INTERNATIONAL ASSOCIATION OF
INSURANCE SUPERVISORS

Public

Draft Application Paper on Macroprudential Supervision

Public Consultation Document

8 March 2021

About the IAIS

The International Association of Insurance Supervisors (IAIS) is a voluntary membership organisation of insurance supervisors and regulators from more than 200 jurisdictions. The mission of the IAIS is to promote effective and globally consistent supervision of the insurance industry in order to develop and maintain fair, safe and stable insurance markets for the benefit and protection of policyholders and to contribute to global financial stability.

Established in 1994, the IAIS is the international standard setting body responsible for developing principles, standards and other supporting material for the supervision of the insurance sector and assisting in their implementation. The IAIS also provides a forum for Members to share their experiences and understanding of insurance supervision and insurance markets.

The IAIS coordinates its work with other international financial policymakers and associations of supervisors or regulators, and assists in shaping financial systems globally. In particular, the IAIS is a member of the Financial Stability Board (FSB), member of the Standards Advisory Council of the International Accounting Standards Board (IASB), and partner in the Access to Insurance Initiative (A2ii). In recognition of its collective expertise, the IAIS also is routinely called upon by the G20 leaders and other international standard setting bodies for input on insurance issues as well as on issues related to the regulation and supervision of the global financial sector.

Application Papers provide additional material related to one or more ICPs and/or ComFrame, including actual examples or case studies that help practical application of supervisory material. Application Papers could be provided in circumstances where the practical application of principles and standards may vary or where their interpretation and implementation may pose challenges. Application Papers can provide further advice, illustrations, recommendations or examples of good practice to supervisors on how supervisory material may be implemented.

International Association of Insurance Supervisors c/o Bank for International Settlements
CH-4002 Basel
Switzerland
Tel: +41 61 280 8090
Fax: +41 61 280 9151
www.iaisweb.org

This document was prepared by the Macroprudential Supervision Working Group in consultation with IAIS members.

This document is available on the IAIS website (www.iaisweb.org).
© International Association of Insurance Supervisors (IAIS), 2021.
All rights reserved. Brief excerpts may be reproduced or translated provided the source is stated.

Contents

List of Abbreviations 5

1 Introduction 6

1.1 Terms 6

1.2 Scope of application 6

1.3 Proportionality 7

1.4 Structure 7

2 Data collection for macroprudential purposes 7

2.1 Consideration of data to collect 7

2.2 Risk dashboard for monitoring key macroprudential indicators 8

2.2.1 Constructing a risk dashboard 9

2.2.2 The use of a risk dashboard 10

3 Insurance sector analysis 11

3.1 Steps and approaches for insurance sector analysis 11

3.2 Common quantitative analysis methods 12

3.2.1 Trend analysis 12

3.2.2 Stress testing 13

3.2.3 Sensitivity analysis 18

3.3 Common qualitative analysis methods 19

3.3.1 Market intelligence and risk workshop with stakeholders 19

3.4 Common quantitative and qualitative analysis methods 20

3.4.1 Vulnerability analysis 20

3.4.2 Horizontal reviews 20

4 Assessing systemic importance 21

4.1 Assessing systemic importance of an individual insurer 23

4.1.1 Indicator-based approach 23

4.1.2 Assessing systemic risk using the indicator-based approach 28

4.1.3 Reduced-form approach 29

4.1.4 Comparison between indicator-based and reduced form identification 32

4.2 Assessing systemic importance of the insurance sector 33

4.2.1 Macroprudential sector-wide stress tests 34

4.2.2 Sector-wide systemic risk assessment 34

4.2.3 Evaluation of recovery and resolution plans 35

4.2.4 Evaluation of the sector-wide exposure to systemically risky activities 35

4.2.5 Cross-sectoral analysis 35

5 Supervisory response 36
5.1 Introduction 36
5.2 Types of supervisory responses 37
5.2.1 Strengthening the ERM framework 37
5.2.2 Crisis management and planning 38
5.2.3 Preventive and corrective measures 39
6 Transparency 40
6.1 Importance of transparency 40
6.2 Possible macroprudential reporting 40
6.2.1 Financial stability report (FSR) 41
6.2.2 Other forms of macroprudential reporting 41
Annex 1 Example indicators and data elements 43
Annex 2 Example risk dashboards 47
South African Reserve Bank Heat Map 47
EIOPA Risk Dashboard (RDB) 50
Annex 3 Example topics for analysis 53
Annex 4 Example of ORSA analysis 56

List of Abbreviations

CDS	Credit Default Swap
ComFrame	Common Framework for the Supervision of IAIGs
CQS	Credit Quality Steps
EBIT	Earnings Before Interest and Taxes
ERM	Enterprise Risk Management
ESAs	European Supervisory Authorities
ESRB	European Systemic Risk Board
FSB	Financial Stability Board
FSR	Financial Stability Report
GDP	Gross Domestic Product
GME	Global Monitoring Exercise
IAIGs	Internationally Active Insurance Groups
IAIS	International Association of Insurance Supervisors
ICP	Insurance Core Principle
IIM	Individual Insurer Monitoring
LOB	Lines of Business
LTGM	Long-Term Guarantee Measures
MES	Marginal Expected Shortfall
ORSA	Own Risk and Solvency Assessment
OSN	Overall Solvency Need
RDB	Risk Dashboard
SCR	Solvency Capital Requirement
VaR	Value at Risk

1 Introduction

1. Insurers provide financial and economic functions that support economic activity by contributing to the flow of savings into investments and enabling risk transfer by assuming the risks of households and businesses in return for a premium. In essence, the core business of an insurer is exposed to various types of inherent risks.

2. Macroprudential supervision is aimed at identifying and, where necessary, addressing both vulnerabilities of individual insurers and the insurance sector to shocks from the external environment (inward risks) and the build-up of systemic risk at the individual insurer level or within the sector as a whole that may be transmitted to the external environment (outward risks).

3. This Application Paper on Macroprudential Supervision ("Paper") provides further guidance on the supervisory material related to macroprudential supervision in Insurance Core Principle (ICP) 24. As part of the holistic framework for the assessment and mitigation of systemic risk in the insurance sector ("Holistic Framework"), the IAIS revised ICP 24 to more explicitly address, among others, the build-up and transmission of systemic risk at the individual insurer and sector-wide level. The Holistic Framework and ICP 24 were adopted by the Annual General Meeting in November 2019.

4. This Paper does not establish new standards or expectations for the supervisor's implementation of a macroprudential supervision framework, but instead provides additional detail to assist with implementation, and examples of good practice. It should, however, not be considered as an exhaustive guide to macroprudential supervision.

5. This Paper provides guidance and examples on:

- Considerations on developing and applying a macroprudential supervision framework in a proportionate way;
- Ways that supervisors may tailor requirements of data collection according to jurisdictional circumstances and market structure; and
- The practical application of the elements included under ICP 24.

1.1 Terminology

6. In this Paper, all terms have the same meaning as described in the IAIS Glossary, the Introduction to the ICPs as well as within ICP 24 itself and the Holistic Framework overarching document.

1.2 Scope of application

7. This Paper and most of its concepts are relevant to the business of insurers and reinsurers, as well as to both insurance legal entities and insurance groups. Its recommendations are applicable across supervisory approaches. From a macroprudential point of view and because of the disparity – especially in size – between jurisdictions, analyses conducted at regional level should also be considered in the scope of the Application Paper.

8. The scope of macroprudential supervision should cover vulnerabilities in the insurance group and at the legal entity level as well as the insurance sector as a whole.[1]

1.3 Proportionality

9. This Paper should be read in the context of the proportionality principle, which acknowledges supervisors' flexibility to tailor their application of supervisory requirements and supervision to achieve the outcomes stipulated in the Principle Statements and Standards, as described in the Introduction to ICPs and Common Framework for the Supervision of Internationally Active Insurance Groups (ComFrame). The guidance, illustrations, recommendations or examples of good practice in this Paper do not supersede this overarching proportionality principle.

10. According to ICP 24.0.1, a jurisdiction's macroprudential supervision processes and procedures should be proportionate to the nature, scale and complexity of its insurance sector's exposures and activities. The supervisor may increase or decrease the intensity of the requirements as described in ICP 24, for example, by varying the frequency, scope and granularity of data collection for macroprudential purposes, insurance sector analysis, systemic importance assessment, and development and application of supervisory requirements. Supervisors may also decide on varying the form and level of detail on the insurance sector publications and comprised data and statistics.

1.4 Structure

11. This Paper follows the structure of ICP 24, which deals with five different elements of macroprudential supervision. The remainder of this Paper is structured as follows:

- Section 2: Data collection for macroprudential purposes
- Section 3: Insurance sector analysis
- Section 4: Assessing systemic importance
- Section 5: Supervisory response
- Section 6: Transparency

12. The annex includes the following examples of indicators and data elements for data collection, risk dashboards and types of analysis:

- Annex 1: Example indicators and data elements
- Annex 2: Example risk dashboards
- Annex 3: Example topics for analysis
- Annex 4: Example of ORSA analysis

2 Data collection for macroprudential purposes

2.1 Consideration of data to collect

13. Sound macroprudential supervision is reliant on timely and good quality data and information to support analysis and ultimately well-informed decision-making. Data collection for macroprudential purposes is a critical element of macroprudential supervision and

[1] ICP 16.1.6 defines group risk as "the risk that the financial condition of a group or a legal entity within the group may be adversely affected by a group-wide event, an event in a legal entity, or an event external to the group. Such an event may either be financial or non-financial (such as a restructuring)."

systemic risk assessments at an individual insurer level and a sector-wide level (refer to ICP 24.1).

14. Supervisors should put in place appropriate policies and processes to collect regular and systematic financial, technical and statistical information from insurers it supervises. Supervisors should collect both quantitative and qualitative data from insurers or use data and analysis from other external or internal sources. Data and information can be requested on a legal entity level or group-wide basis.

15. Data collection for macroprudential purposes should consider certain aspects, which are described in ICP 24.1.1. In particular:

- Data collected should be aligned with supervisory needs by defining required information (eg in what form, from whom and how often). Required information can differ according to market developments, market conditions, market structure, etc.;
- Data could be collected from other supervisors when an insurer operates in multiple jurisdictions (refer to ICP 25 (Supervisory Cooperation and Coordination)). Data could also be collected from other relevant authorities within a jurisdiction. Supervisors should ensure that they have in place appropriate safeguards for information sharing as described in ICP 3.2. Macroprudential supervision data collection activities should be well coordinated;
- Data coverage should support macroprudential analysis at both the individual insurer and at the sector-wide level, covering a representative sample of the respective market or risk. As an example, this could be based on including at least the top five insurers, or at least 75% of the local insurance market or specific business lines, as appropriate;
- Supervisors should develop validation rules to address data quality and deficiencies. It is good practice to have in place a data validation rules programme to check for correctness, meaningfulness and security of data that is input into a system. Data validation rules should be implemented through the automated facilities of a data dictionary, or by the inclusion of explicit application programme validation logic;
- Systems and processes should be developed to collect and analyse ad-hoc data to address emerging risks, such as climate-related risk; and
- The data collection process should be transparent and consistent across all selected insurers.

16. Annex 1 provides examples of indicators and data elements that could be used to monitor trends and assess the build-up of systemic risk for individual insurers and the insurance sector as a whole. These include macroeconomic and microeconomic data, indicators to support the assessment of liquidity risk, macroeconomic exposure, counterparty risk, as well as cross-sectoral indicators.

2.2 Risk dashboard for monitoring key macroprudential indicators

17. When collecting data for macroprudential purposes, supervisors should select analysis methods that provide a general overview of key risks as well as identify relative trends in the insurance industry. A risk dashboard is one such tool that represents a link between data collection and analysis methods.

18. Supervisors may construct a risk dashboard consisting of relevant indicators to enhance sector-wide monitoring of vulnerabilities and macroeconomic instability. A risk

dashboard is seen to be a descriptive data tool aimed at regularly assessing relevant risks and trends.

19. A risk dashboard may contain both quantitative and qualitative information and should be updated on a regular basis. The frequency of updating of indicators may depend on the availability of data, the stage of the financial cycle and other market developments or impending disruptions. Typically, risk dashboards use a combination of indicators and may summarise information visually (eg a traffic light system), providing insight into both historical trends as well as the current risk environment. A risk dashboard may also include specific risk parameters.

20. A risk dashboard may be constructed on a flexible basis, according to categories of risks deemed most significant or imminent. These include: macro risk, credit risk, market risk, funding and liquidity risk, profitability and solvency risk, as well as risks arising from interlinkages and imbalances. Supervisors have the option of adding (or deleting) categories to allow for sector specific risks (eg insurance underwriting risk).

21. The remainder of this section provides general guidance and examples on the construction and use of a risk dashboard. Concrete example risk dashboards are included in Annex 2 for the following members:

- South Africa
- EIOPA

2.2.1 Constructing a risk dashboard

22. It is good practice for a risk dashboard to include the following components: key risk categories, key risk indicators, a risk assessment scale and a risk trend.

Key risk categories

23. Jurisdictions should identify key risk categories that are most relevant for the insurance industry and the environment in which they operate.

Key risk indicators

24. The next step is to identify key risk indicators for each risk category. Specifically, the supervisor should develop a set of indicators, grouped into main risk categories, including indicators displaying how the insurance industry is perceived by financial markets. Key risk indicators are usually data that can be measured over time, such as interest rates, inflation rates and combined ratios (for additional examples refer to Annex 1). Indicators may be based on a combination of publicly available (market) data and supervisory reporting data.

Risk assessment scale

25. A colour-coded risk assessment scale such as red (high), amber (medium-high), yellow (medium-low) and green (low) could then be applied to the risk indicator level. The scale may be applied based on the historical distribution of the risk indicator. This may be accomplished by applying numerical ranges of the risk indicator to different scales. Additionally, supervisors should use expert judgement and/or apply statistical means when conducting risk assessments. Some risk indicators may not lend themselves to historical distributions and the assessment scale may be qualitative or subjective in nature. Another widely accepted method of conducting risk assessments is to apply a likelihood and probability of impact scale to

assess the level of risk. Supervisors should document this process step-by-step, illustrating how they arrived at their risk assessment ratings.

26. The risk scores, identified by the related sets of indicators, reflect the riskiness of the insurance sector from a financial stability perspective. The relative importance of the various indicators can be assessed through the application of specific weight parameters. In principle, the same weights can be applied for each indicator; however, weights can be increased if indicators are of significant importance for a risk category or reduced if indicators are highly correlated.

Risk trend

27. Another key component of a risk dashboard is the trend or direction of the risk, which provides some perspective or comparison of current risk levels, also among peer group or cross-sectoral analysis. The trend is usually indicated by an increasing, flat or decreasing arrow and is indicative of the risk direction from the previous reported risk level to the current risk level. Advanced risk dashboards may contain prospective or forward-looking trend indicators. However, obtaining reliable forecast data may be a challenge. Trends typically reflect the behaviour of the risk indicating how a certain exposure or indicator has developed over time. The behaviour of the risk, based on trends, can be assessed against thresholds or other indicators.

