OECD Journal: Financial Market Trends
Volume 2016/1
© OECD 2016

Analytical tools for the insurance market and macro-prudential surveillance

by
W. Jean Kwon *and* Leigh Wolfrom*

This article provides an overview of the analytical tools used by insurance regulators and supervisors for the purposes of market and macro-prudential surveillance. It is largely based on responses from 24 OECD and non-OECD countries to a questionnaire on the use and relative importance of a set of common indicators and analytical tools that provide information on the soundness, performance and competitiveness of the insurance market. The article therefore provides a point of reference on the use of analytical tools for market surveillance and is intended to inform the further development of the OECD Global Insurance Statistics *framework.*

JEL classification: G22, G28, G32, G38.

Keywords: Insurance market surveillance, insurance supervision, insurance regulation, insurance statistics.

* W. Jean Kwon, Ph.D., CPCU is the Edwin A.G. Manton Chair Professor in International Insurance and Risk Management and Director of the Center for the Study of Insurance Regulation School of Risk Management, Insurance and Actuarial Science, St. John's University. Leigh Wolfrom is a Policy Analyst in the OECD Directorate of Financial and Enterprise Affairs. This report was presented and discussed at the June 2016 meetings of the OECD Insurance and Private Pensions Committee (IPPC) and benefitted from comments by delegates. The authors are solely responsible for any remaining errors. This work is published on the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the OECD or of the governments of its member countries or those of the European Union. This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Introduction

Insurance plays a critical role in supporting economic activity, and a sound insurance mechanism makes a critical contribution to the sustainability and growth of the national economy. Few individuals and entities can effectively protect their property ownership and other economic rights without relying on insurance. Insurance companies are also significant institutional investors, playing a critical role in providing financing to the real economy through investments in bonds, stocks and other assets.

Complexity in contract, sophistication in product design, mass consumption of insurance coverages and the need to ensure proper market conduct for the benefit of individuals and businesses reliant on insurance protection provide the basis of public intervention in the form of supervision and regulation of insurance companies – for the purpose of protecting policyholders and ensuring that insurance companies are sound and able to contribute to financial stability and benefit the real economy. A key requirement for effective regulation and supervision is the authority's ability to collect and analyse data in the insurance market.

This study, launched by the OECD's Insurance and Private Pensions Committee (IPPC), provides a stocktaking and review of analytical tools and other indicators used in insurance regulation and supervision, as well as for the purposes of policymaking for the insurance sector. It is aimed at sharing experience and best practices across countries on the use of analytical tools for monitoring the performance and stability of the insurance sector and, where relevant, providing a basis for expanding the OECD's *Global Insurance Statistics* framework.

Use of the analytical tools examined in this report is not anything new to insurance regulatory authorities around the world. Insurance authorities make use of a diverse set of tools for the analysis of insurance markets or insurance companies in their domestic markets. The set of analytical tools each of them employs reflects the specific country context in terms of the level of development of the domestic insurance market, the number of operating companies as well as other factors. The aim of this report is to identify best practices internationally in terms of the use of indicators and analytical tools for monitoring the insurance sector. Particularly, it examines the analytical tools that authorities employ for regulation and supervision of insurance markets. This report is intended also to support the development and revision of analytical tools in OECD and non-member countries, highlight data sources and needs, and contribute to the identification of data gaps that could be addressed not only by adjustments to OECD's *Global Insurance Statistics* (GIS) exercise but also by complementary public and private data collection efforts – with the ultimate objective of providing a consistent and comparable set of useful indicators of insurance market performance and risks.

The OECD has been collecting insurance statistics for almost two decades, with data on the insurance sector dating back to the early 1980s. In response to the financial crisis, the GIS was launched as part of the OECD's insurance market monitoring activities. The

GIS provide an increasingly valuable cross-country source of comparable data and information on insurance sector developments for use by governmental and supervisory authorities, central banks, the insurance sector and broader financial industry, consumers and the research community. It covers the insurance sectors in OECD countries as well as a number of non-OECD Latin American countries (achieved through co-operation with the Association of Latin American Insurers (ASSAL)), a number of non-OECD countries in Asia as well as South Africa. The data is available at OECD *StatExtracts* (online, under "Finance">"Insurance Statistics") and *OECD Insurance Statistics* (annual).[1] It also publishes *Global Insurance Market Trends* (annual), which is available as a stand-alone version as well as a section of *OECD Insurance Statistics*.

Table 1 lists the key insurance data and performance indicators included in the OECD *StatExtracts* and *Insurance Statistics*. The data and indicators are unique in two broad aspects:

- The OECD collects data on the number of insurance undertakings and employees, gross and net premiums written for domestic and foreign risks and written abroad by branches, claims paid and provisions, commissions, investments by asset class, shareholder equity and net investment income and available and minimum solvency capital. This data is unique and no other international organisation is known to collect comparable data.
- The OECD can calculate several performance indicators at the macro-level, a unique feature found in this database only. They include foreign insurers' market share in the domestic market, premiums per employee, the ratio of reinsurance accepted and the retention ratio, amongst others.

Table 1. ***OECD Insurance Statistics*: Data and performance indicators collected**

Category	Ratio
Data (for domestic, foreign-controlled and branches and agencies of direct insurers and reinsurers)	• Number of insurance undertakings • Number of insurance employees ❖ Insurance companies (full- and part-time staff) ❖ Intermediaries (brokers and agents and their staff) but excluding those who are not directly involved in the insurance industry (e.g. solicitors) • Gross and net premiums written (life, non-life, composite and by class of life and non-life) for domestic and foreign risks and business written abroad • Gross claims paid (on direct business and reinsurance accepted) and outstanding claims provisions • Gross technical provisions • Gross operating expenses • Commissions (on direct business and reinsurance accepted) • Investments by asset class (life, non-life, composite, direct and reinsurers) and net investment income • Available and minimum solvency capital • Shareholder equity and net income
Performance Indicators	• Premiums (volume and growth), premiums per employee, insurance density and penetration • Life and non-life insurance share of the total insurance market • Country's market share in the OECD • Foreign insurers' market share in the domestic market • Balance sheet and income • Portfolio allocation • Ratio of reinsurance accepted • Retention ratio (net written premiums /gross premiums written) • Loss ratio, expense ratio and combined ratio (non-life)

There are other sources of international data on the insurance sector. The International Association of Insurance Supervisors (IAIS), the international standard-setting body for insurance supervision, gathers insurance data for use internally and by member countries via its *Insurance Law Database* (discontinued in 2009) and *Reinsurers Database* exercises.[2] The reinsurance database contains information about reinsurance premiums assumed and ceded by type (i.e. proportional and non-proportional), by market and by line for the non-life sector (property, liability and financial). In 2012, the IAIS began publishing a *Global Insurance Market Report* based on publicly available data as well as confidential data submitted to IAIS.[3] The report discusses the global (re)insurance industry from a supervisory perspective, focusing on the recent performance of the sector as well as key risks. No market or country-specific information is available in this report.[4] The International Monetary Fund (IMF) offers insurance industry data under the Financial Access Survey (FAS) via its *eLibrary*. The data covers mainly the number of insurance institutions, number of policies and technical provisions by market – life and non-life. For European countries, Eurostat maintains a dataset covering the number of insurance enterprises, the number of employees, gross premiums and gross claims by market (life, non-life, composite and reinsurance) for all EU member countries (but not necessarily for all markets or all data years). Eurostat also provides statistics on, *inter alia*, international transactions in insurance services (exports, imports and balance). The European Central Bank maintains financial statement data by country as well as a summary covering indicators of large EU insurance groups at the EU level in the Statistical Data Warehouse. The indicators include: i) gross written premiums and solvency ratios (life insurance); ii) gross premiums written, net combined ratios and solvency ratios (non-life insurance); and iii) retention ratios, return on equity and the number of sample institutions (total).

The discussion in this report is based also on the key findings from the responses to a survey – developed by the OECD in consultation with the IAIS – that was conducted in 2015 and 2016. A total of 24 responses were received, comprising eighteen responses from OECD countries (Australia, Austria, Canada, Chile, Estonia, Germany, Iceland, Italy, Japan, Korea, Latvia, Luxembourg, Portugal, Slovakia, Spain, Switzerland, Turkey and the United States) and six responses from non-OECD economies (Colombia; Costa Rica; Hong Kong, China; Peru; Russia and Singapore).

The structure of this report is as follows. In the following section, an overview of the analytical tools that public authorities, particularly insurance regulatory authorities, use for supervisory/market and macro-prudential surveillance purposes as well as the importance of each of these tools for these purposes is provided. The indicators and analytical tools discussed in the report have been identified based on an academic literature review as well as the analytical measures and financial ratios that selected international organisations and insurance regulatory authorities use (e.g. OECD, IAIS, National Association of Insurance Commissioners [NAIC] and European Insurance and Occupational Pensions Authority [EIOPA]), both those that are in common use and emerging indicators and analytical tools. The report concludes with a summary of key findings and potential implications for the OECD GIS exercise.

Analytical Tools in Insurance Markets

This section provides an overview of the analytical tools in the insurance industry, including the objectives that regulatory authorities as well as other interested parties hope to achieve with these tools. An explanation and evaluation of the types of indicators and analytical tools that have been developed – or are under development – for monitoring of industry performance and risk is also provided.

The discussion throughout this section embeds the findings from the responses to an OECD survey. The survey sought information on the use of analytical tools, including periodic reviews and stress testing and financial market indicators, in the surveillance of insurance markets and individual insurance company performance and risks in the respondent countries as well as on any data gaps related to specific indicators and tools.

