of having an MRM framework in place, and more importantly, MRM has increased the ability of insurers to deal with regulatory scrutiny and modelling capabilities.

Proxy modelling will be critical to anticipate and respond to potential cash flow issues faster. The use of these models has growth potential because of the responsiveness and adaptability insurers must have to address evolving regulatory and risk management environment. Traditional modelling techniques are unable to be apace, especially on capital requirement, valuation, reserving and internal models.

The Brexit effect will continue to raise questions about the internal model, MRM practices and Solvency II-equivalency status of insurers with jurisdiction in the UK. The approach to resolve this could be similar to what insurers operating outside Europe – with Solvency II equivalence in force – follow.

Notably, there are four types<sup>2</sup> of Solvency II equivalence currently, and it is unlikely that a special

category will be defined for the Brexit effect. Based on the current situation in the UK, it is expected to presume a 10-year full equivalency with a transition period, and provisional elements for certain risk-based capital calculations, with final and phased transitions to come from EIOPA.

We expect changes in the way insurance is perceived and used, from a premium-based to a fee-based model to increase income predictability and reduce exposure to adverse market conditions such as low return rates, to meet investment objectives and promises made to policyholders.

Contract structures also need to be simplified, as policyholders look for faster and easier ways to interpret the commitments they are getting into when purchasing insurance. The ability to model these aspects will be a big success factor.

Some key decisions will have to be made to integrate ecosystems with new consumer needs and preferences, and equipping and empowering talent to address these needs.

The use of multiple professionals and calibration of talent diversity to include data scientists, actuaries, accountants, IT professionals and InsureTech experts could challenge the status quo but should pay off if done well. Technology will also play a key role, as the insurance industry searches for solutions that are efficient and regulator-ready.

<sup>2</sup><https://eiopa.europa.eu/external-relations/equivalence>

## Our industry-leading solutions for insurers

CRISIL is an active insurance industry participant offering research and thought leadership, and producing regular reports on topical issues. A

dedicated team of market-risk experts, actuaries, quantitative analysts and SMEs are engaging with clients to provide them with the best possible regulatory- and insurance-related solutions, including actuarial modelling and statutory reporting.



Business Transformation



Risk management



Fraud and Analytics



Insurance Operations

### Our key services include:

- Model-risk management
- Actuarial modeling
- Insurance operations and operational risk
- Data management and analytics services
- Implementation of new regulations
- Asset allocation and strategy research
- Counterparty risk
- Portfolio analytics
- Statutory and tax, reporting and analytics
- Fraud reporting and analytics
- Financial crime and compliance

At CRISIL, we have been collaborating with insurers to help them devise analytics and technology strategies to succeed. Moreover, we have developed

the necessary tools and skill sets to help our clients in their transformation initiatives.

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