2.2.2 The use of a risk dashboard

28. A risk dashboard may be used to satisfy many of the objectives in ICP 24 and monitor both inward and outward risks (including the identification of the build-up of systemic risk in the insurance sector). A risk dashboard should be tailored to the specificities of a certain jurisdictional market and be used to identify interplays between sector-wide risks identified in the dashboard to individual insurer analysis in the same way that the IAIS analyses risks and trends from both an individual insurer and sector-wide perspective on a global basis, as part of its Global Monitoring Exercise (GME).[2] Additionally, the interplay may act as an early warning indicator of a build-up of systemic risk in the insurance sector.

29. The risk dashboard may be used as a tool for supervisors to document analyses of the insurance sector and financial markets. The analyses should be both quantitative and qualitative in nature and include historical trends and the current risk environment, as well as prospective risks. Most risk dashboards primarily consider inward risks but can also be enhanced to incorporate outward risks.

30. Supervisors may also consider using the risk dashboard in a top-down, risk-focused, supervisory approach. Starting at the top with a sector-wide risk dashboard, supervisors should channel their supervisory resources towards identifying individual insurers who contribute to sector-wide risks and potential systemic risk or activities.

31. A risk dashboard may also be used to identify and implement risk mitigation tools (refer to Section 5). As described in ICP 24.5, supervisors may publish any relevant sections of the risk dashboard (ie indicators and/or methodology) (refer to Section 6).

[2] Refer to https://www.iaisweb.org/page/supervisory-material/financial-stability/file/87206/global-monitoring-exercise

3 Insurance sector analysis

3.1 Steps and approaches for insurance sector analysis

32. The objective of this section is to provide a non-exhaustive list of examples of macroprudential analysis methods, to support the implementation of ICP 24.2. Such methods of analysis can highlight key risks, vulnerabilities and trends of economic, financial and technical insurance factors that can affect the actions of individual insurers and the insurance market as a whole. It is useful for supervisors to have an overview of risks but also identify and monitor specific sources of certain trends and risks. Supervisors can decide on the most appropriate method of analysis to use, depending on jurisdictional needs.

33. This Paper is not intended to prescribe which method of analysis is better, as this would largely depend on supervisors' needs and data availability. Instead, the purpose of this Paper is to suggest a range of possibilities that supervisors may consider, to broaden knowledge on the insurance market and for supervisors to put in place (directly or indirectly)[3] mitigating actions to limit systemic risk.

34. It may be useful for supervisors to take into consideration two different but complementary steps:

1. Identification of key risks and trends to assist supervisors to verify whether a risk factor is emerging and could have wider implications for the stability of the insurance sector; and
2. In-depth analysis/assessment of risks and related trends through quantitative insights.

35. For the identification of key risks and trends, it is important for supervisors to also consider historical trends, the current risk environment and a forward-looking component. By monitoring historical trends of factors/indicators over time supervisors can observe the drivers of such changes as well as sources of risk that could destabilise the insurance sector.

36. Supervisors should assess insurers' exposure to both inward and outward risks using the most appropriate analysis method. Assessment of second-round effects could be useful for supervisors in determining outward and inward risks.[4] An outward risk assessment of second-round effects induced by endogenous factors, following actions taken by financial institutions, households and/or policy-makers in response to an initial shock or scenario could be performed. For inward risk, supervisors could assess whether insurers have incurred losses from second-round effects that resulted in premium increases (eg catastrophic risk, cyber risk or operational risk connected to business interruption). Such analysis may be complex, hence, supervisors may need to rely more on qualitative assessments. The analysis of insurance indicators and data elements (mentioned in Section 2 and Annex 1) may be performed individually or aggregated. Also, refer to analysis methods as discussed in paragraph 38.

37. Finally, supervisors should apply qualitative and quantitative methods of analysis, particularly in the case of forward looking indicators that could help identify existing, new and

[3] Examples of direct actions can be regulatory interventions; examples of indirect actions can be expectations or recommendations to insurers whose behaviour can influence the insurance market leading to a containment of a specific risk.

[4] For example, when assessing the impact of Covid-19, first-round effects would be related to the pandemic itself, whereas second-round effects may be related to the impact of regulatory or other actions. Another example is possible fire sales: a scenario that could cause rapid asset sales (first round effects), which could result in a substantial deterioration in market prices and other entities beyond what was initially envisioned.

emerging threats to financial stability in the insurance market. Quantitative and qualitative methods of analyses can also be done for exogenous factors (global macroeconomic and financial markets) and endogenous factors (domestic) in the insurance sector.

Table 1: Common quantitative and qualitative analysis methods

Quantitative analysis methods	Qualitative analysis methods	Both quantitative and qualitative analysis methods
Trend analysis (refer to 3.2.1)	Market intelligence analysis (refer to 3.3.1)	Vulnerability analysis (refer to 3.4.1)
Stress test analysis (refer to 3.2.2)		Horizontal reviews (refer to 3.4.2)
Sensitivity analysis (refer to 3.2.3)		

38. Such analysis methods may, for instance, be employed to assist in identifying and monitoring the following example risk exposures and activities (refer to Annex 3 for further information):

- Liquidity monitoring
- Interconnectedness
- Derivatives monitoring
- Reinsurance analysis

39. It is important to understand the phenomena that could trigger short, medium and long-term events that generate significant risks. Many analysis methods, quantitative or qualitative, may help supervisors identify risks to which the insurance sector is exposed, at a specific point in time, or to monitor current and forecast future results.[5] Qualitative methods can be useful, particularly during stressful conditions where the behaviour of policyholders and entities could significantly deviate from "normal" periods.

40. While some analysis methods could assist supervisors' analysis of existing or newly identified risks (eg vulnerability or market intelligence analysis), other analysis methods may be used for more in-depth investigations to highlight unforeseen risk events (eg stress testing, sensitivity analysis or impact analysis).Outcomes of the analysis can help supervisors act with greater awareness and achieve the objectives described in the principle statement of ICP 24. Common quantitative and qualitative analysis methods are explained in more detail in the next section.

3.2 Common quantitative analysis methods

3.2.1 Trend analysis[6]

41. Trend analysis may include:

- A financial and macroeconomic overview that observes the trends of the key macroeconomic and financial indicators (eg annual growth of gross domestic product (GDP), inflation, unemployment rate, etc.);

[5] Quantitative methods may be used to forecast future operational results of insurers for supervisors to monitor against an insurers actual results to determine whether results are in range with expectations.
[6] A trend is a data pattern that shows persistent characteristics even if there are deviations (relative to trend).

- A relative analysis to observe how trends in the insurance sector compare to trends in (i) insurance sectors in other jurisdictions, regions and across the globe, (ii) between segments of the insurance sector both within and across jurisdictions, (iii) other parts of the financial system and (iv) the real economy.

  There should be a focus on key insurance and financial variables, such as:
  - Profitability and capital strength indicators;
  - Combined ratio of non-life insurance;
  - Return on Equity;
  - Equity prices;
  - Expected earnings;
  - Composition of the qualified capital resources;
  - Composition of the investments;
  - Life insurance guarantees compared with asset performance; and
  - Breakdown for minimum guaranteed rate offered in life contracts.

42. The analysis of the main historical trends in the insurance sector may be carried out by supervisors periodically (eg quarterly, semi-annually or annually), depending on the availability of data (refer to Section 2).

43. Macroeconomic data (referenced in Annex 1) can be used for trend analysis and could possibly impact the development or evolution of the insurance sector as it influences the strategic choices of insurers.

44. Data relevant for risks to the insurance sector can be extracted/processed from reporting and statutory financial statements based on accounting standards and solvency regulations. For this analysis, it is important to have a well-structured database (with clear data extraction criteria) in order not to compromise the reliability of the outcomes.

45. The temporal observation of factors, including resilience[7], highlights trends that can help supervisors in assessing risks and determining the need to take preventive or corrective action (refer to ICP 10.0.2) to strengthen financial stability in the insurance market.

3.2.2 Stress testing

46. As described in ICP 24.2.6 to 24.2.8, supervisors should have in place an appropriate form of stress testing to support the analysis of the current risk environment and to assess the resilience of the insurance sector to severe but plausible scenarios. In addition, stress testing may help to test the solvency, liquidity or profitability of insurers under stressed market conditions. Stress testing analysis helps supervisors have a forward-looking perspective of the insurance sector by considering plausible scenarios to capture potential future adverse developments.[8]

47. The depth of supervisory stress testing exercises would depend on the scope of the stress test (entities involved and stressed factors) and the approach supervisors choose to follow (ie bottom-up or top-down, as discussed below). Stress tests should be fully integrated

[7] Resilience in this context refers to the ability of an insurer to recover quickly from difficulties and find alternative solutions

[8] This type of supervisory stress testing, as described in ICP 24, should not be confused with stress testing and scenario analysis performed by an insurer as part of its own ERM (which is described in ICP 16 (Enterprise Risk Management for Solvency Purposes).

in a jurisdiction's broader monitoring and supervisory framework and not be considered as a stand-alone exercise. This would not preclude designing and using stress tests to assess and monitor assumptions and parameters included in the in-force regulatory framework. Assumptions should always be confirmed and verified especially for forward-looking perspectives.

48. To obtain plausible results in line with the purpose of ICP 24.2.6, supervisors should have in place an appropriate form of stress testing, which is applied to the insurance sector as a whole or a significant sub-sample of insurers, according to their exposures to specific risks.

49. Insurance stress tests should have a common set of characteristics that define best practices on how they are being conducted, the approach and the data that are being used, the frequency at which the test is being conducted, market coverage and the technical structure/features/specifications of the tests.

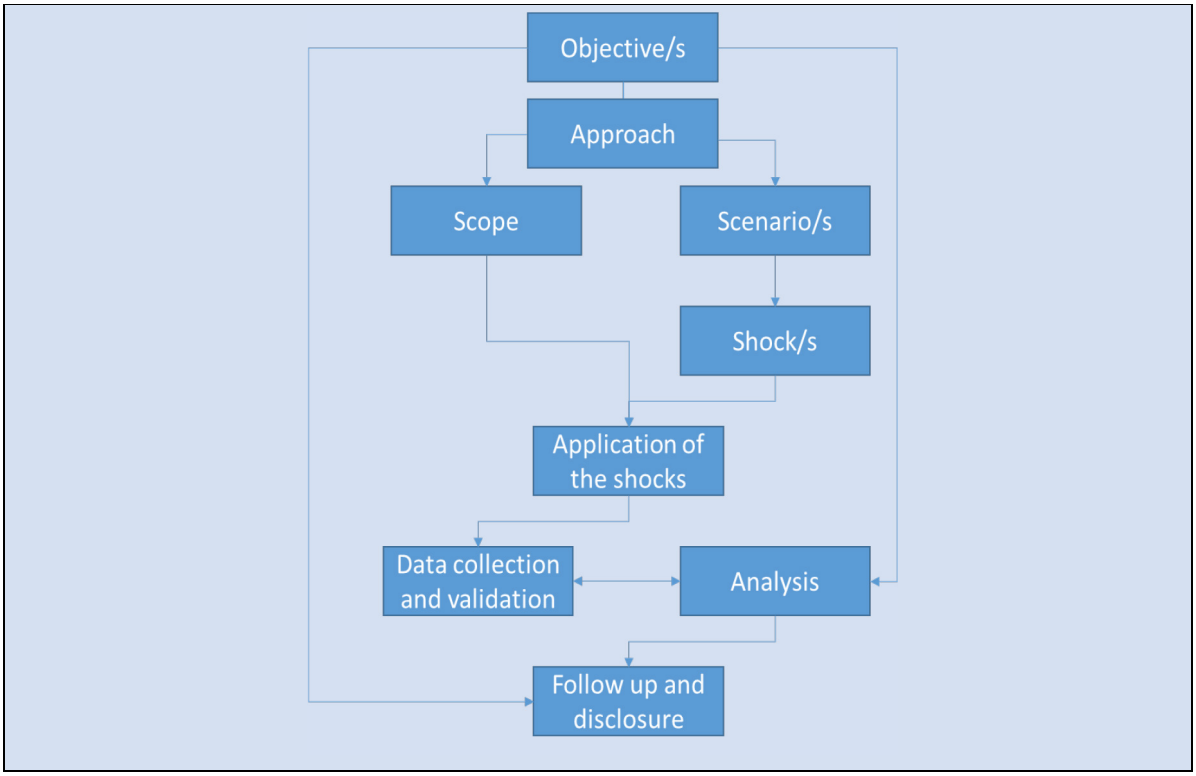
Top-down versus bottom-up stress testing approaches

50. Stress tests are usually conducted using a bottom-up or top-down approach. In the bottom-up approach, each insurer receives a set of pre-defined, common adverse scenarios to be performed in its portfolio before reporting the results to the supervisor.

EIOPA example to establish a bottom-up stress testing framework:

When designing and setting-up a bottom-up framework, as well as determining the structure and main elements of such an exercise, the supervisor could consider the elements reported below. For more detail, refer to EIOPA (2019) Methodological principles of insurance stress testing. Available at:

https://www.eiopa.europa.eu/sites/default/files/publications/methodological-principles-insurance-stress-testing.pdf



On the other hand, in a top-down approach[9] supervisors essentially run the entire analysis themselves and assess the impact of the scenarios on the insurer(s) directly. In a bottom-up stress testing exercise, insurers are asked to calculate the impact of a common adverse scenario that allows supervisors to do benchmarking and assess financial resilience in the insurance sector. Parameters for the bottom-up stress testing exercise could be provided by supervisors in the form of sensitivity parameters or scenarios. If the stress tests are of macro-financial nature, macroeconomic scenarios could be the input of satellite models[10] that link macroeconomic variables to microeconomic and insurance-specific ones.

51. In cases where supervisors may not have sufficient expertise or resources available to develop supervisory stress testing, or complement its supervisory stress testing initiatives, they may also consider benchmarking (horizontal reviews) of stress tests performed by the insurers themselves. As discussed above, stress testing is also required to be conducted by insurers as part of their own Enterprise Risk Management (ERM), for instance as part of the Own Risk Solvency Assessment (ORSA).[11] Supervisors could also provide guidance to the market with specifications on how to conduct stress tests to be included in the ORSA. In this way, supervisors could perform a horizontal review of ORSA reports from different insurers,

[9] An example of stress test analysis conducted with the top-down approach can be seen in the Financial Stability Report N.1/2019 (Bank of Italy), in the section dedicated to Insurance market (page 36). https://www.ivass.it/pubblicazioni-e-statistiche/pubblicazioni/altre-pubblicazioni/2019/rsf-1/FSR_n1_2019_ENG.pdf?language_id=3

[10] Financial linkages models that directly connect macroeconomic assumptions and risk parameters https://www.elibrary.imf.org/staticfiles/misc/toolkit/pdf/chap1.pdf

[11] Further information in ICP 16.2 quantitative techniques to measure risk, ICP 16.10-16.14 and ComFrame standards integrated therein, and ICP 24.2.5 on horizontal reviews.

with risks and assumptions that may help supervisors identify areas of potential risk, particularly with a forward-looking perspective.

52. Both of the aforementioned approaches have advantages and disadvantages as shown in Table 2. In the bottom-up approach, supervisors may need to consider the integrity of the data to ensure reliability of the tests conducted. They should therefore ask for a uniform set of data and apply uniform scenarios across institutions in order to be able to make consistent comparisons between insurers. Comparability could also be achieved through engagements with insurers on approximations and simplifications, which could be applied in the calculation of their post-stress positions and through a validation process. In the top-down approach, supervisors would build on data already collected as part of the supervisory reporting. This may be a drawback as such data may have limitations considering it was not specifically designed for stress testing.