The survey comprised four main sections: i) indicators related to the monitoring of the depth and competitiveness of domestic insurance markets; ii) financial indicators and ratios that may be used to monitor various components of the insurance business; iii) common market indicators of insurance company performance and risk; and iv) analytical tools used to monitor insurance market risks, including potential systemic risks. Each section consisted of questions about the use and relative value of a set of commonly-used (and emerging) analytical tools and indicators, from the perspective of market and macro-prudential surveillance as well as the relative value of including the given indicator in future OECD reports on *Global Insurance Market Trends*, where:

- Supervisory and/or market surveillance refers to the monitoring of performance and risks among specific firms and/or groups of firms for the purposes of identifying potential idiosyncratic risks to the financial soundness of individual firms or groups of firms.
- Macro-prudential surveillance refers to the monitoring of performance and risks across the sector for the purposes of identifying potential systemic risks to the broader financial system.

In providing a rating of the relative value of a given indicator for surveillance purposes, the respondents were asked to select one of the following four categories:

- "Very high" indicating that the indicator is monitored regularly and considered a crucial indicator for surveillance purposes on a continuous basis.
- "High" indicating that the indicator is often monitored and considered an important indicator for surveillance purposes under certain market conditions.
- "Low" indicating that the indicator is monitored occasionally and considered of potential value under some market conditions.
- "Very low" indicating that the indicator is rarely monitored.

Table 2. **List of Indicators in the 2015-16 OECD Survey**

Section	Indicators
Insurance Market Indicators	• Insurance penetration ratio • Insurance density ratio • Herfindahl index • Market concentration • Foreign insurance companies' share of the domestic market • Commissions/premiums

Table 2. **List of Indicators in the 2015-16 OECD Survey** *(cont.)*

Section	Indicators
Insurance Business Performance and Risk	Profitability and Income Generation ● Return on shareholders' surplus ● Return on revenue ● Return on premiums ● Return on assets ● Dividends/net income ● Operating ratio (non-life) Adequacy of Capital/Provisions and Leverage ● Premiums/shareholders' surplus ● Gross technical provisions/shareholders' surplus ● Gross technical provisions/premiums ● Indicators of deficiency in gross technical provisions ● Indicators of leverage related to liabilities ● Indicators of leverage related to funding structure Liquidity ● Indicators related to cash flow liquidity ● Indicators related to liquidity of assets ● Indicators related to funding liquidity ● Liquidity coverage ratios ● Indicators related to the level of policy surrenders ● Indicators related to asset-liability matching Underwriting Performance and Risk ● Net underwriting income ● Claims (benefits) ratio ● Underwriting expense ratio ● Combined ratio (non-life) ● Indicators related to concentration in certain classes of insurance ● Indicators related to premium growth in certain classes of insurance and/or sectors ● Indicators related to the share of business in non-traditional non-insurance activities Investment Performance and Risk ● Investment returns ● Investment yield ● Investment expense ratio ● Net investment income ratio ● Indicators related to changes in asset mix ● Indicators related to counterparty/investment concentration ● Indicators related to level of investment in riskier assets ● Indicators related to adequacy of investment income for meeting policyholder obligations Reinsurance Performance and Risk ● Premium cession ● Reinsurance commissions/shareholders' surplus ● Claims paid by reinsurers/total claims ● Reinsurance assets/total assets ● Reinsurance recoverables/shareholders' surplus ● Overall reinsurance result ● Indicators of counterparty risk related to cession of premiums to reinsurers
Financial Market Indicators	● Credit default spreads ● 10-year swap rate ● Insurance company stock price level ● Insurance company stock price volatility ● Insurance company price-to-book ratio ● Insurance company price-to-earnings ratio ● Insurance company credit ratings and/or outlook
Insurance Market Risk	● Periodic reviews of market risk ● Key indicators of market risk ● Indicators related to interconnectedness ● Indicators related to changes in asset allocation ● Indicators used in stress testing ❖ Economic activity ❖ Inflation/interest rates ❖ Housing market activity ❖ Financial market performance ❖ Banking sector risks ❖ Insurance risks ❖ Reinsurance market risks

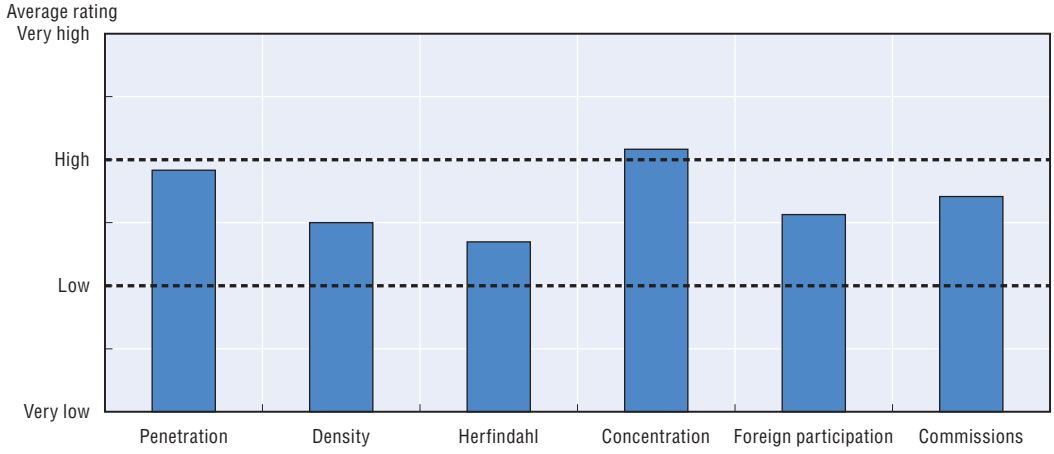
Insurance Market Indicators

This section discusses common analytical tools and indicators that can be used as indicators of the depth and competitiveness of the insurance industry, including for three main policy areas: i) the importance of the insurance sector in the economy (or, alternatively, the overall level of insurance coverage); ii) the level of competition, including from foreign-owned insurance companies; and iii) the relative importance of brokers and agents in the distribution of insurance products.

These indicators may be used as part of regular market monitoring or for policy analysis and development. For example, in Canada, the Department of Finance uses indicators related to insurance market structure for policy analysis and development. In Australia, the Australian Prudential Regulatory Authority (APRA) uses some of these indicators for market monitoring while the Australian Competition and Consumer Commission (ACCC) and the Australian Securities and Investments Commission (ASIC) may use them for policymaking purposes. In Chile, these types of indicators are used for internal reporting within the supervisory agency to monitor the depth and competitiveness of the insurance market.

Countries were asked to rate the relative value of each of these indicators from a policymaking perspective and to provide any other examples of commonly-used indicators for these issues. Figure 1 provides the average rating for each of these indicators.

Figure 1. **Rating of the policy-making value of insurance market indicators**



Note: The average rating was calculated based on countries' responses to the survey. Only ratings provided by countries that use the given indicator were included. For the purposes of calculating the average rating of policy-making value, the following numeration was applied: 0: Very low; 1: Low; 2: High; 3: Very high.

Indicators related to the importance of the insurance sector

There are two commonly-used indicators of the importance of insurance in the national economy (or alternatively, the level of insurance protection) – insurance density and insurance penetration. **Insurance penetration** is calculated as the ratio of total insurance premiums – or premiums at the market level – to the country's GDP. It can be measured using life premiums, non-life premiums or premiums written/earned in specific classes of business and can therefore provide an overall indicator of the level of insurance coverage by type of insurance as well as the growth potential of the insurance market of a country – particularly when compared to penetration ratios in other countries. Insurance

penetration offers some insight but should not be used alone to draw conclusions. Examination of insurance penetration during a multiple-year period can also be done using a compound annual growth rate approach. Similarly, **insurance density** is calculated as the ratio of total insurance premiums to total population and can be used as a proxy for per capita consumption of insurance. It becomes internationally comparable when calculated using a common hard currency although any use of the indicator over time should be based on local currency in order to avoid large changes related to exchange rate fluctuations. One needs to be careful in interpreting the ratio because it merely assumes that every citizen of the country, regardless of age or working status, consumes insurance and that only citizens, thus not entities, consume insurance coverage.

The responses in the aggregate suggest that regulatory authorities use both insurance penetration and density ratio information to assess the importance of the insurance industry in their domestic economies as well as the maturity of the industry relative to the industries in other countries. Countries appear to place more importance on the penetration ratio over the density ratio as ten countries indicated that the density ratio had low or very-low value in terms of relevance for policy-making. A number of countries also monitor other elements related to the depth of insurance markets, such as the relative market share of non-life and life sectors and/or specific business lines. In the United States, the market share of surplus lines[5] is also monitored. In Russia, the ratio of insurance reserves to GDP is used as an indicator of the depth of insurance markets. The United States also monitors overall market growth over a 3-5 year period.

While not covered in the survey, another potentially useful indicator is premium per insurance industry employee (i.e. the ratio of gross (or direct) premiums written to the number of employees in the insurance industry).[6] With the ratio information, a proxy measure on human capital productivity in the insurance industry can be calculated. However, there is no known standard in employee classification (e.g. counting part-time/seasonal workers and staff employed by insurance companies vs. those by intermediaries). Accordingly, use of the ratio is limited and interpretation of the ratio information should be done with care.

Indicators related to competition in the insurance sector

There are a number of indicators related to the structure of the insurance industry that can provide some perspective on whether there may be impediments to competition in the sector, such as excessive market concentration or limited foreign participation in the market:

- The **Market Concentration Ratio (Companies)** is a measure of the percentage of market share controlled by a given number of the largest companies in the domestic industry as well as by market or by line of business. It is a simple sum of their market shares, where the number of companies for the calculation may vary depending on the study objective or the total number of companies in the industry. The number often ranges from three to ten although countries use different approaches (e.g. BaFin [Germany] monitors the largest 15 companies; Finma [Switzerland] looks at the largest 5; EIOPA collects and publishes data on concentration in the largest 3, 5 and 10 companies for certain lines of business). A lower concentration ratio generally means a higher level of competition in the market or the country, *ceteris paribus*. Conversely, a high ratio implies the possible presence of monopolistic competition or oligopoly (a ratio of 100 means full control of the market by the largest companies or the market is probably not privatised). Insurance authorities may find the ratio useful as an indicator of potential pricing control by a

small number of large insurance companies. Results from market concentration analysis can be used to check, albeit crudely, if there is a possibility of oligopolistic competition in the insurance market, for example, when a 3-firm ratio is extremely high.