Table 2: Advantages and disadvantages of top-down versus bottom-up approaches:

	Top-Down	**Bottom-Up**
Advantages	Supervisors control the process which can be used more effectively to get results.	The accuracy of the results leverages off insurers' more informed knowledge of risks (the calculation fully accounts for risk profiles and proactive risk management by insurers eg hedging or risk transfer).
	Uniformity of the test based on a prescribed set of scenarios.	Results could reflect the actual vulnerability of insurers to the prescribed shocks based on their risk profile or identify additional risks and vulnerabilities.
	Knowledge of the criteria, methods and information (eg type, date of data) used for the stress exercise.	Embeds individual specificities.
Disadvantages	Resource-intensive exercise for supervisors.	Resource-intensive for participants and supervisors.
	Supervisors may not have all the available data for risk assessment (eg individual specificities such as assets and liabilities as well as management practices of each insurer).	Lack of transparency as the insurer is privy to information that supervisors may not have.
	Model driven (less flexible).	Incentive to present more favourable results.

53. Depending on the approach taken, insurers are required to provide supervisors with the necessary data from their portfolios to facilitate the conducting of the actual stress test.

<u>Frequency of stress testing exercises</u>

54. The frequency of conducting stress tests should take into account the entire cycle of the exercise, namely the design phase, the running phase and the follow-up phase. Depending on the objective, the complexity of the scenario(s), the number/complexity of the insurers included in the scope, supervisors should plan for sufficient time between stress test exercises. For example, stress testing exercises could be conducted every two/three years, with a provision that supervisors conduct stress tests more frequently in the event of unanticipated market crises or shocks, in which case, reference scenarios could be redefined or simplified.

Market coverage

55. As discussed above, ICP 24.2.6 recommends that stress testing exercises be applied to the sector as a whole, or to a significant sub-sample of insurers. Depending on the objective of the analysis, supervisors may wish to focus on individual legal entities and/or insurance groups.

Example of a top-down stress test (Italy)

Shocks are based on the values of the different asset classes observed at a particular time interval. The interval is determined by considering the maximum value and the 75th percentile of the historical series of the BTP-Bund spread as this is the primary risk factor for the Italian insurance sector. The stresses are applied to:

- Italian government bonds
- Corporate bonds for AAA, AA, A, BBB and BB rating classes separately
- Equity

Bonds values are recalculated by using the following formula (Duration approach):

$\Delta P = -D * \Delta i * P$

Where:

P => value of bond

D => related modified duration

Δi => change of BTP-Bund spread (bond)

ΔP => change of bond value

The results are defined in terms of the impact on the capital requirement and solvency position (eg represented by the solvency ratio).

This example of top-down stress only reflects stress on assets. The stress would also impact liabilities. Liabilities are indirectly considered as they are closely linked to the composition of the product portfolio that determines the obligations of the insurers (different from each other) and of the market as a whole. It is more complex to generalise the stress on liabilities.

56. It is good practice for stress tests to be broad in scope and include a balanced number of insurers in order to provide a comprehensive view of insurance sector vulnerabilities. A low coverage of insurers being stress tested may hide the vulnerabilities in the sector while, on the other hand, covering every insurer may not necessarily produce more information. Different criteria could be used to assess the market share of tested insurers such as the gross written premium, total assets, etc.

Technical structure and specifications

57. Stress tests could include: i) a macroeconomic scenario generator that consistently translates macroeconomic shocks into shocks for both the assets and liabilities (eg a parallel lowering of the risk-free rate curve of 50 basis points); and ii) a stochastic generator of insurance losses based on a correlation structure that could capture possible correlations with the asset or the passive side (eg on the asset side, disinvestments due to massive redemptions (mass laps), and on the passive side, insurance drivers such as mortality/lapse /claims frequency could be considered).

58. Stress tests examine the solvency, liquidity or profitability of insurers for a specific time horizon. The most common approach for stress testing is to examine an insurer over one year (consistently with the widely applied supervisory framework) against a set of instantaneous and permanent shocks. However, supervisors could extend the timeframe of the stress test exercise moving towards a multi-period framework where the post stress solvency position of the insurer is assessed against a set of risks that evolves over longer time horizons (eg 3 or 5 years). In this case, it would be important to consider that the level of complexity required to design and apply multi-period shocks to an industry that already bases its business on stochastic projections is extremely high.[12] Multi-period frameworks bring several advantages such as the possibility of prescribing both permanent and non-permanent shocks (eg a drop in the market followed by a recovery), more realistic scenarios based on sequences of shocks (eg shocks to lapses lagged with respect to shocks to markets) and the possibility to analyse the time evolutions of key indicators (eg assets over liabilities or the capital requirements). At the same time, the forecasts of scenarios become less reliable if the time horizon is extended. This forward-looking approach allows for supervisors to observe that insurers may survive a single shock but could face severe challenges in surviving or resisting a prolonged shock scenario or multi-period shocks. Against this background, any multi-period initiative should be carefully evaluated from a cost-benefit perspective.

3.2.3 Sensitivity analysis

59. Sensitivity analysis is an evaluation of the effects of a model's results (ie by the function that describes analytically) induced by changes in the values of input variables. It refers to a "what if analysis" that evaluates what changes materialise if the values assumed by specific parameters change as well. Sensitivity analysis could be complementary to stress testing analysis, however, it could be that shocks in a sensitivity analysis are less or equally severe than that of a stress test. Additionally, sensitivity analysis aims to evaluate the impact of the variation of an individual risk factor (only one at a time) identified on the basis of sector vulnerabilities or on a specific sample of selected insurers. In other words, sensitivity analysis is performed on most prominent/material risks that could have spillover effects in high volatility scenarios. In such circumstances, the scenarios usually consist of the variation of a single risk factor, where supervisors could evaluate or capture potential future developments of the effects arising from the factor considered.

[12] For an initial discussion on the complexity of multi-period stress test exercise please refer to EIOPA (2020) Second discussion paper on methodological principles of insurance stress testing. Available at: https://www.eiopa.europa.eu/sites/default/files/publications/consultations/eiopa-bos-20-341_second-discussion_paper-methodological-principles-for-stress-testing.pdf

60. Sensitivity analysis exercises can make use of data that is readily available to supervisors, provided that there is a structured and homogeneous database, with established criteria for extracting and acquiring information. The data extracted by insurers should always follow the same criteria to be able to understand the macroeconomic view generated by a given factor. In the case of a non-homogeneous database, the data could be acquired in a homogeneous way through ad hoc requests to insurers (including sampling).

61. Sensitivity analysis provides supervisors with the ability to:

- Assess the solvency, liquidity or profitability position of the insurance sector in response to a shock affecting a single aspect of interest, particularly asset class assumption (eg sovereign bonds), an increase in bond spreads (eg +100 basis points) and keeping other asset classes at their reporting values (baseline); and
- Contribute to more informed policy choices (ie the reactivation of specific monitoring analysis to create more awareness in a specific moment, such as monthly liquidity risk monitoring).

An example of sensitivity analysis on asset classes

The composition and duration of assets at the latest available data point (using balance sheet data) can be used for sensitivity analysis. The following investment categories can be considered for each insurer in a sample:

- National government securities (eg Italian, French, UK, US, Japan, China);
- Corporate bonds divided by Credit Quality Steps (CQS) and by sector (financial and non-financial);
- Structured notes and collateralised securities per CQS and per sector in line with the breakdown envisaged for corporate bonds;
- Equities; and
- Debt or equity mutual funds.

For each type of investment category, the relative weighted average duration is determined on the basis of the value of each security for which the insurer reports the duration. Shock scenarios can be applied, to the insurance sector in its entirety, with the assumption that for securities without duration, the duration is equal to the average duration of the investment class.

3.3 Common qualitative analysis methods

62. Supervisors could also consider qualitative analysis methods (eg questionnaires or surveys) to monitor and assess specific risks that might not necessarily be identified by quantitative analysis methods. This type of qualitative vulnerability analysis can be conducted on a quarterly, semi-annual or annual basis to complement quantitative assessments.

3.3.1 Market intelligence and risk workshop with stakeholders

63. In line with the purpose of ICP 24.2.3, supervisors should identify the key sources of market and industry information and take into account all relevant factors when assessing the information. Supervisors should ensure that there is an appropriate internal focus on regularly reviewing macroprudential supervision issues and market specificities and, where appropriate, initiate senior level engagements with insurers on these issues. For this purpose, it could be useful for supervisors to keep abreast of the main risks observed by financial and insurance analysts that can influence the development of the insurance market.

64. Macroprudential supervision uses approaches from a multi-disciplinary and cross-sectoral perspective in order to identify activities, trends and developments that might negatively impact the risk profile of insurers. Supervisors could assess analytical perspectives of relevant stakeholders in public and private sectors by setting up periodic meetings (eg annual workshops) with different stakeholders involved (directly or indirectly) in the development of the insurance market (eg credit rating agencies, consultant firms, supervisory colleges).

65. Annual qualitative exchange of views with stakeholders allows: (i) supervisors to deepen their assessments on key risks in the insurance sector, and (ii) market participants to benefit from the sharing of ideas on issues that present challenging or innovative aspects for the evolution of the insurance sector.

66. Supervisors could benefit from comparative analyses conducted by different stakeholders on main risks of the sector from different perspectives, both in terms of impact and probability of occurrence.

3.4 Common quantitative and qualitative analysis methods

67. Other analysis methods could have both quantitative and qualitative approaches that could help supervisors monitor and assess risks in the insurance sector. The analyses could be conducted on a quarterly, semi-annual or annual basis to complement quantitative assessments.

3.4.1 Vulnerability analysis

68. As part of monitoring the primary sources of vulnerability in the insurance sector, supervisors may determine certain risk factors that could generate aspects of vulnerability and compromise the financial stability of the sector's insurance market. For example, such analysis could be used for liquidity risk (eg risk associated with exposures to government and bank issuers) or pandemic risk (eg a focus on providing containment and alert measures). Supervisors could use this analysis to conduct investigations on inward and outward risks. Considering this analysis is performed on risks influenced by social and economic-financial events that may change over time, this analysis may require the use of ad-hoc information.

69. This analysis can be conducted according to proportionality and is based on the supervisor's information needs. Supervisors should take into account the materiality of the risk to be monitored. This analysis may be conducted on a sample of insurers in terms of market share and/or exposure to the risks under investigation.

70. The information and data for this analysis may not be available to the supervisor through public or supervisory reporting and require that additional quantitative and qualitative data be requested. Standard requests, planned periodic reporting, are typically used for monitoring known risk factors while additional requests may be necessary to investigate specific aspects arising from supervisory concerns.

3.4.2 Horizontal reviews

71. To study aspects from a macroprudential perspective, consistent with ICP 24.2, supervisors could perform or make use of both public and other sources of information, that include horizontal reviews of insurers and relevant data aggregation.

72. Horizontal analyses can relate to quantitative or qualitative aspects, both of which should be structured appropriately for accurate interpretation.

73. Horizontal quantitative analysis could be conducted on:

- Readily available statutory data; or
- Data collected from periodic structured data calls (using specific templates that request detailed information not included in statutory returns.

74. In both cases, supervisors should aggregate the data to examine homogeneity or strong deviations, as well as common aspects for certain insurers. This analysis could be useful to understand the distribution of certain indicators that could offer information on different areas of vulnerability.

75. Horizontal qualitative analyses can be conducted through:

- Pre-set questionnaires with multiple choice answers (eg perception of risk level: high, medium-high, medium, medium-low, low); or
- Questionnaires with open-ended responses.

76. The benefit of having pre-set questionnaires is that they solicit information that is easier to understand and compile. The added benefit of having open-ended questionnaires is to gauge specificities or behaviours related to specific business strategies of insurers. For example, the behaviour of similar entities with similar risk profiles could be better observed. The evaluation of this information can allow supervisors to have an overview that could be a starting point for further study on other macroprudential and quantitative analysis methods.

77. Supervisors may also find it useful to perform peer group or benchmarking analysis for horizontal reviews. As described in ICP 24.2.5, the criteria for establishing a peer group or benchmarking for horizontal analysis should be considered carefully by the supervisor. It is common practice to ensure peer group participants have common features or meet common criteria for inclusion. For example, within the Individual Insurer Monitoring (IIM) exercise, which is part of the IAIS GME, the IAIS has established a minimum set of criteria that ensures analysis of selected groups with significant aggregate size and insurance activities outside of the home jurisdiction. In addition, insurers can be further grouped by business type (primarily life, primarily non-life, or composite) and regulatory regime or geographic region. Bespoke criteria can be developed to build peer groups for almost any specific activity. Peer groups should be periodically reviewed to make sure prior participants continue to qualify for inclusion. Some benchmarking options are readily available through financial data providers.[13]

4 Assessing systemic importance

78. Identification of systemic importance in the insurance sector is one of the paramount objectives of macroprudential supervision. As described in ICP 24.3, supervisors are required to have “an established process to assess the potential systemic importance of individual insurers and the insurance sector”. This section provides guidance and examples on how such processes can be set up and used in practice, both from the perspective of individual insurers (Section 4.1) as well as from a sector-wide perspective (Section 4.2). Firstly, the potential

[13] During Covid-19 crisis, the IAIS, through its risk dashboard of key market indicators, monitored the global insurance sector’s performance through, but not limited to, comparing the MSCI World Insurance Index value relative to the MSCI World Index; MSCI World Bank Index; and MSCI World Financial Index.

systemic exposures, activities and transmission channels, as described in ICP 24.0.4, are briefly summarised.[14] These are relevant regardless of the perspective of the assessment.

Liquidity risk (asset liquidation)

79. Liquidity risk arises as a result of imbalances between liquidity sources and needs, although not as important for insurers as it is for banks. It becomes a macroprudential concern if a shock (the trigger event) leads to reactions causing liquidity shortages in a particular sector.

80. If liquidity risk materialises for an insurer or a number of insurers, this could trigger a downward pricing spiral in the financial markets. Through these price impacts, shocks could be transmitted to other parts of financial markets and the real economy by triggering write-downs on similar assets at other firms, distorting the signalling function of prices or impacting the ability of firms to fund activities.

Interconnectedness (exposure channel)

81. Interconnectedness refers to interlinkages with other parts of the financial system and the real economy. Two main aspects of interconnectedness are counterparty exposure and macroeconomic exposure. Indications of increased interconnectedness can be related to a high correlation of the balance sheet with the financial markets, interconnectedness with banks and other financial institutions, non-bank financial intermediaries or other insurers.

82. Insurers are participants in the overall financial system, either as providers of financial services or as providers of funds that are used in the proper function of the financial system. As such, insurers are connected with other parts of the financial system, including other insurers, banks, funds, brokers, custodians etc. Failure of one or more insurers could have contagion effects to the rest of the financial system. At the same time, the failure of other financial institutions could affect the financial health of an insurer, with the insurer potentially acting as an amplifier of existing systemic risk.

83. Additionally, direct interconnectedness can occur within conglomerates, and is of particular relevance in cases where an insurer is part of a larger financial group, which includes banks or other financial institutions that have been identified as systemically important. Within such a conglomerate, the bank and insurer are exposed to weaknesses in each other through financial, reputational and operational links.