- The **Herfindahl Index** is calculated as the sum of the square of the market shares of all insurance companies in the market.[7] The ratios range, in theory, from zero (perfect competition) to 10 000 (monopoly). Interpretation of the index score is somewhat subjective, although a score ranging between 1 000 and 2 000 is usually perceived to reflect a relatively competitive market environment.
- The **Market Share of Foreign-Owned Insurance Entities** can be calculated as the ratio of the sum of premiums written by foreign-owned insurance entities to total premiums written, where foreign-owned entities are broadly defined as locally operating insurance companies – including branches – whose parents were incorporated in a foreign country or jurisdiction. The ratio may be useful for measuring, for instance, the speed of market liberalisation over time when a market is newly open to foreign insurance entities. It can also be used to investigate whether a market remains attractive to foreign entities. However, depending on the definition of "foreign-owned", the ratio may not reflect the premium share owned by joint ventures and/or other domestic insurance companies with significant foreign ownership. For example, some countries use a threshold of 10% for significant foreign ownership while in others (e.g. Latvia) the threshold may be as high as 50%. Care needs to be taken in making any suggestions based simply on this ratio, particularly given the difficulty in defining a foreign-owned company. The usefulness of this ratio is also reduced where there is significant cross-border insurance trade (such as under the European Single Market for insurance services). The indicator may also be more important in markets where a relatively strong presence of foreign insurance companies is necessary to maintain or enhance market capacity (in many countries, sufficient capacity and competition is generated through local insurance companies).

Among the indicators related to insurance market competition, the market concentration ratio is the most used (and most valued) across countries (eighteen of the twenty-four respondent countries rated this indicator as having a high or very high-value for policymaking). The Herfindahl index was rated as being highly relevant in eleven countries and three countries indicated that it had a very high value for the purposes of policymaking. The market share of foreign insurers' was rated as highly or very highly relevant in fourteen countries although only one country (Chile) rated it as very high in terms of policy relevance. Some countries identified additional indicators that could be used to monitor market concentration and competitiveness. Portugal uses a Gini-type[8] calculation of market concentration and also looks at the concentration of premiums within specific insurance groups (which may contain a number of life and/or non-life subsidiaries). In the United States, the number of insurance market entries and exits is used to provide additional data on market structure. Data on average premium rates in specific segments (which may provide an indicator of the level of competition) is also collected and published regularly in the United States.

Importance of brokers and agents in the distribution of insurance products

The **commissions-to-premiums ratio** provides information on the relative importance of brokers and agents in the distribution of insurance products (relative to direct sales by insurance companies themselves). Findings from an analysis of the commissions-to-premium ratio may offer some insight about the significance of

insurer-controlled policy acquisition expenses on pricing as well as the efficiency of intermediary-based insurance distribution channels. The indicator is used and considered valuable in sixteen of the twenty-four respondent countries and was rated as very high-value in four countries (Hong Kong, China; Italy; Peru and Spain). In a number of countries, this ratio is collected as a means to monitor expense ratios (net commissions/ net premium written) at individual companies.

Insurance Business Performance and Risk

Understanding the performance of individual insurance companies and the risks that they face is the core objective for a prudential regulator of insurance companies and all insurance regulators have established standardised analytical tools to measure the performance of individual insurance companies and the market more broadly. The data necessary for this analysis is usually collected for all regulated entities operating in a given jurisdiction, either from the insurance companies themselves on a regular basis (as frequently as monthly or at least annually, increasingly through the use of dedicated online portals) or from financial statements published quarterly or annually (see Box 1). The majority of the jurisdictions around the world publish summary data and key performance indicators with more complete data available in a few jurisdictions. For example, in the United States, consumers can obtain online, at no charge, statutory financial statements for the nearly 5 000 insurers filing with the NAIC. In Canada, a significant amount of regulatory data captured by the Office of the Superintendent of

Box 1. **Financial statements**

The financial statements of insurance companies provide an important source of standardised data on their operations. Most countries require regulated insurance companies to prepare and disclose their financial statements according to the relevant national accounting standards (in many cases based on International Financial Reporting Standards (IFRS)) or an insurance-regulation specific Statutory Accounting Principle (SAP). This allows for the examination of comparable data on insurer performance within each jurisdiction. However, any comparison of insurer performance using financial statements across jurisdictions must take into account differences in the accounting basis for those statements, particularly in terms of asset and liability valuations, reserving requirements, investment guidelines, and capital regulation.

The balance sheet and income (profit/loss) statement are the two most commonly used sources for calculation of key performance indicators. The balance sheet presents the financial positions of the company as of a certain date while the income statement presents the outcome of the company's operation for a specified period (e.g. calendar or fiscal year). The balance sheet contains data on all outstanding transactions such as invested assets, unearned premiums, loss reserves (technical provisions) and capital and surplus (shareholders' surplus). The income statement contains data on completed transactions over the period such as premiums earned, claims paid, expenses incurred, investment income and capital gains realised, taxes paid and net income. Cash flow statements and additional information (e.g. share price for publicly traded stock insurance companies or proprietary data services by private statistical agencies) can also be added for the analysis.

Financial Institutions (OSFI) is available online. Almost all jurisdictions tend to make the data they collect from companies – while excluding data of confidential nature – available free or for a fee.

The IAIS Insurance Core Principle (ICP) 9 (Supervisory Review and Reporting), and specifically Standard 9.7, identifies the objectives of offsite reporting and monitoring by supervisors. The IAIS's application paper on information gathering and analysis (2010), prepared in line with the ICPs, outlines the statistical and financial information as well as the basic ratios that insurance authorities should monitor in their supervisory work (see Box 2). The IAIS also makes available the Core Curriculum to supervisors to support the implementation of the ICPs. The modules on "Market Analysis" and "Reporting to Supervisors and Off-site Monitoring" describes several financial ratios that should be an important input into decision making by regulatory authorities as well as a few other ratios that could be useful although are less frequently used due mainly to problems of data availability.[9]

For the purposes of its assessment of the insurance sector under the Financial Sector Assessment Program (FSAP),[10] the IMF uses the CARAMELS framework (see Table 5).[11] This framework, also recommended by the World Bank and the US Agency for International Development (Rossiter, 2006), has been used by authorities in selected countries and for academic research.

In the United States, the NAIC[12] has established a set of statutory financial statement data that US insurers submit to all jurisdictions (states) in which they are licensed and by default to the NAIC (see Box 3).

Taking into account the approaches developed by the IAIS, IMF, NAIC and other organisations, the survey and report use a classification of indicators of insurance business performance and risk based on the following broad categories: i) profitability and income generation; ii) adequacy of capital/provisions and leverage; iii) liquidity; iv) underwriting performance and risks; v) investment performance and risks; and vi) reinsurance performance and risks. The following sections outline the findings about the use and importance of these indicators and tools from the survey.

Profitability and Income Generation

The survey sought information on the use and importance of a number of ratios that are commonly used to evaluate the overall profitability of an insurance market or company:

- **Return on Equity:** Commonly calculated as the ratio of net income to shareholder equity (also known as policyholders' surplus). In this ratio, the return (net income) is on the insurer's net worth (or assets minus liabilities). This ratio is used in almost all countries (except Slovakia). Nineteen countries consider it crucial ("very high") or important ("high") for supervisory/market surveillance purposes and fourteen countries for macro-prudential purposes.
- **Return on Premiums:** Calculated as net income divided by premiums (written or earned). Just over half of all countries (thirteen) use this ratio. Among those countries that use this ratio, nine consider it crucial or important for supervisory/market surveillance purposes and six countries for macro-prudential purposes.

Box 2. **IAIS recommendations on information gathering and analysis**

The IAIS recommends that its member countries collect the following data from insurance companies:

- Gross and net premiums written (by line of business).
- Balance sheet – total admitted assets, intermediaries' balances (uncollected premiums), total liabilities, losses paid, loss adjustment expenses, earned premiums, capital paid-up and shareholders' surplus (surplus as regards policyholders).
- Income statement – net underwriting gain/loss, net investment gain/loss, dividends to policyholders and net income; distribution of cash and invested assets (by type of investment).
- Capital and surplus accounts – net unrealised capital gain/loss, dividends to shareholders and changes in surplus.
- Gross losses paid (by line of business, including excess-of-loss (non-proportional) reinsurance).
- Catastrophe exposure development.
- Operating percentages – premiums earned, losses incurred, loss adjustment expenses incurred, other underwriting expenses and net underwriting gain/loss.

Table 3. **Insurer Performance Checklist**

Category	Checklist
Pricing	• Loss ratio (claims incurred to earned premiums) • Expense ratio (expenses to earned premiums) • Combined ratio (sum of loss ratio and expense ratio) • Operating ratio (combined ratio adjusted by allocated investment gain/loss from earned premiums)
Provision Adequacy	• Technical Provision ❖ Claims from events that have already occurred at the date of reporting ❖ Claims for future events (sum of unearned premium provision and unexpired risk provision) • Run-off Triangulation (claims development)
Claims Performance	• Trends in the number and average size of claims • Ratio of the total cost of claims incurred to the number of claims • Claims frequency • Trends in mortality and morbidity experiences • Supportability of bonus rates for participating policies (life insurance)
Risk Concentration	• Concentration of insurance risk by territory and by economic sector • Risk concentration in reinsurance coverages to examine the extent to which the risk is reduced by reinsurance and other risk mitigating elements ❖ Gross premiums and net of reinsurance premiums ❖ Sum of premiums ceded to five largest reinsurers, as a ratio of total reinsurance premiums ceded
Reinsurance Quality	• Balance sheet information ❖ Reinsurers' share of technical provision ❖ Receivables from reinsurers on settled claims ❖ Reinsurance result (cost of reinsurance less recovery from reinsurance of incurred claims), where the cost of reinsurance includes reinsurance premiums and foregone investment return from these reinsurance premiums • Qualitative information ❖ Credit quality of the reinsurers (e.g. grouping reinsurance assets by credit rating) ❖ Credit risk concentration of reinsurance assets ❖ Proportion of reinsurers that are supervised ❖ Nature and amount of collateral held against reinsurance assets ❖ Development of reinsurance assets over time • Ageing of receivables from reinsurers on settled claims
Capital	• Information on capital adequacy in relation to solvency requirements: ❖ Ratio of regulatory capital to premium income ❖ Ratio of regulatory capital to losses ❖ Ratio of regulatory capital to technical provisions

Source: IAIS (2010).

Box 2. **IAIS recommendations on information gathering and analysis** *(cont.)*

This data should be used to evaluate the performance of different aspects of an insurance company's operations. To support supervisors' use of this data, the IAIS also provides a checklist for analysing issues related to pricing, technical provision, claims, risk concentration, reinsurance and capital (see Table 3) and a set of key financial ratios that the supervisor may use to support its work (see Table 4).

Table 4. **Insurer Performance Indicators**

Category	Ratios
Trends in Insurance Portfolios	• Premium growth rates • Policy renewal rates
Profitability	• Loss ratio • Expense ratio • Combined ratio • Operating ratio • Return on revenue • Net investment yield • Return on equity • Return on assets • Interest margin
Reserves and Leverage	• Surplus aid to shareholders' surplus • Reserves to shareholders' surplus • Gross/net premiums to shareholders' surplus • Reserve development to shareholders' surplus • Surplus arising by different sources in life insurance (mortality, investment, expenses)
Assets and Liquidity	• Adjusted liabilities to liquid assets • Non-investment grade bonds to shareholders' surplus • Risky assets [to shareholders' surplus] • Affiliated investments and receivables to shareholders' surplus • Problem real estate and mortgage loans [to shareholders' surplus] • Surrenders to net premiums

Source: IAIS (2010).

- **Return on Revenue:** Calculated as net income divided by the sum of premium income, interest income and other income. Given that the Return on Premium uses the main and significant source of insurance companies' income (i.e. premium income), the use of this ratio as well as any residual information that can be extracted from this ratio might be limited. Only nine countries use this ratio of which seven countries consider it important for supervisory/market surveillance and five countries for macro-prudential purposes.
- **Return on Assets:** Calculated as the ratio of net income to the sum of cash and invested assets. This profitability ratio measures net income relative to all invested assets.[13] This indicator is used in almost all countries (except Switzerland) and is considered crucial or important for supervisory/market surveillance purposes in seventeen countries and for macro-prudential purposes in fifteen countries.
- **Operating Ratio:** This ratio provides an indicator of both the insurance operation and premium investment outcome and is calculated as follows: *Operating ratio = (Loss ratio + Expense ratio) – Net investment income ratio or Combined ratio – Net investment income ratio.*[14] An operating ratio below 100% indicates that the insurer generated a profit from its core operations (not including other components of net income such as policyholders' dividends, income tax and interest liabilities, etc.). Analysis of operating ratios (including over multiple years) is helpful in determining the reasons behind the insurer's performance, whether it is due to a high (or low) loss ratio, a high (or low) expense ratio,

Table 5. **IMF Financial Soundness Indicators for Insurance: Core Set**

Category	Indicator	Relevant to:	
		Non-life	Life
Capital adequacy	Net premium/capital	X	-
	Capital/total assets	X	-
	Capital/technical reserves	-	X
Asset quality	(Real estate + unquoted equities + debtors)/total assets	X	X
	Receivables/(gross premium + reinsurance recoveries)	X	X
	Equities/total assets	X	X
	Non-performing loans to total gross loans	-	X
Reinsurance and actuarial issues	Risk retention ratio (net premium/gross premium)	X	X
	Net technical reserves/average of net claims paid in last three years	X	-
	Net technical reserves/average of net premium received in last three years	-	X
Management soundness	Gross premium/number of employees	X	X
	Assets per employee (total assets/number of employees)	X	X
Earnings and profitability	Loss ratio (net claims/net premium)	X	-
	Expense ratio (expense/net premium)	X	X
	Combined ratio = loss ratio + expense ratio	X	-
	Revisions to technical reserves/technical reserves	-	X
	Investment income/net premium	X	-
	Investment income/investment assets	-	X
	Return on equity (ROE)	X	X
Liquidity	Liquid assets/current liabilities	X	X
Sensitivity to market risk	Net open foreign exchange position/capital	X	X
	Duration of assets and liabilities	-	X

Source: IMF (2005).

or a low (or high) return on investments. When analysing the result, it is sometimes necessary to consider the result of loss/technical reserve development (e.g. two-year reserve development to shareholders' surplus) during the period because prior year reserve development or current reserve deficiency may understate or overstate the true operating position of an insurer.

Most countries (nineteen) use this indicator for profitability analysis. It is considered critical or important for supervisory/market surveillance purposes in seventeen countries that use this ratio and for macro-prudential purposes in thirteen countries. BaFin (Germany) closely monitors the combined ratio and the net investment income ratio but does not perceive the specific value of the operating ratio. Costa Rica measures a "Technical Financial Result" (similar to the operating ratio) and uses it as part of its Early Warning System. Spain calculates the "Technical Result" (i.e. 1 – Combined Ratio) and the "Financial Technical Result" (i.e. 1 – Operating Ratio).

- **Dividends to Net Income Ratio (Dividends Payout Ratio):** Calculated as the amount of dividends paid out to shareholders as a share of net income and can be used to analyse the sustainability of a company's dividend levels (i.e. a company with a high ratio may need to consider reducing its dividend). Half of the surveyed countries use this indicator for profitability analysis although it is only considered critical or important for supervisory/market surveillance purposes in seven countries and for macro-prudential purposes in five countries.

Box 3. **US Financial Analysis Solvency Tools (FAST)**

The NAIC's Financial Analysis Solvency Tools (FAST) consists of two main components: i) for prioritisation – the Scoring System and the Insurance Regulatory Information System (IRIS); and ii) for analysis – Financial Profile Reports, Financial Analysis Handbook, Summary Reports and Jumpstart Reports. The Financial Profile Report is a summary of key financial information – including but not limited to IRIS and Risk-Based Capital (RBC) results – for each insurance company over the last five years from the year of analysis. The Financial Analysis Handbook is to assist regulator analysts and contains, among others reports, audit report, actuarial opinion, and guidance for notes to the financial statements.

The IRIS is used to identify risks that may lead insurers to financial difficulties, and the insurers with highest total number of results outside the "usual range" are given priority for review. The IRIS is not intended to replace regulatory authorities' own in-depth solvency monitoring but to help them conduct financial analyses or examinations. It is important to note that a ratio that falls outside the "usual range" is not indicative of adverse financial conditions of the company. The responsible regulatory authority uses it along with other FAST findings for further analysis of the company. The NAIC also notes that no regulatory authority can rely on the tools' results as its only form of surveillance. Accordingly, one should refrain from making conclusions based solely on one or more IRIS ratio results.

Table 6. **NAIC Insurance Regulatory Information System (IRIS) Ratios**

Category		Ratio	Unusual values	
			Over	Under
Life/Accident and Health	Overall ratios	1. Net change in capital and surplus	50	-10
		2. Gross change in capital and surplus	50	-10
		3. Net income to total income (including realised capital gains/losses)	..	0
	Investment	4. Adequacy of investment income	900	125
		5. Non-admitted to admitted assets	10	..
		6. Total real estate and total mortgage loans to cash and invested assets	30	..
		7. Total affiliated investments to capital and surplus	100	..
	Surplus relief	8. Surplus relief		
		• Over USD 5 million capital and surplus	30	-99
		• USD 5 million or less capital and surplus	10	-10
	Changes in operations	9. Change in premium	50	-10
		10. Change in product mix	5	..
		11. Change in asset mix	5	..
		12. Change in reserving ratio	20	-20
Non-life	Overall ratios	1. Gross premiums written to policyholders' surplus	900	..
		2. Net premiums written to policyholders' surplus	300	..
		3. Change in net premiums written	33	-33
		4. Surplus aid to policyholders' surplus	15	..
	Profitability ratios	5. Two-year overall operating ratio	100	..
		6. Investment yield	6.5	3.0
		7. Gross change in policyholders' surplus	50	-10
		8. Change in adjusted policyholders' surplus	25	-10
	Liquidity ratios	9. Adjusted liabilities to liquid assets	100	..
		10. Gross agents' balances (in collection) to policyholders' surplus	40	..
	Reserve ratios	11. One-year reserve development to policyholders' surplus	20	..
		12. Two-year reserve development to policyholders' surplus	20	..
		13. Estimated current reserve deficiency to policyholders' surplus	25	..

Source: NAIC (2015).

Box 3. **US Financial Analysis Solvency Tools (FAST)** *(cont.)*

The outcome of the entire FAST process is not necessarily known to the public. However, the NAIC makes available the IRIS results to regulatory authorities as well as interested parties. The NAIC maintains a set of financial ratios for each of the life/accident and health market, the non-life market, and the fraternal insurance market. The NAIC uses a set of 12 ratios to examine financial soundness of US life insurance companies. The IRIS ratios for life insurance do not include tests of reserve adequacy or strength; however, they do include a test of reserve consistency. The test of consistency may identify insurers that have problems with reserve calculation. However, the determination of reserve adequacy is one of the primary purposes of an onsite examination. The IRIS for non-life insurance comprises 13 ratios. The ratios used for life and non-life insurance as well as the usual value ranges for each of the ratios are provided in Table 6.