Limited substitutability (critical functions)

84. The failure of a large insurer in a critical niche market may become a systemic concern if it leads to financial problems for its counterparts, particularly if these counterparties are critical financial market participants themselves. Hence, limited substitutability refers to the difficulty for other components in the financial system to ensure the continuation of supply of insurance coverage after a failure or distress of an individual insurer. However, the exposure can also apply to groups of insurers that perform a specialised function.

85. Alongside these three main exposures, it is important to assess other factors such as:

- The extensive use of leverage (other than regular leverage in the form of policyholders' reserves), can be an indication of risk building and cascading exposures between

[14] A full description of the IAIS view on the sources of systemic risk in the insurance sector can be found in Section 2 of the Holistic Framework overarching document.

leverage providers which could be banks, funds, etc. that are exposed to credit risk of insurers;
- Products and/or assets with non-linear reaction to volatility (ie extensive usage of option-like payoffs including exotic-type of payoffs with path-dependence, look-back provisions, barrier type of write-off);
- Size matters at both the individual insurer level and sector-wide. It could well be that individual insurers may have small exposure to certain activities, but at the aggregate level there could be a significant build-up of vulnerabilities; and
- Global activity may be a proxy for the complexity of an insurance group, as well as the extent to which other jurisdictions' economies or financial systems might be impacted.

Depending on the jurisdictional circumstances, there may be other factors, or emerging risks, that are relevant to include in the assessment of systemic importance.

4.1 Assessing systemic importance of an individual insurer

86. There are two main, albeit non-exhaustive, approaches to identifying systemic risk, the indicator-based approach and the reduced-form approach.

4.1.1 Indicator-based approach

87. In the indicator-based approach for the identification of systemically important insurers, supervisors define a set of indicators that proxy different aspects of the systemic footprint of the insurer. In choosing the appropriate indicators, supervisors could take into account the following elements, as examples:

1. A total balance sheet approach, including off-balance sheet items that may contribute to systemic risk;
2. The potential systemic exposures and activities (as described above), including the interconnectedness with the financial system and real economy; and
3. Limited substitutability.

88. Elements 1-3 can be used as tools to assess systemic risk by applying a principles-based approach with underlying theoretical concerns. The indicator-based approach is in contrast to the reduced-form approach that strives to identify systemically important insurers using statistical relationships. Given elements 1-3 in the assessment of systemic risk, the supervisor can identify indicators within these elements to identify potential systemic risk.

89. One example of an indicator-based approach is the IIM exercise employed by the IAIS as part of its GME. While the IIM exercise is aimed at assessing systemic risk at a global level, supervisors may nevertheless find it useful to consider when designing an approach aimed at assessing systemic risk within their own jurisdictions.[15]

Total balance sheet approach

[15] Refer to https://www.iaisweb.org/page/supervisory-material/financial-stability/file/87206/global-monitoring-exercise, in particular Section 4.1 "The IIM assessment is no longer focussed on identifying prospective G-SIIs, but rather aims to support a comprehensive assessment by the IAIS on the potential build-up of systemic risk in the insurance sector as a whole by looking at potential systemic risk from activities or exposures concentrated in individual insurers."

90. Insurers are assessed according to their entire exposure in terms of assets and liabilities, including capital resources, to evaluate the systemic footprint of an insurer. In the total balance sheet approach, supervisors should evaluate the following:

- How the insurer's assets correlate with financial markets to allow risk from financial markets to affect the financial status of the insurer (inward risk);
- How the revaluation of insurer's assets can cause financial instability through channels such as fire sales, mark-to-market repricing, credit risk, run on liabilities, default of a reinsurer etc. (outward risk);
- How insurance liabilities interact with financial markets and the real economy, with either a run or a reduction in the supply of insurance liabilities, having detrimental effects on the real economy and/or financial markets (macroeconomic exposure);
- How capital can sustain systemic shocks of the financial system (inward risks) and how capital can shield off any adverse effects of a systemic event to the real economy (outward risks). Capital should be evaluated both in terms of quantity, quality and duration (short-term vs. long-term); and
- How liquidity could be affected in times of stress and how liquidity shortages could have both inward and outward repercussions in the systemic profile of the insurer.

91. While the total balance sheet approach is important, off-balance sheet items should be judged holistically. For example, the quality and availability of contingent financing during times of stress should be thoroughly evaluated.

92. Capital interconnectedness is the notion that securities issued by financial institutions (banks or insurers) and held by other financial institutions should demand haircuts or be written-off as potential resources of liquidity or solvency. During systemic events, financial institutions are usually highly correlated in terms of revaluations, recapitalisation demand and eventual failures. In the total balance sheet approach, this interconnected capital should be evaluated separately, with conservatism in its ability to be a resource for the insurer.

93. In addition, supervisors should take into account any existing measures that the insurer or the sector have taken to mitigate risks from these activities and evaluate effectiveness if/when possible. Examples of these mitigating measures include:

- Risk transfer to wider and deeper markets that may be able to handle risks more appropriately;
- The existence of central clearinghouses that mitigate counterparty risk in derivatives;
- Conservative haircuts and sufficient high quality collateral held against exposures; and
- Geographic and economic diversification of exposures.

Table 3 shows examples of indicators that a total balance sheet approach could take into account when assessing systemic risk.

Table 3: Examples of indicators in a total balance sheet approach

Indicator	Type of Indicator	Interpretation
Total assets/liabilities	Accounting	Size of the insurer

Net income/earnings before income tax (EBIT)/comprehensive income	Accounting	Measures of financial performance
Financial ratios	Accounting	Measures of financial performance
Liquidity indicators	Accounting	Ability of the insurer to pay liabilities in a short period

Systemic risk activities

94. Table 4 provides several examples of potential systemic activities that can be used to assess systemic impact. These examples can assist in forming indicators relevant to these activities. For example, indicators in the form of exposures to these activities that have the specific characteristics shown in Table 4.

Table 4: Examples of potential systemic activities

Exposures/activities	Financial guarantee insurance	Securities lending or repurchase agreements[16]	Guaranteed products	Holding bank-issued securities
Use of leverage			X	
Interconnectedness with banks and other financial institutions				X
Interconnectedness with non-bank financial intermediation	X			
Issuance of options and guarantees with exposure to financial market volatility		X	X	
Low liquidity		X		
Short-term funding reliance		X		
Wide-spread under reserving			X	

Interconnectedness

95. In assessing the interconnectedness of an individual insurer with the broader financial system, supervisors need to conduct proper analysis of a quantitative and qualitative nature. Several indicators have been devised, including specific indicators, such as the amount of derivatives written to financial institutions, the amount of securities held by an insurer and

[16] Non-linear reaction to volatility can come if repurchase agreements are collateralised with structured securities such as collateralised debt obligations. Liquidity risk can emerge if the collateral assets suffer substantial haircuts during systemic events.

issued by other financial institutions, and statistical measures indicating the dependence of an insurer's financial variables to that of other insurers or the market, and the evaluation of the systemic risk of an insurer, based on market interactions with other participants in the financial system. Dependence on recapitalisation in stressed market conditions is also a form of interconnectedness with the financial market. Solvency should be analysed in this respect to evaluate the extent of reliance on recapitalisation on a sector-wide level.

96. Examples of these indicators are presented in Table 5.

Table 5: Examples of indicators for assessing interconnectedness

Indicator	Type of indicator	Interpretation
Stock beta	Statistical-financial	Assesses the sensitivity of the insurer's share price to movements in financial markets
Correlation, tail dependence, Spearman ρ, Kendall τ.	Statistical-financial	Evaluate the dependence of an insurer's financial variables to variables of other insurers and of the financial system
Exposure in derivatives	Exposure-balance sheet	Measure of exposure to non-linear instruments with market volatility the insurer is exposed
Exposures in other financial institutions' capital	Exposure-balance sheet	Measure of how much an insurer is exposed to other financial institutions' potential distress
Reinsurance recoverables	Exposure-balance sheet	Measure of exposure to reinsurance
Off-balance sheet financing	Exposure-balance sheet	Measure of exposure to the general financial system including shadow banking
Wholesale funding	Exposure-balance sheet	Measure of reliance to large institutional investors for funding

97. Supervisors should use these indicators in conjunction with other indicators and not in isolation, acknowledging that some indicators are impacted by non-economic volatility. For example, statistical measures of interconnectedness in reduced form[17] can move when there is temporary market turmoil without the fundamentals of the insurers having changed.

98. Moreover, purely exposure measures do not take into account the inherent risk underlying these indicators. For example, if an insurer reports significant amounts of reinsurance recoverables, the recoverables may be with one reinsurer or be diversified between a pool of reinsurers, which could have different risk implications from the

[17] Here "reduced form" means without any economic model behind these models. These metrics are able to replicate statistical relationships.

diversification effect. Likewise, wholesale funding may differ between long-term exposures from established financers as compared to short-term and opportunistic.

Interconnectedness with the real economy

99. The systemic footprint of an insurer is contingent on the macroeconomic profile of the jurisdiction(s) in which the insurer operates and with the real economy in general. Potential macroeconomic vulnerabilities could have detrimental effects to insurers' balance sheets and cause failures. At the same time, an insurer could be small in systemic footprint using regular indicators but, given the macroeconomic vulnerabilities of a particular jurisdiction, the insurer could become systemically important.

100. Examples of such cases include the following:

- The insurer's assets are very large compared to the jurisdiction's GDP;
- The insurer is a large financer of important infrastructure works in a particular jurisdiction;
- The insurer's failure would have triggered a bail out, in the absence of an effective resolution regime; and[18]
- The insurer's failure could cause collateral defaults from third-party suppliers, contractors etc.

101. Supervisors should assess the systemic footprint of the insurer with respect to the size of the broader economy, as well as other factors within the non-financial sector. Indicators should be devised to evaluate the systemic footprint of the insurer vis-à-vis the overall economy (refer to Table 6).

Table 6: Examples of indicators for macroeconomic impact assessment

Indicator	Interpretation
Non-Financial Sector	
Non-financial sector investments held by insurer as share of total non-financial sector investments	Measure of the importance of an insurer to real economy financing
Employment	Measure of importance of an insurer as provider of employment
Size of pension, long-term care and other socially sensitive coverage	Measure of an insurer's share of coverage of socially sensitive coverage
Assets to GDP	Indicator that shows the size relative to the jurisdiction's GDP
Public Sector	

[18] Refer to ICP 12, which includes a recommendation in ICP 12.2.3 that resolution should seek to minimise reliance on public funding. In principle, any public funding used for the resolution of the insurer should be recouped from the insurance sector in a transparent manner. The phrase "reliance on public funding" does not refer to the use of funds from policyholder protection schemes to support the implementation of resolution actions.

Resolvability without public funds	Qualitative indicator that reflects whether public funds are required to successfully resolve a failed insurer
Recovery without public funds	Qualitative indicator that reflects whether public funds are required to successfully keep an insurer as a going concern
Assets to Government Revenue[19]	Indicator that shows whether the government has enough resources to assist a failing insurer

Limited substitutability/critical functions

102. Table 7 provides examples of indicators that can be used in the assessment of limited substitutability/critical functions. The following examples can be tailored to each jurisdiction's needs:

Table 7: Examples of indicators for limited substitutability/critical functions

Indicator	Interpretation
Market power in insurance lines of business (LOB) that are key for the economy	Measure of whether the failure of an insurer could have an impact in the provision of insurance services
Amount of pension assets/healthcare coverage compared to the sector	Measure of socially important coverage
Share of reinsurance market	Measure of how important the reinsurer is in providing important reinsurance

103. In many instances, there are overlaps between indicators of different elements of systemic risk. For example, an indicator under limited substitutability/critical functions may also be valid under interconnectedness. The taxonomy of indicators presented previously is indicative and serves as examples of how jurisdictions can implement their systemic risk assessment methodology.

4.1.2 Assessing systemic risk using the indicator-based approach

104. When supervisors select indicators to monitor systemic risk in the insurance sector, they should have a process of blending all the analyses into a final assessment highlighting the extent of systemic importance of an insurer. This may be based on a binary pass/fail approach, or supervisors could also employ a proportional approach where insurers are subject to supervisory measures without necessarily having a definite score of systemic footprint. There are various approaches that supervisors can use to blend these variables into one score.

Relative scoring

[19] A comparison of assets to government revenue should only be used when other indicators signify that an insurer may not be systemically important.

105. Supervisors could assign an overall score, based on prior considerations of the relative weights of each indicator for a pool of insurers. The final score is the aggregate result of individual scores of each indicator. Thereafter, insurers are benchmarked relative to an average measure, for example, the weighted/unweighted average of all indicators[20] from the entire pool of insurers. Insurers overall score above thresholds as determined from the sample could be deemed systemically important, while those scoring below the thresholds would not be considered as systemically important financial institutions.

Absolute scoring

106. Similar to relative scoring, supervisors could assign scores to each indicator and blend them into a single score. In an absolute scoring system, supervisors set scoring thresholds according to supervisory judgement. Insurers who score above the threshold will be considered systemically important.

107. While absolute and relative scoring both have their merits, there are some challenges with the measures. In the case of relative scoring, when insurers' risk characteristics move in tandem, the average will also move, hence the relative score may not reflect change despite the prevalence of systemic risk in the financial system. In addition, the relative approach is burdened with the potential exclusion of size effects. Some systemic indicators may be large for smaller institutions but overall they may not have a substantial impact, thus a weighting technique could be established to improve the information content of the relative scores.

108. Absolute scores try to address the aforementioned shortcomings of relative scores by having a hard threshold that is required for a pass/fail in systemic risk assessments. However, thresholds are subject to supervisory judgement, which could create potential conflicts with the industry. Moreover, the time-varying nature of systemic risk may render these thresholds obsolete in the event that systemic risk has increased or decreased significantly and perhaps the indicators may not fully reflect the actual measurement of systemic risk.

109. As such, the assessment of systemically important insurers is not an exact science but a blend of science and supervisory judgement. Supervisors should be able to explain succinctly the assumptions and the rationale behind systemic risk assessment. In the IIM exercise, scoring is predominantly based on absolute scoring, recognising that absolute scoring better reflects the changes to systemic risk over time. Relative rankings continue to be calculated as additional information for input.

4.1.3 Reduced-form approach

110. Unlike the indicator-based approach for identifying systemically important insurers, there is the reduced form approach, which bases the assessment on observable statistical properties of stock and bond prices of the insurer. Behind this methodology, the assumption is that markets are efficient and correctly price the market value of assets and liabilities.

111. Changes in the market value of assets and liabilities reflect changes in the true value of the insurer, thus a systemically risky insurer is priced by the market based on its contribution to some market-wide distress indicator. These reduced-form models are "objective" in the sense that there is no ad-hoc choice of variables that define the systemic footprint.

[20] To add indicators of different units of measurement some sort of standardisation needs to occur. For example, one can standardise them by indexing them to 100, taking percentage changes, using a Z-score or ad-hoc weights.

112. Reduced form models require an abundance of data to do appropriate time series econometric analysis with publicly available data for publically traded entities. Therefore, for insurers that are not publicly traded, these models will not work and supervisors should resort to more structural identification of systemic risk. Moreover, these reduced-form models usually cover groups and not legal entities.