Figure 2. **Use of profitability indicators**

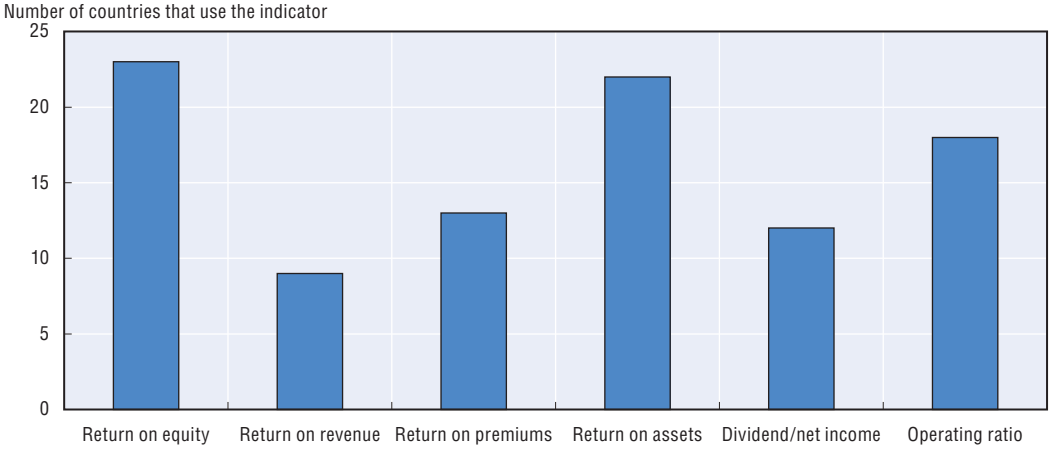
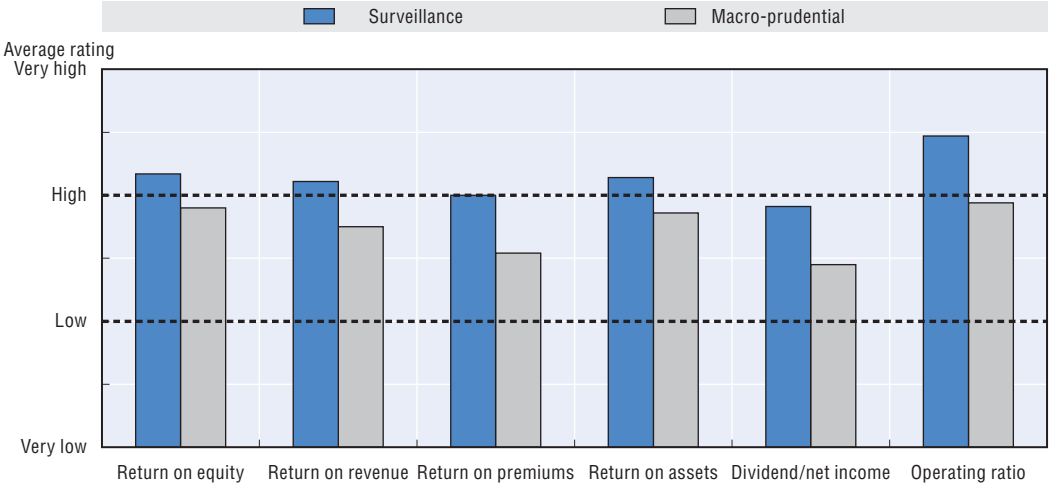


Figure 3. **Rating of the surveillance and macro-prudential value of profitability indicators**



Note: The average rating was calculated based on countries' responses to the survey. Only ratings provided by countries that use the given indicator were included. For the purposes of calculating the average rating of market surveillance and macro-prudential value, the following numeration was applied: 0: Very low; 1: Low; 2: High; 3: Very high.

A number of other potential indicators of profitability and income generation are also used. For example, the ratio of **Net Income to Total Income** (often calculated as the ratio of net income (including realised capital gains/losses) to the sum of total income and realised capital gains/losses) provides another measure of the insurer's profitability – although the use of this ratio must be done with caution as insurance companies have considerable discretion in allocating expenses across their lines of business. A number of countries use some component of income or revenue to derive indicators of profitability. For example, Portugal splits the analysis of profitability into technical and non-technical results and into operating and financial results and regularly monitors the contribution of technical results to net income. Peru monitors technical revenues and investment revenues as a share of premiums (net written) as well as investment revenues as a share of the total investment portfolio. In Canada, information on embedded value and other relevant information to assess normalised earnings is collected. Italy collects the ratio of profit/loss from extraordinary operations to equity/shareholder surplus as well as the ratio of income tax on profit/loss to profit/loss for the same year. The United States also monitors operating gain/loss to shareholders' surplus as well as indicators related to operating and combined ratios over time (two-year operating ratio, combined ratio trend).

Adequacy of Capital/Provisions and Leverage

The survey sought information on the use and importance of a number of ratios that are commonly used to evaluate the adequacy of capital and provisions as well as the use of different types of leverage by insurance companies (excluding solvency ratios which are used in most countries as the main indicator of capital adequacy):

- **Premium to Shareholders' Surplus Ratio:** Can be used to measure whether an insurer is operating at a prudent capacity level to a given size of capital. The higher the ratio, the more aggressive the insurer is in terms of using its capital to leverage premium revenue and the lower its capacity to write additional business, *ceteris paribus*. The more volatile the business of an insurer (e.g. long-tail, liability business), the lower ratio the insurer is likely to maintain. Generally, insurers with stable profits are better able to sustain a higher ratio of premiums to shareholders' surplus without undue risk than insurers with losses or unstable profits. The ratio can be calculated based on net or gross premiums written (i.e. including reinsurance assumed and without adjusting for reinsurance ceded). If the difference between the net and gross premiums written is large, the insurer may be relying heavily on reinsurance to enhance underwriting capacity and for claims recoverables from its reinsurers. These ratios can also be used for analysis at the level of line of business, market or for the entire insurance industry. The distribution of premiums between property lines (that is, short-tail) and liability lines (that is, long-tail) should be reviewed when examining these ratios.

  The majority of surveyed countries (sixteen) use the premium to shareholders' surplus ratio although only nine consider this indicator as critical or important for supervisory and/or market surveillance purposes and eight for the purpose of macro-prudential surveillance.

- **(Gross) Reserves to Shareholders' Surplus Ratio:** Can be calculated as the ratio of the sum of the two key reserves in insurance business – that is, unearned premium reserves and loss reserves (technical provisions) – to shareholders' surplus. It measures how strong an insurer's capital is relative to its liabilities related to unexpired risks as well as outstanding claims (or future benefits in life insurance) including the claims that are

expected to develop. Alternatively, the **Loss (Technical Provision) Reserves to Shareholder's Surplus Ratio** can be used. It can be calculated as the ratio of loss reserves (technical provisions)[15] to shareholders' surplus and provides a measure of the strength of an insurer's capital relative to the liabilities for outstanding claims (or future benefits in life insurance) including the claims that are expected to develop (excluding unexpired risks) that must be supported. This ratio may be considered a measure of "insurance leverage" which carries a different implication from "financial leverage".[16] The higher this ratio, the greater impact an adverse development in reserving is likely to have on an insurer's capital and thus its underwriting capacity. Alternatively, the more volatile the business of an insurer (e.g. long-tail, liability business), the lower ratio the insurer is likely to maintain.

Sixteen countries use a measure of reserves/technical provisions to shareholders' surplus ratio and those that do tend to rate it relatively highly as an indicator for supervisory and/or market surveillance purposes (thirteen countries consider it critical or important) and, to a lesser extent, for macro-prudential surveillance (ten countries consider it critical or important). Differences exist across countries in terms of the use of these ratios, for example a gross premium or technical provision basis in lieu of a net basis.

- **Gross Technical Provisions to Premiums Ratio:** Can be calculated as the ratio of gross technical provisions to premiums and can provide an indicator of changes in provisioning/reserving practices on business written. A majority of surveyed countries use this indicator (fourteen) although it is less frequently collected than ratios based on shareholders' surplus. Most of the countries that use this indicator consider it to be critical or important for supervisory and/or market surveillance purposes (ten countries) although only five countries consider it critical or important for macro-prudential surveillance.
- **Indicators of deficiency in gross technical provisions:** The sufficiency of technical provisions for covering potential claims is a critical indicator of the strength of an insurance company. Almost all countries (nineteen) use some form of indicator/calculation to identify any deficiency in gross technical provisions and consider it a critical or important part of their supervisory and/or market surveillance responsibilities (no country suggested that this indicator had a low or very low value). However, the approach taken to identifying any deficiency varies substantially across countries. Switzerland performs a market consistent valuation of technical provisions as part of the Swiss Solvency Test. Germany, Estonia, Luxembourg, Portugal and the United States apply a statistical method (e.g. loss triangulation) for the calculation of the provisions relative to an estimate of the cost of claims. Colombia, Costa Rica, Germany and Italy calculate changes in claims provisions from the end of the previous period and the United States additionally uses a two-year reserve development method. Italy also uses the settlement rate (i.e. numbers and amounts of claims) and an Annual Premium Equivalent (APE) method. Slovakia compares asset allocation and its maturity to technical provisions. Germany has adopted the "Actuarial Corporate Interest Rate (ACIR)" method for private health insurance companies to project the interest rates of their asset portfolios. If the ACIR is lower than the actuarial interest rate, the insurer must then lower the interest rate assumption for its asset portfolios and needs to recalculate (that is, raise) its premium rates so that the revised premiums can cover the capital needs emerging from the lower interest rate. In Canada, an assessment is undertaken on any material strengthening of technical provisions to determine whether this may be indicative of mispricing and/or an understatement of liabilities.

- **Indicators of leverage related to liabilities:** Fifteen countries indicated that they use indicators of leverage related to liabilities (e.g. unpaid claims as a share of claims incurred) although only ten indicated that those indicators were critical or important for supervisory and/or market surveillance and only five indicated that they were valuable for macro-prudential surveillance. Similar to indicators of deficiency in gross technical provisions, a broad range of approaches are used. Switzerland quantifies the risk of the liabilities over successive one-year time horizons. Luxembourg evaluates paid claims per development year as compared with total estimated claims. Portugal calculates the amount of reopened claims and the amount of paid claims as a share of claims incurred. Estonia and Canada undertake analyses of claims/loss development.
- **Indicators of leverage related to funding structure:** Regarding indicators of leverage related to funding structure (e.g. debt/equity or surplus notes/equity), the vast majority of countries (eighteen) indicated that they use one or more such indicators, most (thirteen) indicated that these indicators were critical or important for supervisory and/or market surveillance and eleven indicated that these indicators were valuable for macro-prudential surveillance. Costa Rica, Russia and Spain monitor debt to equity ratios while Canada and Switzerland monitor compliance with funding leverage limits (Switzerland imposes a limit on the ratio of additional capital to core capital). Costa Rica and the United States use measures of leverage related to the use of reinsurance (surplus relief through the use of reinsurance in the United States). Chile and Peru use measures of leverage to equity – leverage and investment surplus as a share of equity is used in Chile while Peru uses a measure of the capital coverage of leverage levels.

The OECD currently collects and publishes data on **Changes in Shareholder Equity**, calculated as the ratio of the change in current year's capital and surplus to the change in the prior year's capital. This analytical tool allows for the identification of any improvement or deterioration in an insurer's own capital condition during the year. Several factors can affect such changes, which include but are not limited to: underwriting performance, investment performance (realised and unrealised), interest and other income, dividends to policyholders and shareholders, changes in loss reserving principle, changes in accounting principle and

Figure 4. **Use of capital/provision adequacy and leverage indicators**

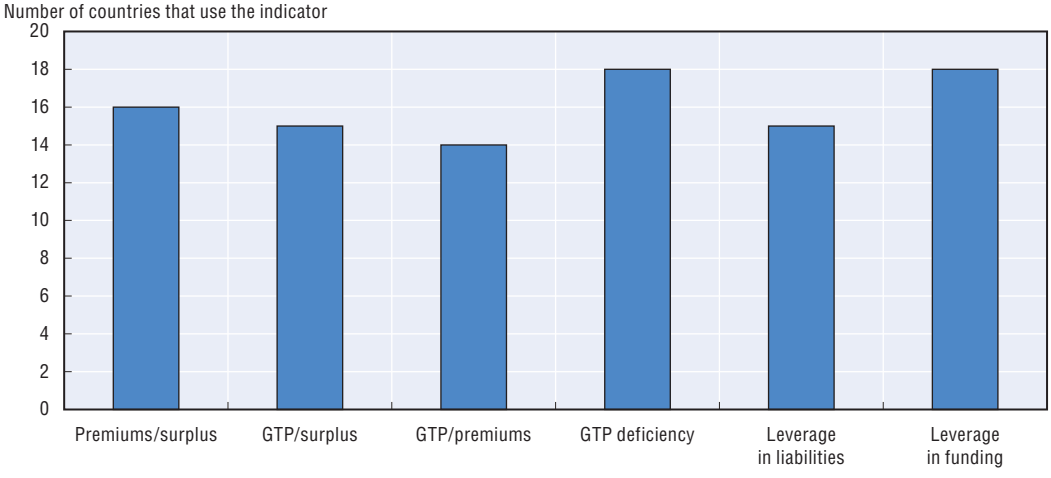
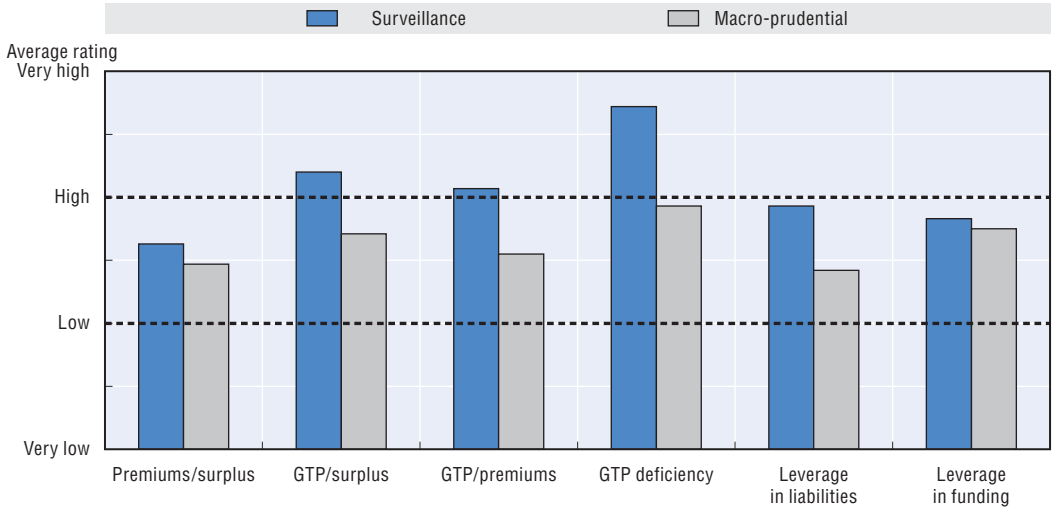


Figure 5. **Rating of the surveillance and macro-prudential value of capital/provision adequacy and leverage indicators**



Note: The average rating was calculated based on countries' responses to the survey. Only ratings provided by countries that use the given indicator were included. For the purposes of calculating the average rating of market surveillance and macro-prudential value, the following numeration was applied: 0: Very low; 1: Low; 2: High; 3: Very high.

taxation.[17] This tool is also known as "gross" changes in shareholders' surplus as compared to "net" changes in shareholders' surplus which is calculated without considering any new injection of capital paid-in or additional contributions.

Liquidity

Liquidity relates to the insurer's ability to meet its insurance obligations in a timely manner. It is one of the critical risks that every insurer must manage. The survey sought information on the use and importance of a number of indicators that are commonly used to evaluate the capacity of insurance companies (or the market more broadly) to manage their liquidity:

- **Indicators related to cash flow liquidity:** A slight majority of countries (thirteen) use indicators related to cash flow liquidity. However, only nine of the countries that use these types of indicators consider them to be critical or important from the perspective of supervisory and/or market surveillance and only eight consider these indicators to be highly relevant for macro-prudential surveillance. A common source of data for cash flow liquidity indicators is insurers' cash flow statements (e.g. Chile, Canada, Germany, Italy, Slovakia and the United States). Canada uses a net cash flow analysis. Germany calculates expected incoming cash flows minus expected outgoing cash flows. Italy's analysis of duration and cash flow matching techniques is used mainly for assessing the consistency of assets and liabilities[18] and is based on a number of specific indicators, including the ratio of the sum of policy lapses and surrenders (redemptions) to gross premiums written in life business, the ratio of claims incurred to gross premiums written in non-life business, the ratio of cash holdings between the current and previous periods and the ratio of cash holding for technical provisions to technical provisions. Estonia uses the ratio of claims (including surrenders in life business) to premiums. The United States monitors net cash from operations, cash flow trends, cash-outflow-to-inflow ratios, loss payment

trends (paid losses/reserves incurred) and investment trends (proceeds/acquisitions). Regulators in the United States also require annual cash flow testing by life insurers, for which the results must be made available to the regulator if requested.

- **Indicators related to the liquidity of assets:** Most countries use one or more indicators related to the liquidity of assets. Most of the countries that use such indicators (fourteen) consider them to be critical or important for supervisory and/or market surveillance while ten countries consider them as critical or important for macro-prudential surveillance. Most countries calculate a ratio of assets considered liquid to total/invested assets, total liabilities or shareholder equity (or all three). Solvency II provides a common definition of the liquidity of different assets for use in European countries. In Turkey, the ratio is calculated based on duration (short-term relative to long-term) while in Peru, cash is used as the liquid asset. The United States monitors changes/trends in liquid assets, affiliated investments and receivables to shareholders surplus, agents' balances to shareholders' surplus, and non-investment grade holdings to shareholders' surplus, among other measures. Canada's evaluation of asset liquidity is undertaken through liquid asset tests.
- **Indicators related to funding liquidity:** Less than half (ten) of the countries surveyed reported using indicators related to funding liquidity with only seven indicating that these indicators are critical or important for supervisory and/or market surveillance purposes and only five suggesting that they made an important contribution to macro-prudential surveillance. Only Colombia, Germany, Canada and the United States provided an indication of the types of measures they may use to monitor funding liquidity, such as access to capital markets and lines of credits.
- **Liquidity coverage ratios:** Liquidity coverage ratios provide a measure of an insurance company's liquidity strength by comparing the access of the company to liquid assets relative to its need for liquidity to meet short-term obligations. There are a variety of ways to calculate this ratio depending on the types of assets that are considered "liquid" and the scope of obligations included. In insurance markets, this ratio measures whether an insurer keeps its invested assets liquid enough to meet its insurance obligations for unexpired risks as well as claims to be developed. A typical liquidity coverage ratio could be calculated as the ratio of the sum of cash and invested assets to the sum of the unearned premium reserve and the loss reserve, over a single period or two consecutive periods. The invested assets are often valued at market prices, and the loss reserve includes the accompanying loss adjustment expense (LAE) reserve. An insurance company may exhibit a low liquidity coverage ratio because of its failure in one or more of the following: managing cash flows, asset liquidity, matching liquidity sources with liquidity needs, and matching assets and liabilities in duration and return. As the ratio moves toward zero, the insurer could be forced to liquidate certain assets at prices below market value.