113. Some common reduced-form models[21] that could be used to identify systemically risky insurers are presented below:

MES

114. Marginal Expected Shortfall (MES) is calculated as the expected negative return of the equity of an insurer given that the market return has declined by a specific amount, usually the 95% Value at Risk (VaR) of negative returns. A model for returns that takes into account fat tails and extreme events is usually calibrated in order to have a mathematical expectation that can be modelled.

115. If the model is properly estimated, it shows the sensitivity of an insurer to extreme movements of the market. If the market is in systemic distress and the loss of equity value is worse than that of the market, there is a good chance that the insurer may be systemic. In a pool of insurers, MES would be calculated per insurer and then insurers would be ranked in systemic risk according to their MES.

116. MES requires a model for returns but at the same time there are multiple models for returns. Supervisors should try to estimate the MES using a variety of models to ensure that the ranking is consistent when each return model is used for the same pool of insurers.

SRISK

117. SRISK is a forward-looking, market-based measure of systemic risk that captures risks that are pertinent to the entire financial system due to contagion and interlinkages. SRISK has been defined by Engle and Brownlees (2017)[22] as the capital shortfall of an institution when the whole financial sector is in distress. It assumes that the entire financial system is constrained, or in distress, such that any single financial institution whose equity falls sufficiently relative to its liabilities: (i) would be unable to raise additional capital; (ii) would not be acquired by another market player, or (iii) would be unable to conduct an orderly resolution. It also assumes that any existing debt cannot be renegotiated.

118. Using equity returns from the insurer, SRISK is defined as the expected capital shortfall given that the market is in crisis. A prudential factor is used as a threshold where the firm remains solvent, which in some jurisdictions is 8%.

119. Unlike MES which looks at insurers in a more abstract way (as a variable of the stock market), SRISK takes into account the capital structure of the insurer (debt/equity mix) and the prudential regulation. Both measures, MES and SRISK, condition their value on the market being in distress. In the language of ICP 24 these are measures of inward risk, ie risks emanating from the financial markets to the insurer. As with MES, insurers are then ranked according to their SRISK value from more systemic to less systemic.

[21] A survey on similar type of models can be found here: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1983602. Also the paper of Berdin, Elia and Sottocornola (2015) analyses the use of these models in the assessment of systemic risk: https://ssrn.com/abstract=2701821

[22] Engle and Brownlees (2017) https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1611229

ΔCoVaR

120. ΔCoVaR is a measure that was defined by Brunnermeier and Adrian (2016)[23] and differs from MES and SRISK in that it ranks insurers according to their systemic footprint from their outward risk. In other words, ΔCoVaR measures the impact to the market of the distress of a particular insurer. In ΔCoVaR there are two states of financial markets, the median or normal state and the crisis state.

121. The CoVaR per state (crisis or non-crisis) is similar to the VaR of the financial market return given a state, crisis or non-crisis. The difference between CoVaR at crisis state and the CoVaR at the normal state is called ΔCoVaR and ranks insurers according to their contribution to the risk of the entire financial market.

122. Thus, ΔCoVaR is a systemic risk measure of outward risk of insurers to the rest of the financial markets. Like MES and SRISK, ΔCoVaR ranks insurers according to the value of the indicator from more systemic to less systemic.

123. Table 8 presents a list of comparative characteristics between the three measures; no one method is deemed more favourable over the others.

Table 8: Comparison of measures

	MES	SRISK	ΔCoVaR
Reliance on market data	X	X	X
Capital structure of insurer		X	
Considers regulatory indicator		X	
Inward risk	X	X	
Outward risk			X

124. Reduced-form models have many advantages compared to indicator-based approaches, however, there are some shortcomings with this approach. Table 9 summarises some of the pros and cons of reduced form models.

[23] Brunnermeier and Adrian (2016) https://www.nber.org/papers/w17454

Table 9: Features of reduced form models

Pros	Cons
Based on publically available information and real time data	Markets may overreact with increased volatility due to panics, euphorias that may skew results
Market data can be forward looking, by including market expectations	Companies have no effective way to de-risk based on some objective indicators. Instead the systemic footprint and supervisory measures are contingent on the market's behaviour
Calibrated according to econometric techniques without noise from static prudential information and discrepancies of accounting standards	Estimation errors during calibration
	Not all companies may be publically traded, thus many of the measures may not be calculated
	Relies on market information with the assumption that market data includes all relevant factors

4.1.4 Comparison between indicator-based and reduced form identification

125. Both methods are intended to identify systemically important insurers from different perspectives. The indicator-based method assumes that systemic risk can be identified from using a set of indicators that eventually filter out those insurers without a systemic footprint. The indicator-based approach is based on supervisors' thinking on how systemic risk is evolving. Indicator-based approaches use mostly accounting or prudential data. In this Paper, also included are some statistical measures in the indicator-based approach (refer to Table 5). The drawback of relying solely on prudential and statutory data is that data can sometimes be backward-looking while trying to provide a view on current trends for insurers.

126. Reduced-form methods rely on market data to identify systemically important insurers. Their premise is that efficient markets reflect all the available information and are able to capture more information than prudential or statutory returns. For each insurer, its systemic footprint is estimated either by the expected capital shortfall or some stock return indicator drop under extreme market conditions. The advantage of these methods is that they reflect objectivity in terms of variable selection; they tend to be forward-looking in nature and; aggregate market information is used instead of information from prudential returns only. However, these methods also have some weaknesses. For example, they carry significant non-economic volatility[24] which reduces the validity of the signal. At the same time, they require market data which may not be available for many insurers. These measures have to

[24] By non-economic volatility we mean volatility which does not necessary reflect fundamental changes in the real value of financial assets but reflect temporary supply/demand imbalances which are smoothed out in a relative short period.

be calibrated to different markets creating a comparability issue between insurers listed in different stock exchanges. The assumption of efficient markets is strong as not all markets are mature enough to aggregate sufficient information to identify systemic risk.

127. Another weakness with reduced form indicator is the quality of calibration. As calibration requires econometric techniques, these techniques tend to suffer from estimation errors and small sample effects in case of data scarcity. In addition, these methods may not be able to capture all the nuances of an insurer in terms of particular liability and product features that could have profound impact in systemic risk.

128. A good practice would be to blend both approaches to gauge the true systemic footprint of an insurer. At the same time, supervisors could run both approaches individually and compare the results accordingly. In a perfect world where both methods have been properly utilised and calibrated, they should provide similar identifications of systemic risk.

De-risking

129. Supervisors should have clearly defined methodologies of assessing and monitoring the systemic importance of individual insurers. If there is a formal identification methodology for systemically important insurers, the methodology should include a means by which an insurer identified as systemically important can exit such identification by reducing its systemic footprint. Hence, supervisors should communicate their assessment methodologies as appropriate, and be in regular engagements with insurers to reduce systemic footprints. Supervisors should have established forms of communication for this purpose and provide assistance and guidance to insurers on the workings of their thresholds and scoring methodology.

Use of proportionality

130. Identifying systemically important insurers is a data-intensive exercise that requires significant resources for data collection, validation and compilation while applying supervisory judgement. Supervisors should consider using proportionality to narrow the scope of insurers it assesses as systemically important rather than assessing the entire insurance sector. Criteria that could be applied include: balance sheet size, gross written premiums, amount of technical provisions, market share, number of employees in the entire insurance group (including subsidiaries), etc. For example, supervisors may prefer to assess a few insurers that have more than 50% of market share. Such quantitative thresholds should be evaluated for several consecutive years in order to improve analyses. Supervisors may also assess whether smaller insurers collectively or in niche markets have a systemic footprint (eg credit insurance).

131. Even if there is a cut-off period for insurers to provide data to supervisors for systemic risk assessments, supervisors may sill encounter challenges in finding data to support their methodology. A best-effort approach could be for supervisors to communicate with market participants on data gaps that may be resolved through a data call. The additional data collected can make the process more transparent by encouraging greater participation by insurers in the exercise.

4.2 Assessing systemic importance of the insurance sector

132. Systemic risk may arise not only from the distress or disorderly failure of individual insurers, but also from the collective exposures of insurers at a sector-wide level. Clearly, the

identification of a single systemically important insurer already provides some indication that the sector could have systemic risks. However, it could also very well be that no individual insurer is systemically risky while common behaviours of certain insurers could still cause significant disruption to the wider financial system and real economy. Supervisors should take into consideration this sector-wide approach when assessing systemic importance.

133. The following methods could help assess the systemic risk in the insurance sector:

- Macroprudential sector-wide stress tests that focus on the interconnectedness of the insurance sector both for inward and outward risks;
- Sector-wide systemic risk assessment with the methodologies described previously for the entire insurance sector or a large sample of it;[25]
- Evaluation of recovery and resolution plans;
- Evaluation of the sector-wide exposure to systemically risky activities; and
- Cross-sectoral analysis.

4.2.1 Macroprudential sector-wide stress tests

134. The objective of macroprudential stress tests is to establish links between the insurance sector in its entirety and the financial system. These tests are intended to identify whether the insurance sector can be severely impacted by the actions of individual insurers and other financial undertakings or whether the insurance sector can cause contagion effects to the rest of the financial system. While traditional stress testing techniques can be applied, they may be limited in scope.[26] Network analysis may be more suitable to model direct-links of the insurance sector with the rest of the financial system. Network analysis considers links between insurers in the form of each insurer being a node of risk concentration and risk linking.

135. Such network analysis may be easier to perform within the insurance sector, while expanding the analysis outside the insurance sector can be data-intensive. Simpler approaches to network analysis could be the balance sheet approach to financial crises[27], which was initially used for macroeconomic vulnerability analysis but can potentially be used to assess insurers' balance sheets.

4.2.2 Sector-wide systemic risk assessment

136. The indicator-based and reduced forms of assessing the systemic footprint of individual insurers can be used to assess the systemic importance of the insurance sector. As the insurance sector comprises the sum of all individual insurers, the sector may be considered as systemically risky itself if some insurers are identified as systemically important in nature. However, it would be important to take note that non-systemically risky insurers identified from prior assessments are isolated from the perimeter of supervisory responses to systemic risk.

137. There is no clear-cut rule on how many insurers would need to undergo systemic risk evaluation to ensure that the sector is well-represented. In this instance, supervisors would

[25]Although the scope is different, supervisors may find the IAIS' GME a useful source of input in terms of choosing relevant indicators (refer to the IAIS' GME, in particular Section 4.2).
[26] Here "traditional" implies methodologies using pricing and risk models that structurally price assets and liabilities, their interactions and risk implications.
[27] https://www.imf.org/external/pubs/ft/wp/2002/wp02210.pdf

need to exercise supervisory judgement and use the proportionality principle to assess whether a large or small sample of insurers needs to be selected.

4.2.3 Evaluation of recovery and resolution plans

138. If supervisors and/or resolution authority have recovery and/or resolution plans[28] in place for a sufficient number of insurers, these plans can serve as guides on the systemic risk footprint of the sector. Recovery and resolution plans contain a wealth of information about individual insurers and consequently evaluating them jointly can identify potential systemic risk in the insurance sector.

139. Supervisors and/or resolution authority should always assess the feasibility of whether private sector interventions could assist in avoiding the use of public funds for successful recovery or resolution. Moreover, a failed recovery or resolution of a single institution may not necessarily trigger system-wide effects to the broader financial system. Therefore, the evaluation of these plans should be holistic and sector-wide focused to take into account events of a systemic nature with a high correlation of occurring in the insurance sector.

140. If required, supervisors and/or resolution authority could also take a group-wide view of recovery and resolution plans to assess their adequacy and capital fungibility as well as potential conflicts that may arise between different jurisdictions.

4.2.4 Evaluation of the sector-wide exposure to systemically risky activities

141. Even if individual insurers are deemed non-systemically risky, it could still be the case that their combined activities can pose systemic risks to the insurance sector as a whole. Supervisors need to properly identify potential systemic activities before they conduct sector-wide assessments of these activities.

142. Supervisors can then assess whether the aggregate exposure to these activities could have systemic impact. Examples of indicators that could be employed for such evaluations include the following:

- Total exposure of potential systemic activities to total activities;
- Sensitivity of repricing of potential systemic activities to changes in volatility, underlying assets, economic variables or insurance technical variables;[29]
- Value of non-hedging derivatives and other volatility sensitive instruments; and
- Value of short term funding compared to total funding.[30]

4.2.5 Cross-sectoral analysis

143. Cross-sectoral analysis links the insurance sector with other parts of the financial system such as banks, funds, payment systems and the public sector. This analysis can be based on tools such as network analysis that assesses the impact of cross holdings of balance sheets between insurers and other financial institutions. This approach ensures that insurers are assessed on both inward and outward risks through interconnectedness. As mentioned in earlier sections, cross-sectoral analysis is data and resource intensive and it may not always

[28] Resolution planning is subject to an "as necessary" requirement in ICP 12. Although recovery and resolution plans are useful tools, it is not expected that all jurisdictions will have this tool available.
[29] This sensitivity analysis should be conducted for sectoral exposure to potential systemic activities.
[30] Ideally, any cross holding of debt between insurers should carry large penalties in the form of capital charges to discourage interconnectedness.

be possible to perform detailed reviews. That said, cross-sectoral exposures can be elicited from supervisory data and stress tests could be augmented with a cross-sectoral view in mind.

144. Cross-sectoral analysis is currently in the toolkit of the Holistic Framework. The cross-sectoral analysis can help put into perspective insurers' integral role in the financial sector and their exposures to other financial sectors as well as help provide a better grasp of interconnectedness across sectors.[31]

5 Supervisory response

5.1 Introduction

145. The objective of this section is to provide further guidance and examples to support effective interaction between macroprudential analysis and supervisory responses (refer to ICP 24.4). A macroprudential perspective in the development and application of supervisory requirements is important to help limit the build-up of systemic risk and contribute to the resilience of the financial system. Depending on the outcome of macroprudential analysis, supervisory responses may be targeted at individual insurers and/or the insurance sector as a whole (or a subset thereof). Systemic risk varies over time and supervisory responses could be tailored to circumstances at each point in time.

146. With the adoption of the Holistic Framework, which includes enhanced and additional standards in ICPs and ComFrame,[32] supervisors are expected to have in place a broad toolkit to identify and, where necessary, address vulnerabilities within the insurance sector and identify the build-up of systemic risk. Supervisors should also have the necessary flexibility to tailor their supervisory responses to the nature, scale and complexity of their insurance sector exposures and activities, based on their macroprudential analysis.

147. Based on the outcome of the macroprudential analysis, which includes the assessment of systemic importance (refer to Sections 3 and 4), supervisors are expected to limit the build-up of systemic risks and mitigate those risks. Supervisory response can be twofold in nature:

- General supervisory requirements aimed at reinforcing the resilience of the insurance sector and limiting the possibility of any disorderly failures; and
- Targeted supervisory requirements, focused at addressing a specific potential systemic exposure (eg to liquidity risk, interconnectedness (macroeconomic and counterparty exposure) or lack of substitutability).

148. While both approaches can be taken independently from each other, there can also be a mixed approach where measures can be taken at both levels. The second approach includes a supervisory decision to expand the application of certain measures to those insurers that have demonstrated systemic exposure.