  Fourteen countries use some form of liquidity coverage ratio of which ten countries consider it to be a critical or important indicator for supervisory and/or market surveillance and seven countries consider it to be highly relevant for macro-prudential surveillance. Canada uses a liquidity coverage ratio as well as various indicators of liquidity at risk. The United States monitors a liquidity ratio, a short-term liquidity ratio and the ratio of adjusted liabilities to liquid assets (while the adjustments for liability and assets can vary according to the accounting principle in the jurisdiction, this indicator measures the insurer's ability to meet its obligations to policyholders and

claimants especially if the insurer were to be liquidated). Germany calculates the ratio of the sum of expected incoming cash flows and liquid assets to expected outgoing cash flows. Peru uses a current ratio and a quick ratio and also calculates stress liquidity risk losses based on valuing a quick sale of assets in a scenario involving additional claims. Chile uses the ratio of liquid assets to short-term liabilities.

- **Indicators related to the level of policy surrenders:** Insurance products, especially in life business, can be heavily front-loaded for fees, commissions and other policy acquisition costs. Insurance companies need to keep newly underwritten products for a reasonably long period to recover those costs. The risk of policy cancellation – including surrenders and lapses[19] – may not be eliminated and needs to be managed. A majority of countries (sixteen) monitor indicators related to the level of policy surrenders, thirteen countries consider these indicators as critical or important for supervisory and/or market surveillance and nine countries consider such indicators to be critical or important for macro-prudential surveillance. Canada uses policy lapse rates, cashable liabilities as well as policy cash surrender values. Lapse rates are also monitored in Germany. Luxembourg calculates the ratio of paid-out amounts for surrenders to average technical provisions. Portugal measures the number of surrenders relative to policies in-force. Switzerland uses a comparison of policy surrenders over two consecutive periods. The United States analyses the ratio of policy surrenders to premiums at various levels of detail and the surrenders on deposit-type insurance contracts with respect to the accompanying deposit reserves.
- **Indicators related to asset-liability matching:** Every insurance company must successfully manage its assets and liabilities in duration and return. Management of this asset-liability matching risk is critical in all lines of business. It also becomes increasingly challenging as the line of business becomes longer-tailed (e.g. annuities and environmental pollution liability insurance). Most countries (nineteen) use indicators of asset-liability matching. Seventeen of the countries that use these indicators consider them to be critical or important for supervisory and/or market surveillance and nine countries for macro-prudential surveillance. Canada and Germany examine asset-liability matching generally and by currency, although Canada suggested that there are no simple indicators that can be used to effectively monitor this risk. The United States monitors asset duration and the maturity distributions of bond

Figure 6. **Use of liquidity indicators**

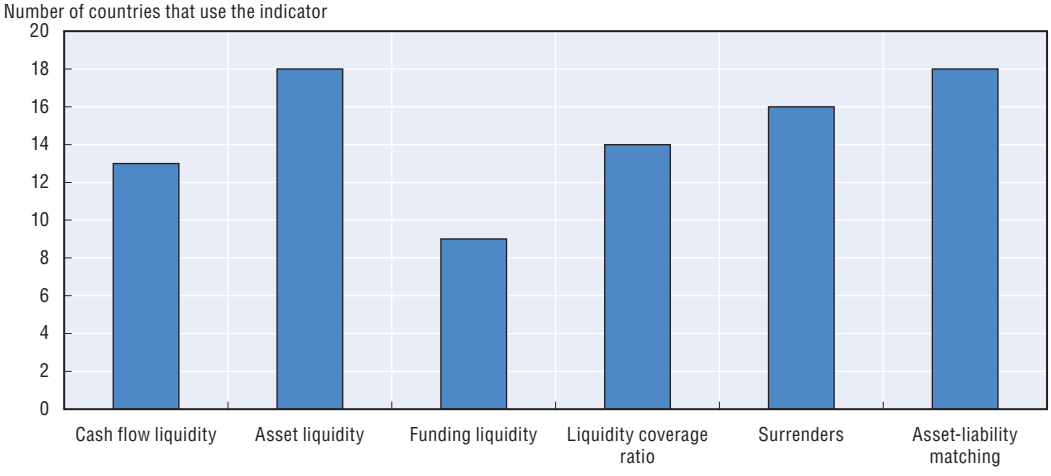
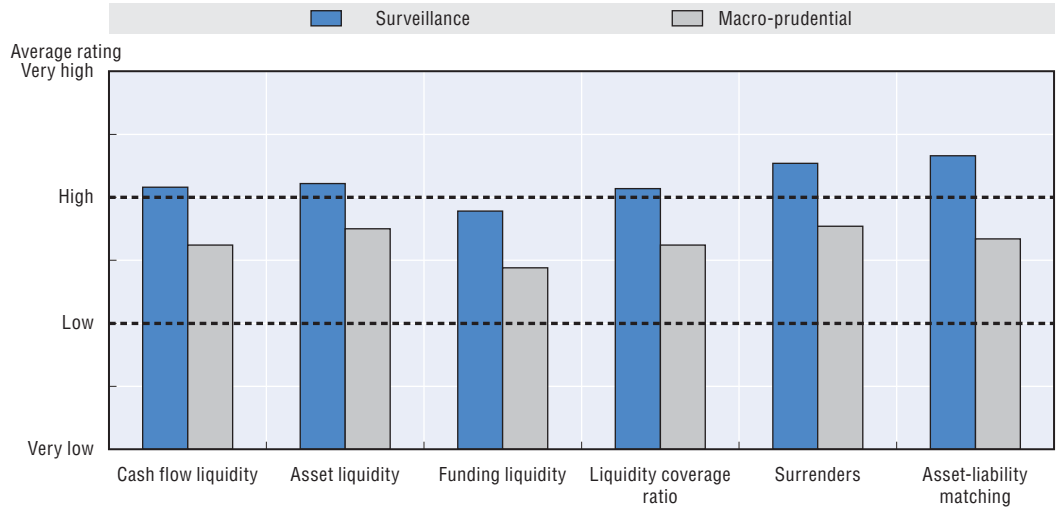


Figure 7. **Rating of the surveillance and macro-prudential value of liquidity indicators**



Note: The average rating was calculated based on countries' responses to the survey. Only ratings provided by countries that use the given indicator were included. For the purposes of calculating the average rating of market surveillance and macro-prudential value, the following numeration was applied: 0: Very low; 1: Low; 2: High; 3: Very high.

investments. Peru collects information on future cash flows of assets and liabilities by time band for annuities. Switzerland quantifies asset-liability matching as part of the financial market risk calculation in the Swiss Solvency Test by calculating the impact on net changes in financial market risk factors. Chile undertakes a sufficiency of assets test.

Underwriting Performance and Risk

Underwriting is one of the two core functions of insurance operations (in addition to investment) and therefore a critical area for supervision and market surveillance (underwriting performance is also a key element of profitability and income generation and therefore some of the relevant indicators were briefly discussed in that section). The survey sought information on the use and importance of a number of ratios that are commonly used to evaluate the underwriting performance and risks for an insurance market or company:

- **Net underwriting income:** Calculated as the difference between net premiums earned and the sum of claims or benefits incurred (inclusive of adjustment expenses or surrenders), underwriting expenses and policyholder dividends. Almost all countries (twenty-three) monitor this indicator as a basic measure of underwriting profitability and all those that do use this indicator consider it to be critical or important for supervisory and/or market surveillance. Seventeen countries also consider net underwriting income as a critical or important indicator from the perspective of macro-prudential surveillance.
- **Claims (Loss) ratio:** Calculated as the ratio of claims/benefits incurred to earned premiums, where claims/benefits incurred include loss adjustment expenses (LAE) incurred. This ratio provides a measure of the actual risk coverage per unit of premiums that the insurer has already earned. Insurers aim to achieve a claims ratio below 100% to allow sufficient room to cover policy acquisition expenses and generate reasonable profits. Caution should be exercised when interpreting the development of this ratio as

market competition, price (underwriting) cycles and catastrophic losses (e.g. natural disasters and pandemics), among others externalities, can affect the numerator of this ratio. The ratio may also increase (decrease) without any significant changes in the actual loss experience should an insurer increase (decrease) its premium rates. All of the surveyed countries monitor the claims/loss ratio and consider it critical or important for supervisory and/or market surveillance while eighteen countries also consider it as highly relevant for macro-prudential surveillance.

- **Underwriting expense ratio:** Usually calculated as the sum of policy acquisition expenses (e.g. agency commissions, advertisement, property inspection cost and other administrative expenses) divided by written premiums. As the expenses are incurred prior to and throughout the coverage period, written premiums may be more appropriate as the denominator (rather than earned premiums) although countries use different approaches (including both gross and net premiums written or earned). A high expense ratio may be due to a rise in market competition (e.g. high commissions and brokerage fees) or inflation in the territory of operation. Similar to the case of loss ratio interpretation, one needs to be aware of the possibility of the expense ratio rising (falling) while holding the denominator (numerator) constant. For example, the ratio may fall even when actual expenses remain unchanged or rise if premium rates rise (at a faster rate than expenses). The vast majority of countries (twenty-three) monitor the underwriting expense ratio. Most of those countries (twenty-two) consider it critical or important for supervisory and/or market surveillance and twelve countries consider it critical or important for macro-prudential surveillance.
- **Combined ratio (non-life):** Calculated as the sum of the claims (loss) ratio and the underwriting expense ratio (Combined ratio = Claims (Loss) ratio + Expense ratio). The combined ratio measures whether the premium revenue of an insurer is sufficient to cover its underwriting operations. A ratio less (greater) than 100% means profits (losses) in the operation during the period. It is generally used in non-life operations although a similar measure may be used to monitor the sufficiency of premium revenue in the life sector. All surveyed countries (twenty-four) monitor the combined ratio and consider it critical or important for supervisory and/or market surveillance. Eighteen countries also consider the combined ratio to be highly relevant for macro-prudential surveillance.
- **Indicators related to concentration of insurance:** Different lines of insurance business entail different sorts of risks and some business lines may require more careful monitoring than others. The share of business in specific lines – at the level of a particular company or market more generally or in comparison to a prior period – can provide important information on changes in product mix and particularly any concentration in specific lines of business. Most of the countries surveyed use some form of indicator on business line concentration and many (fifteen) consider these indicators as critical or important for supervisory and/or market surveillance. Eleven countries also consider such indicators as critical or important for macro-prudential surveillance. Canada monitors the percentage of premiums written by line of business

for insurers as well as by reinsurance treaty for reinsurers. Germany calculates the share of premiums and claims for individual business lines within the aggregate non-life insurance market. Italy and Portugal also conduct similar calculations. The United States uses more than 30 underwriting performance and concentration metrics based on the line of business and product. Russia examines the structure of premiums written and dynamics of market share by line of business. Turkey examines the distribution of technical profits and losses across lines of business.