149. Two different types of triggers are possible: rule-based, automatic, triggers (eg the breach of a pre-defined condition or threshold) or triggers based on supervisory discretion.

[31] Refer to the Holistic Framework overarching document for more information.
[32] For an overview of these standards, refer to Section 3 of the Holistic Framework overarching document, notably Table 1, as well as ICP 24.4.4.

Table 10: Types of triggers

	Pros	Cons
Rule-based/automatic trigger	Transparency	Rigidity
	Simplicity	Wrong signal
	Reactivity	
Supervisory discretion trigger	Deep and global analysis	Lack of reactivity
	Flexibility	

150. In order for these measures to have successful outcomes, it is important that macroprudential frameworks are based on efficient and robust coordination and cooperation processes with relevant supervisors in other jurisdictions or other financial sectors. This is especially appropriate in the case of IAIGs, through the setting up of crisis management groups (refer to ComFrame integrated in ICP 25 (Supervisory Cooperation and Coordination)). These may include:

- Sharing the results of macroprudential analysis;
- Exchanging on the necessity of applying preventive or corrective measures; and
- Providing appropriate guidance on the analysis of supervisory requirements: ERM, recovery and resolution plans.

5.2 Types of supervisory responses

151. Many supervisory measures described in this section are essentially microprudential instruments that are applied with a macroprudential perspective in mind. Indeed, microprudential requirements can mitigate potential spillover effects from the distress or disorderly failure of an individual insurer or from the common exposures or behaviours of a (subset) of the insurance sector as a whole, therefore contributing to the overall resilience of the financial system. Macroprudential analysis should provide guidance and direction in conducting more in-depth and more targeted analysis of microprudential requirements to be applied.

152. Supervisors should consider modifying the granularity and the frequency of requirements. These can take the shape of requirements, such as the strengthening of the ERM framework, additional arrangements (more statements, more frequent supervisory reporting or disclosures), or results from decisions (incentive or prescriptive), enhanced crisis management and planning, and preventive or corrective measures.

5.2.1 Strengthening the ERM framework

153. As described in the introductory guidance of ICP 16 (Enterprise Risk Management for Solvency Purposes), requirements on ERM are primarily microprudential in nature (aimed at enhancing the sound operation of the insurer and ensure the adequate protection of policyholders) but, collectively practiced in the industry, it also supports the operation and financial conditions of the insurance sector as a whole.

154. The outcomes of macroprudential analysis should provide direction to supervisors when setting requirements and increasing or decreasing the intensity of such requirements. If a potentially systemic exposure is identified by trends in certain risks and activities in the macroprudential analysis, supervisors should require insurers to strengthen their ERM framework.[33] The next subsections provide a non-exhaustive list of examples of such requirements, related to counterparty risk and liquidity risk in particular.

155. The results of macroprudential analysis may raise concerns that could be first addressed by requiring insurers to undertake further stress testing or scenario analysis. As such, the assessment of certain stresses could provide appropriate inputs for supervisors in macroprudential analysis. This could be done by specifying criteria or analyses as part of the supervisory risk assessments to achieve effective supervision and consistency across insurance groups. Indeed, uniform stress testing requirements may be necessary to assess the overall/ aggregated impact of the insurance sector on the financial system. Supervisors should then take the appropriate supervisory measures to address macroprudential concerns that could be raised by the outcomes of the set of specific stress tests. Supervisors may also need to communicate with other financial services supervisors on the results of the analysis to address any potential spillover effects that could arise.

156. Macroprudential analysis is the most appropriate tool to identify and measure interdependencies and the concentration risk in the financial sector. Based on the risks the assessment may highlight, supervisors may require insurers to strengthen their risk appetite statement or to establish a counterparty risk appetite statement to define more stringent limits. The Application Paper on Liquidity Risk Management also provides a range of measures that could be used to address liquidity concerns raised by macroprudential analysis.

5.2.2 Crisis management and planning

157. Crisis management and planning tools are aimed at reducing the likelihood and adverse impact of a disorderly failure of an insurer. It is good practice for supervisors to require the development of recovery and resolution plans[34] at least for those insurers that it has assessed to be systemically important.

158. Macroprudential analysis is particularly relevant to determine the scope of application of the recovery and resolution plans. These analyses may help to identify the most systemically risky activities and thus for which insurers this requirement is needed.

159. Macroprudential analysis is also a valuable tool to assess the quality and feasibility of the recovery and resolution plans. It may help to ensure that the recovery solutions envisaged are sufficiently robust to address any spillover effect.

160. The concepts for both recovery and resolution planning are described in ICP 12 (Exit from the Market and Resolution) and ICP 16 and further guidance is provided in the Application on Recovery Planning and the draft Application Paper on Resolution Powers and Planning.

[33] In particular, in deciding whether it is necessary to require more detailed requirements, the supervisor should take into account the nature, scale and complexity of the insurer's activities that lead to increased risk exposure as well as the risk amplification effects related to the size of the insurer.

[34] Recovery plans are developed by the insurer, and identify in advance options to restore the financial condition and viability under severe stress. Resolution plans are developed to identify, in advance, options for resolving all or part(s) of an insurer to maximise the likelihood of an orderly resolution, the development of which is led by the supervisor and/or resolution authorities in consultation with the insurer in advance of any circumstances warranting resolution.

These Papers provide guidance on the decision of the supervisor and/or resolution authority on the need for these plans, as well as a description of the main elements of such plans.

5.2.3 Preventive and corrective measures

161. In the event that systemic risk materialises, or there are signs of the build-up of systemic risk based on macroprudential analysis, supervisors should have at their disposal a sufficiently broad set of powers. ICP 10 (Preventive Measures, Corrective Measures and Sanctions) puts forward various measures to address supervisory concerns. The measures described in ICP 10.2 may also be applied to address a threat to financial stability, in particular:

- Restrictions on business activities:
  - Prohibiting the insurer from issuing new policies or new types of product;
  - Withholding approval for new business activities or acquisitions; and
  - Restricting the ownership of subsidiaries.
- Directions to reinforce the insurer's financial position, such as:
  - Requiring measures that reduce or mitigate risks (for example, restricting exposures, through either hard or soft limits, to individual counterparties, sectors, or asset classes);
  - Requiring an increase in capital; and
  - Restricting or suspending dividend or other payments to shareholders.
- Other powers, including:
  - Requiring the insurer to prepare a report describing actions it intends to undertake to address specific activities the supervisor has identified, through macroprudential surveillance, as potentially posing a threat to financial stability;
  - Temporarily delaying or suspending, in whole or in part, the payments of the redemption values on insurance liabilities or payments of advances on contracts;
  - Lowering the maximum rate of guarantees for new business or introducing additional reserving requirements; or
  - Incentivising the use of a system-wide lending facility, when available, for market-wide liquidity issues extending to insurers.

162. In some cases, supervisors may require the development of a systemic risk report that would aim at presenting, in a coherent and summarised manner, all applicable measures that the insurer intends to undertake in order to address macroprudential concerns. In that sense, it is the least intrusive measure, as it allows insurers to first develop their own action plan. If supervisors are not satisfied with the report or the progress made by insurers to implement it, supervisors are expected to take additional preventive or corrective measures accordingly.

163. It is important for supervisors to document and communicate to insurers the precise assessment of potential systemic exposures or activities that led to the requirement. While insurers should be able consider their inward risk and vulnerabilities (as part of the ERM), it may be more difficult for insurers to examine how their activities or vulnerabilities may affect others, and hence, may lead to a systemic risk.

164. As an example, such a report could include the following elements:

- Additional elements to its liquidity management planning;
- Additional elements to their recovery plan;

- An outline of intra-group financial relations; and
- A description of linkages to other measures.

6 Transparency

6.1 Importance of transparency

165. As described in ICP 24.5, the supervisor is required to publish relevant data and statistics on the insurance sector. As described in ICP 24.5.1, it may enhance market efficiency by allowing market participants to make more informed decisions and reducing the cost to the public of acquiring insurance sector information and may serve as a market disciplining mechanism by facilitating comparisons of an individual insurer to the sector as a whole.

166. Transparency may in some ways be seen as a macroprudential instrument itself. For example, communicating macroprudential concerns may have a preventative effect by triggering certain behaviour that limits the further build-up of the systemic risk or vulnerability. Also, through external communication, supervisors should explain the objectives, strategy and processes of their macroprudential supervision. Transparency not only reinforces accountability of supervisors, it may also contribute to the effectiveness of macroprudential supervision itself, by enhancing its predictability and by managing stakeholders' expectations.[35]

6.2 Possible macroprudential reporting

167. Transparency may be achieved by publishing relevant insurance data by supervisors. Insurance data and statistics can be published by supervisors on their official webpage allowing each user of the information to perform comparative analysis of individual insurers as well as aggregated indicators of the insurance market.

168. For macroprudential purposes, supervisors may publish:

- Objectives and responsibilities, goals and priorities and associated activities;
- Data collected on the insurance sector necessary for macroprudential supervision (both quantitative and qualitative);
- Results of the insurance sector analysis;
- Results of the systemic importance assessment;
- Supervisory responses based on macroprudential concerns; and
- Supervisory measures taken in relation to problem or failed insurers, subject to confidentiality considerations and in so far as it does not jeopardise other supervisory objectives or prejudice another case pending before the supervisor.

169. Macroprudential reporting by supervisors may take the following forms:

- Financial stability report;
- Risk dashboard (heat-map, or other format of monitoring key market indicators);
- Macroprudential database;
- Reports on insurance sector stress test results and its specifications (methodology);
- Lists of supervisory measures taken in relation to problem or failed insurers

[35] For more details please refer to BIS papers on objective setting and communication for macroprudential policies: https://www.bis.org/publ/cgfs57.pdf; https://www.bis.org/publ/arpdf/ar2018e4.pdf

- Lists of supervisory measures in relation to any relevant risks materialising; or
- Other relevant analytical reports on current risks of the insurance sector.

170. As described in ICP 24.5.2, in cases where supervisors provide other parties (eg the government statistical office) with adequate means for publishing data on the insurance sector, they should take into account principles of outsourcing supervisory activities covered in ICP 2.11.

6.2.1 Financial stability report (FSR)

171. A financial stability report is an integral part of financial stability communication and may be a relevant tool for increasing transparency on macroprudential supervision issues in the insurance sector.

172. An FSR may include the following information on the insurance sector:

- Key market developments affecting the insurance segment;
- Overview of the insurance segment (its solvency, profitability etc.);
- Main trends in the insurance and reinsurance segments;
- Results of quantitative and qualitative insurance sector analysis;
- Stress testing results;
- Major outward and inward risks identified;
- Any supervisory actions taken to maintain the stability of the insurance sector during the reporting period; and
- Forecasts for the future development of the sector.

173. The information presented in an FSR for the insurance sector may be divided by life and non-life segments for better granularity. If an FSR is published, it should be on a regular basis.

Examples of FSR

- In Russia, according to the Federal Law No. 86-FZ dated July 10, 2002, the Central Bank of the Russian Federation (Bank of Russia) publishes the FSR at least twice a year. Commonly, each publication of the FSR includes a section “Risks of insurance companies” comprising an overview of the Russian insurance market and its risks, both for life and non-life segments.
- De Nederlandsche Bank (DNB) publishes the FSR twice a year with macroprudential indicators and statistics as well. In it, DNB raises awareness of systemic risks among stakeholders, providing analysis of the current developments within the financial sector and their implications to the financial stability. One of the tools is a risk map that presents a schematic overview of the main risks, including the vulnerabilities of insurers and pension funds.[36]
- In the United States, the Financial Stability Oversight Council (FSOC) publishes an annual report to address significant financial market and regulatory developments, including insurance and accounting regulations and standards, along with an assessment of those developments on the stability of the financial system.

6.2.2 Other forms of macroprudential reporting

[36] An example can be found here: https://www.dnb.nl/en/news/dnb-publications/financial-stability-report/index.jsp

174. If supervisors perform top-down or bottom-up stress tests in the insurance sector, they may publish an insurance stress test report. This report could cover the jurisdiction's stress testing framework, including the methodological approach of the exercise, stress test results and key findings that describe the impact of stress scenarios on the insurance sector as well as next steps for stress testing enhancements.

175. In response to any relevant risks materialising from the stress tests, supervisors may release public statements covering recommendations, preventive and corrective measures (refer to 5.2.3) aimed at mitigation of the build-up of systemic risk. For example, supervisors could issue or update recommendations on dividend distribution and remuneration policies, advising that supervisors themselves will closely monitor compliance with these recommendations.[37] Additionally, supervisors may conduct a survey on compliance of insurers with issued recommendations and publish the results (refer to ICP 3 (Information Sharing and Confidentiality Requirements)).

176. Supervisors may publish data collected on the insurance sector for macroprudential purposes. For example, supervisors may develop special macroprudential databases that contain datasets of indicators or data elements relevant for macroprudential purposes.[38]

[37] An example can be found in 2020, when EIOPA issues a statement on dividends distribution and variable remuneration policies in the context of Covid-19 (https://www.eiopa.europa.eu/sites/default/files/publications/statement-on-dividend-distribution-april2020.pdf)
[38] An example can be found by the Macroprudential database. Statistical data warehouse of the European Central bank. https://sdw.ecb.europa.eu/browse.do?node=9689335

Annex 1 Example indicators and data elements

This annex provides a non-exhaustive list of relevant indicators and data elements that could be collected for macroprudential purposes, in support of the implementation of ICP 24.1.

1. Macroeconomic data examples to assess the exposure of the insurance sector to economy-wide factors
    a. Solvency
        - solvency capital ratio (insurer and individual level – life and non-life)
        - changes in GDP growth, financial cycle
        - changes in inflation
        - changes in equity valuations
        - downgrades in credit ratings and outlooks (fixed income portfolios)
        - financial strength ratings
        - insurance outlook (industry-wide): life insurance and property and casualty
        - changes in interest rates
        - changes in sovereign and major indices credit default swap (CDS) spreads
        - changes in real estate valuations
        - changes in equity prices (local and sectoral)
        - duration mismatch[39]
        - changes in exchange rates (impact on valuations)

    b. Profitability
        - changes in financial revenue (impairments, investment losses from higher risk aversion
        - changes in corporate dividends
        - changes in claims (life and non-life)
        - changes in banking sector profitability
        - performance of equity prices and expected profits of the national companies and the belonging area (insurance or non-insurance activities)
        - changes in paid-up rates
        - changes in combined ratio (loss ratio plus expense ratio)
        - changes in new lines of business
        - changes in premium income of different segments
        - changes in corporate sector profitability
        - changes in unemployment and corporate solvencies
        - changes in gross and net premium income

[39] Duration mismatch occurs in the event of changes in the interest rate where when a financial institution borrows funds, using short-term loans or bonds but lends out these funds for a longer term.

- changes in credit-to-GDP gap
- changes in household debt as a percentage of disposable income
- changes in household debt service ratio
- growth in household disposable income

2. Microeconomic data examples to identify variances in insurance trends for more in-depth monitoring
    a. General data
        - market share of the insurance sector
        - changes in insurance pricing and underwriting performances (individual and industry)
        - changes in expenses
        - cancellations and policy lapses
        - changes in equity value (capital and surplus)
        - changes in asset allocation (bonds equities, cash, deposits, collective investment schemes etc.
        - changes in shareholder and policy dividends
        - changes in capital requirements
        - capital contributions to shareholders
        - changes in interest rate and inflation
        - changes in morbidity and mortality rates
        - changes in assets and liabilities (refer to 3a and 3b)
        - Jaws ratio[40]

    b. Data relating to specific and unforeseen events, such as pandemics, natural disasters, cyber-attacks: (individual and industry)
        - changes in the frequency and severity of events
        - changes in the solvency position
        - changes in the liquidity position
        - changes in profitability (realised gains or losses)
        - changes in assets
        - changes in liabilities
        - collateral requirements as a result of changing market conditions

3. Liquidity risk data examples to detect possible liquidity mismatches between assets and liabilities (individual and sector-wide level)
    a. Assets side: (insurance and non-insurance)
        - degree of liquidity of assets (insurance liquidity ratio)
        - ratio of bank loan funds in asset portfolio
        - changes in sovereign bond investments
        - changes in equity investments

[40] The Jaws ratio measures the rate at which expenses grow relative to premiums

- changes in investment funds
- decrease in corporate debt investments
- changes in collateralised loan obligations
- revaluations (real estate and equities)
- changes in derivatives holdings
- average duration of assets
- changes in sovereign bond yields and spreads
- higher market volatility (VIX), higher margin calls on options or derivatives
- changes in asset composition (equities, debt, cash)
- changes in leveraged loans
- changes in financial guarantees
- deterioration in credit quality of assets (due to credit rating downgrades)
- changes in securitised assets
- changes in level 1, level 2 and level 3 assets (Fair Value Hierarchy)
- changes in interest rates

b. Liabilities side: (insurance and non-insurance)

- changes in claims (life and non-life), business interruption insurance, pandemic insurance
- changes in net and gross incurred claims
- changes in net and gross written premiums (life and non-life)
- changes in surrenders and lapses
- average duration of liabilities
- short term debt issued by insurers
- line of credit or letter of credit drawdowns
- changes in claims (due to lower economic activity in motor, aviation, marine insurance)
- insurance claim triangles[41]
- changes in direct premiums written for LOB[42]
- total borrowing by insurance companies (short term and long term)
- changes in maturity or redemption structure of non-insurance liabilities
- financial guarantees on life insurance

[41] An insurance claims triangle is a way of reporting claims as they develop over time. Typically, insurance claims get registered in a particular year and payments take place over several years.

[42] In example, direct premiums written for certain LOB may be of particular interest: event cancellation, work stoppage, travel insurance, mortgage guarantee, financial guarantee, export credit coverage, aviation coverage and marine coverage.

4. Counterparty risk examples to assess the probability of default
    - capital adequacy ratio of insurers
    - measuring credit quality of insurers (non-performing loans, share prices, implied CDS and CDS spreads, market capitalisation, changes in short term and long term debt, loans loss reserve)
    - profitability of insurers
    - specific sectors holdings (eg financial or real estate), and geographical areas
    - reinsurance coverage (with local and foreign reinsurers)
    - concentration: insurance sectors assets and liabilities holdings by life and non-life insurers
    - expected default frequencies to measure credit risk
    - derivatives holdings(local and foreign holdings)
    - market concentration risk (holding of equities and debt – local and foreign)
    - cross-sectoral holdings of other insurers, banks (and money-market funds), other financial institutions and corporates

5. Macroeconomic exposure data examples to monitor to assess the insurance sector's vulnerability to macroeconomic shocks (life and non-life)
    - changes in GDP growth
    - inflation rate
    - savings rate
    - changes in bond yields
    - unemployment levels
    - interest rate
    - changes in equity prices

In addition, there are other reports available that supervisors may find helpful when designing data collection exercises. As an example, the World Bank has published a report on *The Use of Financial Health and Stability Indicators in Insurance Supervision*, specifically aimed at supervisors in economies with less developed insurance markets. This report is not only aimed at supporting macroprudential supervision, but also microprudential supervision. This could be very useful for supervisors in emerging market and developing economies.

Annex 2 Example risk dashboards

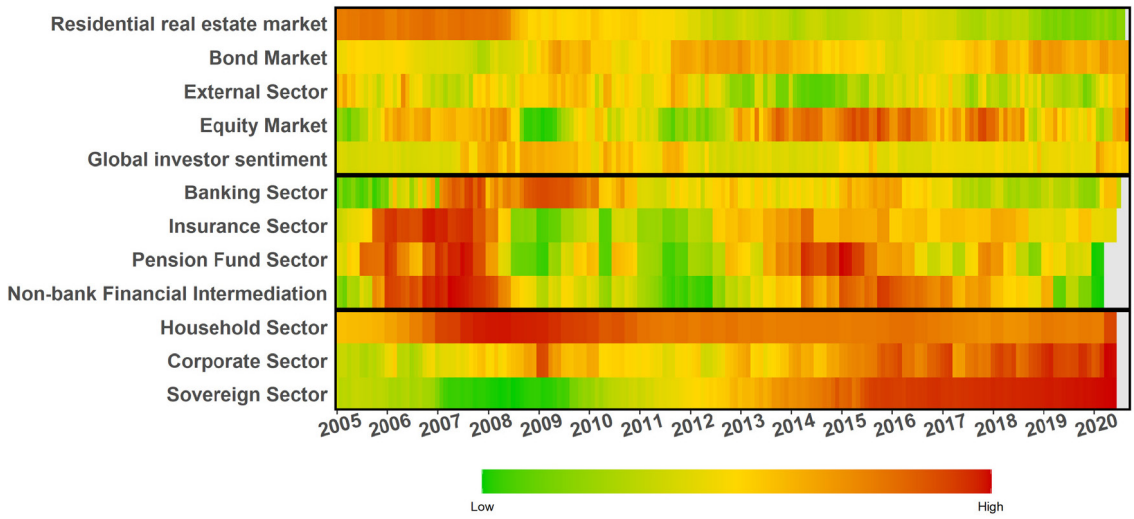
South African Reserve Bank Heat Map

The South African Reserve Bank (SARB) monitors a wide range of sectors, asset markets and financial intermediaries for signs of possible systemic risk. No single indicator can provide a comprehensive view of these y risks, thus a multitude of quantitative tools is used to support a qualitative assessment of risk. An example of one such quantitative tool used to assess potential risks and vulnerabilities is a financial stability heat map (Figure 1) which is an important input into the SARB's financial stability monitoring process. The heat map is a visual depiction of various risk indicators and provides an easy-to-interpret overview of the evolution of risk across different parts of the economy.

The relative simplicity of the heat map, however, presents both pros and cons. On the one hand, it provides a broad, consistent view of changes in certain financial variables over time. On the other hand, it only includes a subset of financial variables, and it simply aggregates these variables without assigning weights to them. Therefore, risk build-up in other areas of the economy might be missed. The construction of three different versions of the heat map, one with all the individual indicators, one with the different sectors and one with the broad risk or valuation categories, tries to mitigate the possibility of missing certain indicators to some extent. Also, trend changes in some variables can occur, which may send misleading signals in the heat map (many indicators are assumed to be mean-reverting). Furthermore, some indicators might be double-sided in that risk build-up or rising vulnerability occurs when an indicator is both increasing and decreasing which could possibly make the interpretation of the specific indicator more difficult.

It is therefore important to use the heat map alongside various other risk identification tools for a more comprehensive view of potential risks to financial stability.

Figure 1: Financial stability sectoral heat map



Source: SARB

The heat map is a diagram with data values represented by colours. It provides a compact and easy-to-grasp depiction of a large amount of data, making it easier to identify patterns and trends.[43] Following the methodology of Arbatli and Johansen (2017),[44] raw indicators are transformed so that the increases in each indicator can be interpreted as an increase in risk, with the exclusion of possible double-sided risks. This entails normalising each indicator so that all the observations are in the range of 0-1.[45] If a normalised indicator equals 0.6, for example, it means that 60% of the historical values of the indicator are less than or equal to the most recent observed value. Indicators are aggregated into categories. The category average is then mapped to a continuous colour bar, where 0 is green and 1 is red.

The South African heat map currently consists of 12 categories:

i) The residential real estate market category consists of two indicators: the annual growth rate of the Standard Bank House Price Index, and mortgage loans as a share of total loans.

ii) The bond market consists of the spread between the SA 10 and 2 year bond and the SA 10 and 5 year bond, the sovereign CDS spread and the bond spread between the US and SA 2 year and 5 year bonds.

iii) The external sector comprises of the real effective exchange rate of the exchange rate of the rand (with 20 trading partners) and the one -month exchange rate volatility.

iv) The equity market consists of two indicators: the JSE prices gap and the JSE price-to-earnings ratio.

v) The global investor sentiment category consists of the Chicago Board Options Volatility Index (VIX) as a one-sided and double-sided indicator of risk appetite; Merrill Lynch Option Volatility Estimate (Move Index), US Dollar Index, Commodity Research Bureau Index, US 10 year Government Bond and MSCI Emerging Markets Index.

vi) The banking sector category consists of five indicators, namely: averages for the sector-wide value of assets to equity, impaired advances to gross loans and advances, the liquidity coverage ratio (LCR), the assets-to-GDP gap, and the credit-to-GDP gap. This category provides a composite measure of the buffers in the banking sector to both solvency risk (the equity buffer) and liquidity risk (the LCR), as well as an indication of the level of credit risk building up in the system.

vii) The insurance sector category comprises five indicators, all sector-wide, namely: the assets-to-GDP gap, the combined ratio[46] (non-life), growth in gross written premiums (life and non-life), the individual lapse ratio (life), and the solvency capital requirement (SCR) (life and non-life). This category provides a composite measure of the degree of risk taking by insurers, the growth in new business underwriting profits, and buffers in place to absorb an adverse shock.

viii) The pension fund sector is represented by the assets-to-GDP gap.

ix) Other financial institutions comprises of the assets-to-GDP gap.

[43] L Wilkinson and M Friendly, 2009, 'The history of the cluster heat map', The American Statistician 63(2), pp 179–184.

[44] E C Arbatli and R M Johansen, 2017, 'A heat map for monitoring systemic risk in Norway', Norges Bank staff memo 10.

[45] This normalisation is done on the basis of each indicator's empirical cumulative distribution function.

[46] The combined ratio is an indicator of the underwriting profit. It is calculated as net claims and expenses incurred divided by net premiums written.

x) The household sector category consists of three indicators: the debt-service cost-to-disposable-income ratio, the debt-to-disposable-income ratio, and the debt-to-GDP ratio.

xi) The corporate sector category comprises of three indicators for the non-financial corporate sector: the debt-to-GDP ratio, the debt-to-net-operating-profit ratio, and the interest coverage ratio.[47]

xii) The sovereign sector category makes use of a single indicator: the gross government debt-to-GDP ratio.

The heat map is a 'living' tool and is updated from time to time in line with international best practice.

[47] The interest coverage ratio demonstrates the degree to which an entity's EBIT cover its annual interest expenses.

EIOPA Risk Dashboard (RDB)

Background

As part of the European legislation, EIOPA as well as the other European Supervisory Authorities (ESAs) and the European Systemic Risk Board (ESRB) are called upon to "develop a common set of quantitative and qualitative indicators (i.e. a risk dashboard) to identify and measure systemic risk". The legislation further stipulates that these dashboards should be constructed in cooperation between the ESAs and ESRB. In response to this requirement, the ESAs, together with the ESRB and the European Central Bank have determined a set of general features for all dashboards to follow:

- Each Risk Dashboard will be constructed based on the same set of risk categories: macro risk, credit risk, market risk, funding and liquidity risk, profitability and solvency risk and risks resulting from interlinkages and imbalances. Furthermore, each institution has the option to add categories to allow for sector specific risks (e.g. insurance (underwriting) risk).
- All Risk Dashboards should be constructed on a flexible basis in order to allow each authority to reflect the most imminent risks identified.

RDB Structure

The EIOPA RDB is based on a large set of indicators grouped into seven risk categories plus an additional category showing how the insurance industry is perceived by financial markets. The risk categories are broadly aligned with those used by the other ESAs and by the ESRB and can be listed as follows:

1. Macro risks: Macro risk is an overarching category affecting the whole economy. EIOPA's contribution focuses on factors such as economic growth, state of the monetary policies, consumer price indices and fiscal balances which directly impact the insurance industry. The indicators are developed encompassing information on the main jurisdictions where European insurers are exposed to both in terms of investments and product portfolios.
2. Credit risks: The category measures the vulnerability of the European insurance industry to credit risk. To achieve this aim, credit-relevant asset class exposures of the (re)insurers are combined with the relevant risk metrics applicable to these asset classes. For instance, the holdings of government securities are combined with the credit spreads on European sovereigns.
3. Market risk: Most asset classes are assessed by analysing both the investment exposure of the insurance sector and an underlying risk metric. The exposures give a picture of the vulnerability of the sector to adverse developments. The risk metric, usually the volatility of the yields of the associated indices, provides a picture of the current level of riskiness. The risk category is complemented by an indicator that captures the difference between guaranteed interest rates and investment returns.
4. Liquidity and funding: This category aims at assessing the vulnerability of the European insurance industry to liquidity shocks. The set of indicators encompasses the lapse rate of the life insurance sector with high lapse rates signalling a potential risk, holdings of cash & cash equivalents as a measure of the liquidity buffer available, and the issuance of catastrophe bonds, where a very low volume of issuance and/or high spreads signals a reduction in demand which could form a risk.

5. Profitability and solvency: The category scrutinises the level of solvency and profitability of the European insurance industry. Both dimensions are analysed for the overall industry (using group data) and include a breakdown for the life and non-life companies (using solo data). In detail, the solvency level is measured via SCR Ratios and quality of own funds. Standard profitability measures for the whole industry are complemented by indicators such as the combined ratio and the return on investments specifically applied to the non-life and life industry respectively.
6. Interlinkages and imbalances: In this section various kinds of interlinkages are assessed, both within the insurance sector, namely between primary insurers and reinsurers, between the insurance sector and the banking sector, as well as interlinkages created via derivative holdings. Exposure towards domestic sovereign debt is also included.
7. Insurance (underwriting) risks: Indicators for insurance risks gross written premiums of both life and non-life business are an important input. Both significant expansion and contraction are taken as indicators of risks in the sector; the former due to concerns over sustainability and the latter as an indicator of widespread contraction in insurance markets. Information on claims and insurance losses due to natural catastrophes also contribute to this risk category.
8. Market perception: This category encompasses the financial markets' perception of the healthiness and profitability of the European insurance sector. For this purpose, relative stock market performances of European insurance indices against the total market are assessed, as well as fundamental valuations of insurance stocks (price/earnings ratio), CDS spreads and external ratings/rating outlooks

Data Sources

The Solvency II reporting provides information both at solo and group level. Groups represent the most systemically relevant institutions in the European insurance industry, both from an entity perspective (i.e. size, interconnectedness, complexity) and from an activity perspective (i.e. wide spectrum of activities covered). Solvency II data are complemented by publicly available market data.

Methodology

The level of each indicator is represented by a discrete score ranging from 1 (low risk) to 10 (very high risk). The risk scores are used discretely at the level of each risk indicator, but transformed to non-discrete scores at the level of each risk category, i.e. after aggregation. Final scores are transformed into colour codes based on four colours to represent the final level of the risk. Changes over time of the scores (quarter-on-quarter variation) are represented by arrows.

Thresholds used to transform risk levels to discrete risk scores are calculated according to specific guidelines based on: i) Historical distribution (where a sufficiently long and significant time series is available); ii) Pre-defined (where indicators come with a regulatory defined threshold – e.g. SCR ratio); iii) Cross-sectoral distribution (where time series are not available).

Risk scores of each indicator are aggregated at risk category level through the use of weights defined taking into account the relevance of the indicator for the category and its correlation with other indicators within the category.

Presentation

The Dashboard is published on a quarterly basis and it is includes a synthetic view of the level of risk and the trend compared to the previous quarter for each risk category accompanied by the narrative of the key finding.

Risks	Level	Trend
1. Macro risks	Very high	
2. Credit risks	High	
3. Market risks	High	
4. Liquidity and funding risks	Medium	
5. Profitability and solvency	High	
6. Interlinkages and imbalances	Medium	
7. Insurance (underwriting) risks	Medium	
8. Market perceptions	Medium	

The overview is complemented by a comprehensive list of the evolution of each indicator grouped by category.

Annex 3 Example topics for analysis

Certain topics may require in-depth analysis to take into account the needs of supervisors while considering industry vulnerabilities and differences between jurisdictional frameworks.

A non-exhaustive list of topics for which supervisors can perform in-depth analysis may include:

- Liquidity monitoring
- Derivatives monitoring
- Reinsurance analysis
- Interconnectedness

Further analysis could be done and includes impacts arising from emergency situations (health, environmental, geopolitical, etc.), such as the recent Covid-19 crisis.

These additional analyses could investigate, in more detail, the effects that certain strategic choices can generate for the stability of the sector or, more generally, of the financial system.

Liquidity monitoring

The periodic analysis of liquidity could be included in trend analysis focused on elements that could identify liquidity risk. This analysis method could help supervisors monitor liquidity risk which, although less important than in the banking context, is still recognised as a potential source of systemic risk in the insurance sector. In some instances liquidity can represent an element requiring greater attention when taking into account the state of financial markets and any liquidity demands resulting from social or health issues (such as the current epidemiological emergency). Supervisors should assess insurers' exposure to liquidity risk by taking into account both inward and outward risks.

Supervisors may carry out the analysis of liquidity on an "ordinary basis" with agreed periodicity (for example annual, biannual, quarterly or when necessary) or with a "higher frequency" that takes into account the availability of data and proportionality.

The liquidity monitoring could be based on a set of indicators that supervisors track (including a supranational context) and are representative of liquidity conditions. The examination, depending on proportionality and availability of data, could be conducted on the entire national insurance market or on a representative sample. The elements of attention could include those identified in the *Application Paper on Liquidity Risk Management* ("Liquidity Paper"); although the perspective of the mentioned Liquidity Paper is different, it can provide ideas for specific insights into the liquidity profiles attributable, more generally, to the insurance sector.

Periodic monitoring of liquidity can be based on data that the supervisor has at its disposal, by periodic reporting (eg financial statements) or by ad-hoc requests that are solicited by the supervisor to the entire market (or to a sample of it).

Supervisors could also closely monitor some factors represented in the Liquidity Paper, that could influence the liquidity risk, including: insurable events, policyholder behaviour, funding structure, transferability of assets and liquidity impairments on capital markets. Severe stress scenarios, including from a macroprudential perspective, should be helpful in considering potential capital market-related devaluations that could further hinder market responsiveness. Severe stress scenarios should be useful to consider potential correlated impairments to capital markets that may further hinder an insurer's ability to manage a liquidity event. The analysis should allow the interaction between liquidity risk and losses on investments.

Periodical liquidity monitoring could enable supervisors to detect, in a timely manner, crucial information on adverse market circumstances, such as:

- The value of unrealised gains/losses on investments; and
- The assessment of the asset values' trend linked to the development of the whole market situation (ie spread level).

Regarding the potential elements to be monitored, supervisors can perform analyses of different levels of depth:

a) Can track a set of indicators that provide the liquidity situation of the sample/insurance market.

   For example, periodical (eg monthly) data collection allows the timely monitoring of cash inflows and outflows used as proxies of liquidity strains in the life sector.

   - Claims ratio = claims/premiums
   - Lapse ratio =lapses/premiums
   - Cash and equivalents/total assets
   - Liquid assets/total assets

b) Can conduct a more in-depth analysis and identify indicators, calculated both at market and individual level, structured in "main areas" on which it assesses liquidity risk. Each "main area" is analysed by suitable indicators.

Examples that may be identified for liquidity monitoring, among those mentioned in the Liquidity Paper:

- Liabilities – aspects related to the redemption options included in the contracts.
- Assets – assessing the degree of liquidity of the assets held by the insurer (sample) and considering the amount of cash and deposit securities considered "liquid" on the basis of criteria shared internationally, etc.
- Interaction between assets and liabilities – assessing liquidity risk by looking jointly at the assets and liabilities of companies (sample) according to their duration gap.
- Effects of liquidity risk connected to activities that are not strictly insurance – deriving for example from short-term financing, from investments in derivatives or from other mechanisms.

Interconnectedness

This analysis could be performed to evaluate systemic risk related to the interconnectedness among the different players in the insurance sector. The analysis may consider the exposures (eg bonds and equities) of a particular insurance group to others (refer to Section 4).

Derivatives monitoring

This analysis may be done with periodical monitoring (eg semi-annual monitoring) aimed at verifying potential vulnerabilities in the insurance sector related to the use of derivative instruments.

Reinsurance analysis

This analysis is performed to identify potential vulnerabilities and/or insurance systemic risks that could arise from the use of reinsurance. There may not always be complete data (data could come from different institutions in different jurisdictions with different reporting systems).

Adjustments could be required, for example:

- The codes of reinsurers are amended according to the information available on Supranational Supervisor and Global LEI databases;
- Data provider Reuters is used to check the external ratings of listed reinsurers; or
- Cross-checks are carried out in the jurisdiction and external rating information provided by each institution.

Annex 4 Example of ORSA analysis

The Own Risk and Solvency Assessment (ORSA) requires an analysis of the main risks and solvency position of an undertaking to be performed on a current and forward-looking basis. The regulatory framework may allow the use of the ORSA as both a microprudential and macroprudential supervisory tool. A specific report could be generated for supervisors to analyse risks from both these perspectives.

From a macroprudential perspective, the ORSA shall form an integral part of the undertaking's business strategy on an ongoing basis in its strategic decisions. The ORSA could assist supervisors to identify the main factors, assumptions and strategies used at a sectoral level for the estimation of overall solvency needs from a forward-looking basis. For this purpose, it could be useful for supervisors to act preliminary on the regulatory framework to prescribe the information to be analysed. Supervisors could provide a scheme to establish a process to analyse the ORSA but the insurers would remain free to define the content of the ORSA.

For example, the ORSA scheme could include a set of specific information, such as:

a) Risk strategy and risk profile of the undertaking

b) ORSA governance

- Reconciliation, if different, between strategic plan/capital management plan/ORSA
- Role and responsibilities (Board, Committees, top management, key functions and other function involved in ORSA process)
- Internal reporting procedure on ORSA

c) Methods and assumptions

Methods and assumptions for risk assessment, also from a forward looking perspective and for Overall Solvency Needs, both for quantifiable and non-quantifiable risks. Details on stress test and reverse stress tests are included in the ORSA.

Aspects included: Time horizon and Sovereign risk.

d) Outcomes, conclusions and internal use: such as outcomes with and without Long-Term Guarantee Measures (LTGM) in terms of Technical Provision, Capital Requirement, solvency ratio and Own Funds + self-assessment on ORSA

Example form for ORSA macroprudential analysis by IVASS

A	**Risk profile**	**Company A**	**Company B**
1	risk appetite		
2	limits for risk appetite		
3	limits for single risk		
4	criteria to calculate risk appetite		
B	**Governance ORSA**	**Company A**	**Company B**
1	scope of ORSA		
2	timing reconciliations with strategic plan, capital plan		
3	responsibilities in ORSA process: - Administrative, Management and Supervisory Body - key functions		

	- other functions - outsourcing		
4	reporting ORSA (processes)		
5	(if any) reasons for deviation from the reference date and/or transmission terms		
6	other requirements from regulation		
C	**Methodologies and assumptions**	**Company A**	**Company B**
1	methods for identifying significant risks - from the risk map of "net risks"		
2	methodologies and assumptions for forward looking assessment		
3	timing for assessment		
4	methodologies and assumptions for overall solvency need (OSN)		
5	mitigation actions (included, if any, management action) in the management of significant risks		
6	impact of risk concentrations (due to portfolio structure: government bonds) - assumption for stress used - adequacy of portfolios used - any initiatives taken		
7	LTGM used		
8	data quality in the ORSA assessment		
9	adequacy of capital requirement compared to the undertaking risk profile, taking into account LTGM		
10	continuous compliance with capital requirements		
11	continuous compliance with technical provision		
D	**Outcomes and ORSA used**	**Company A**	**Company B**
1	ORSA results, OSN, in terms of - capital requirement - solvency ratio - own fund		
2	results and possible actions taken		
3	impacts of long-term guarantees in terms of - technical provision - capital requirement - solvency ratio - own fund		
4	embedding of ORSA outcomes in the strategies, also in - management capital plan - products strategy		
5	charges related to the possible demand for assets to cover OSN		
6	ORSA self-assessment		

ORSA Tool – aspects to be analysed and rated (1-4 described below)

Main areas and encompassing aspects to be considered in more detail:

a) Completeness of the Report and compliance with the regulation;

b) ORSA Governance and risk strategy including risk profile of the undertaking (quantifiable and non-quantifiable risks);

c) Appropriateness of risk profile assessment: assumptions and methodologies used to assess current and expected risks

d) Main outcomes of ORSA and internal use

From a macroprudential point of view, the general evaluation can be an average result of the analyses carried out at an individual level (or on the sample considered)

Area		Elements to consider for evaluation purposes	Comments	General eval.
Completeness and compliance with requirements	1	compliance with the EIOPA guidelines and the ORSA Regulation	In relation to this area, the analyst must express a general opinion based on the level of completeness of the ORSA Report as well as on the level of compliance with the requirements set out in the EIOPA Guidelines, as well as with the IVASS Regulation in the forthcoming final issue	1
	2	objectives and scope of application		1
	3	connections and references to the Risk Appetite Framework		2
	4	internal governance processes, risk management and evaluation measures adopted		2
Governance and use of ORSA	1	degree of involvement and accountability of the Board of Directors (if not illustrated directly but the reference to the ORSA Policy is reported, consider requesting it)	The report could refer to specific company or group documentation to which the ORSA process is connected. Check if all the documentation is cited and evaluate case by case the opportunity to ask the company for further information	4
	2	assignment of roles and responsibilities within the ORSA process to the various company functions/responsible personnel		2
	3	degree of use of the ORSA in terms of corporate governance system, business planning and corporate strategies, also with reference to the results produced		1
Appropriateness of the risk profile and strategies	1	definition and description of the risk profile: analysis detail, risk map (quantifiable and not)	For this area, the complete and conscious risk mapping identified by the company must be evaluated. Furthermore, with regard to the capital requirements calculation tool	4
	2	instrument adopted for the calculation of the SCR and any considerations on adequacy, also over time		2
	3	assessment of the adequacy of the risk profile proportionate to the nature, complexity and specificity of the business		3
Technical aspects of risk assessment and projections	1	process of identifying the risks to which the company is exposed: criteria and hypotheses for selection, possible quantification, references to group policies/local customisations	Area of assessment of methodologies and technical assumptions on the current and future risk assessment	N. A.
	2	metrics adopted and risk tolerance levels: calculation criteria and reasons		1
	3	use of long-term growth measures: quantification and impact on		4

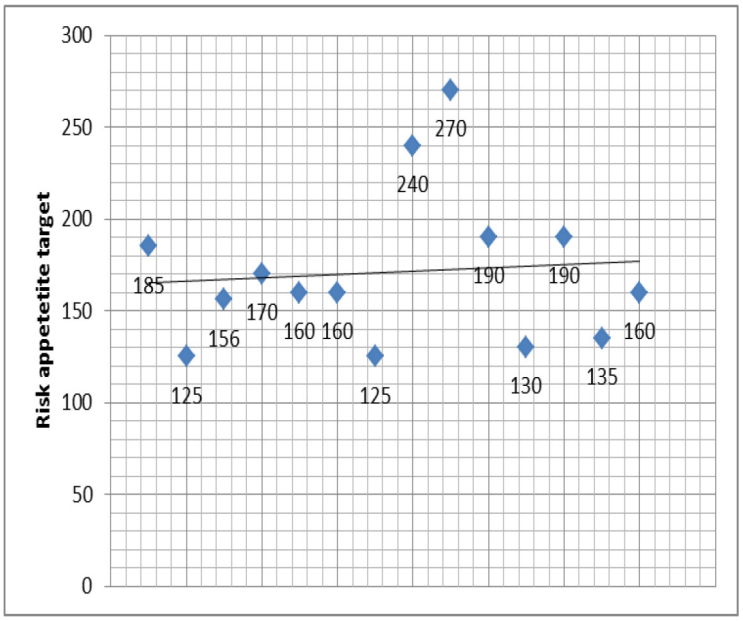
		capital requirements, presence of comparisons of the SCR with and without their adoption		
	4	stress tests: adequacy and complexity of the methods adopted, reference time frame, risks subjected to stressed assessments, description and motivation of the selected scenarios, description of the reverse stress test scenario		4
	5	Asset liability management and, in particular, government bond management policy		4
	6	prospective risk assessment (forward-looking perspective): assumptions and methodologies adopted, reference time horizon, connections to the business plan		4
Further evaluation elements			The analyst reports in this section any further relevant elements that emerged from the analyses carried out	4
Not analysed (does not contribute to the automatic evaluation, ie in the calculation of the simple average)				*N/A*
The ORSA Report is fully adequate				*1*
The ORSA Report needs integrations/improvements on some "non-core" aspects				*2*
The ORSA Report needs integrations/improvements on some "core" aspects				*3*
The ORSA Report is inadequate to represent the process of determining the capital to face corporate risks				*4*

The horizontal examination of information (or data) allows supervisors to highlight market trends that could also be found for similar types of insurers. The result of this analysis may be used as input to Supervisory Boards, other macroprudential analysis/tools as well as microprudential supervision.

To perform ORSA analysis, supervisors could also obtain the following examples of information:

- Major management actions used to manage risks
- Risk appetite compared to solvency ratios
- Type and frequency of risk factors under stress
- How, if or which “qualitative” risks are considered in the overall solvency need (shocks applied and range of shocks)

Stress values on the main market factors		
Risk factors	**Stress scenario used**	**More frequent values**
Italian government bonds spread	+75/+250 bps	+100 bps
Curve of risk free rate	-120/+300 bps	+/-100 bps
Value of equity securities	-20/-40 %	-25 %
Spread of private bond	+50/+150 bps	+125 bps
Real estate	-10/-25 %	-20 %



From a macroprudential perspective, the assessment of the ORSA reports, should take into consideration the supervisors needs according to proportionality, for a representative sample of the national market (ie 75% of production – including national groups and large players).