- **Indicators related to premium growth in certain classes of insurance:** Another indicator of potential risk related to concentration in certain lines of business is the growth in premiums by line of business (or class of insurance). The difference in premiums written between two consecutive periods divided by the premiums written in the prior period for a given class of insurance allows supervisors to monitor stability in the insurer's underwriting operations. Any significant difference may be observed when the insurer is new, has added a new line of business or territory or has engaged in a merger/acquisition. Positive growth will also be observable when an insurer has adopted an aggressive underwriting policy to win competition or to increase cash flow.

  Growth in premiums for classes of insurance is more commonly monitored than concentration as almost all countries (twenty-one) use such indicators. Seventeen countries consider these types of premium growth indicators as critical or important for supervisory and/or market surveillance and fifteen countries consider such indicators as critical or important for macro-prudential surveillance. Most countries undertake this type of analysis across business lines and may use the results to help target supervisory attention (e.g. where certain lines of business involve more risk or are less profitable). Turkey focuses its attention on excessive premium growth in certain lines of business. Colombia focuses particularly on annuities and life business. The United States tracks premium growth using more than 30 metrics across several lines of business and products.

- **Indicators related to the share of business in non-traditional, non-insurance (NTNI) activities:** In the aftermath of the global financial crisis, significant efforts have been invested by insurance regulators in identifying activities by insurance companies that could pose potential systemic risks to the financial system. There is a general consensus among regulators that *traditional* insurance activities do not generate or amplify systemic risk.[20] The IAIS has concluded that the traditional business model, which is built on the "underwriting of diversified pools of mostly idiosyncratic and uncorrelated risks", is unlikely to become a source of systemic risk (IAIS, 2011b). Use of reinsurance and retrocession with domestic and qualified overseas institutions offers another layer of guarantee on the insurer's ability to meet its contractual obligations to its policyholders.[21] As a result, significant attention has been placed in identifying the potential non-traditional non-insurance activities undertaken by insurance companies that may have the potential to create systemic risks (see Box 4).

Less than half of the surveyed countries (eight) indicated that they collect indicators related to the share of business in NTNI activities and only four countries considered such indicators to be important for supervisory and/or market surveillance and macro-prudential surveillance. Given that the definition of – and supervisory approaches to – NTNI activities are still under discussion at the IAIS, the low number of countries that collect indicators in this area is not surprising.

Box 4. **Non-traditional non-insurance activities (NTNI)**

Traditional insurance activities are based around "the concept of the insurability of risks, in particular the insured events' accidental nature, random occurrence and the applicability of the law of large numbers" (European Commission, 2013). In general, these types of activities are perceived to have limited potential to create systemic risks.

NTNI activities, on the other hand, "involve financial features such as leverage, liquidity or maturity transformation, imperfect transfer of credit risks (shadow banking), credit guarantees or minimum financial guarantees. They also often involve products that are more financially complex than traditional insurance products in the shifting of financial market risk to insurers. Other products of concern include those where the liabilities are significantly correlated with financial market outcomes, such as stock prices, and the economic business cycle" (IAIS, 2013a). These types of activities create risk in terms of maturity transformation and interconnectedness with other financial services industries which can amplify the impact of stress events. As a result, the extent of NTNI activities within an insurance company's operations is considered – along with interconnectedness, product substitutability, size and global activity – in the identification of Global Systemically Important Insurers (G-SIIs) (IAIS, 2013b) and accounts for 45% of the classification weight in identifying G-SIIs.

Figure 8. **Use of underwriting indicators**

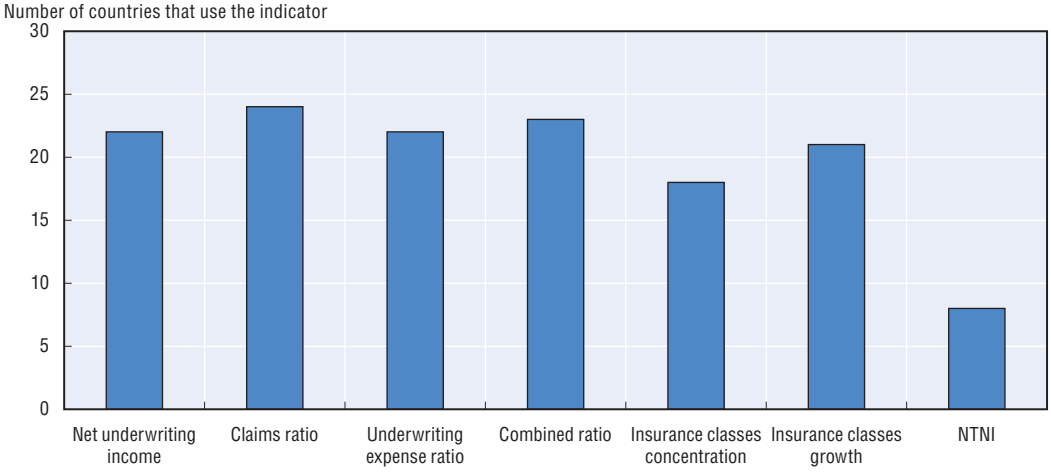
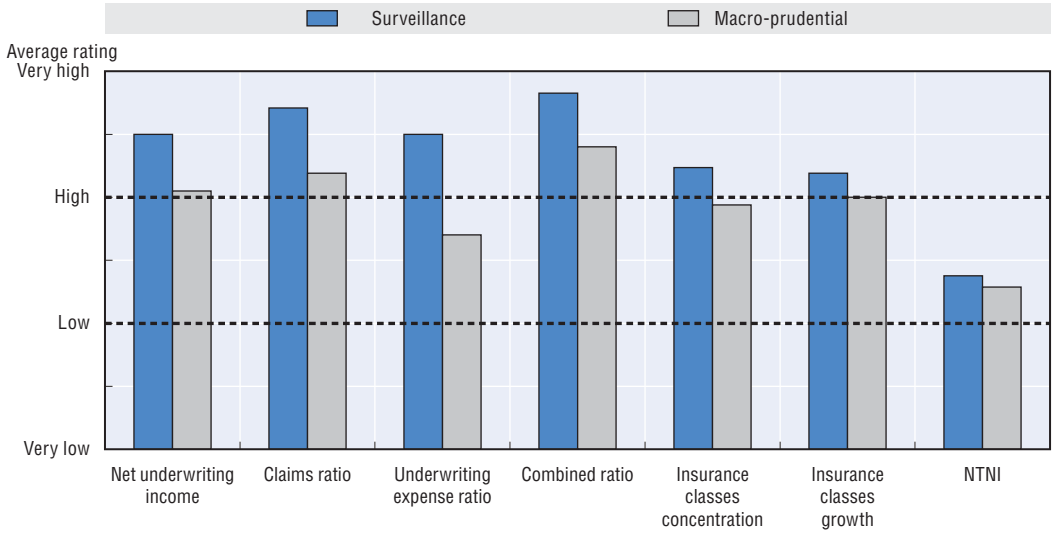


Figure 9. **Rating of the surveillance and macro-prudential value of underwriting indicators**



Note: The average rating was calculated based on countries' responses to the survey. Only ratings provided by countries that use the given indicator were included. For the purposes of calculating the average rating of market surveillance and macro-prudential value, the following numeration was applied: 0: Very low; 1: Low; 2: High; 3: Very high.

Investment

Investment is the other core function of insurance operations and therefore also a critical area for supervision and market surveillance. Indeed, insurance companies increasingly embed expected returns from investment – especially of premiums written – in their calculation of premium rates. The survey sought information on the use and importance of a number of indicators and ratios that are commonly used to evaluate the investment performance and risks for an insurance market or company:

- **Investment returns:** Calculated as the ratio of net investment income (including realised gains and losses as well as changes in unrealised gains and losses) to the [market] value of invested assets, investment returns provide an indicator of the success of investment operations in generating returns which can be compared to other companies (or markets). All countries surveyed collect information on investment returns and consider it to be critical or important for supervisory and/or market surveillance. Most countries (eighteen) also consider this indicator as highly relevant for macro-prudential surveillance.
- **Investment yield:** Similar to investment returns, although calculated based on the [market] value of invested assets at the beginning of the period. Fewer countries collect data on investment yield (twenty) than investment returns although most (eighteen countries) consider it to be critical or important for supervisory and/or market surveillance and for macro-prudential surveillance (fifteen countries).
- **Investment expense ratio:** Calculated as the ratio of investment expenses to premiums which provides an indicator of the share of premiums that must be allocated to expenses related to investment activities (rather than for provisioning against the risk covered). Less than half (nine) of the surveyed countries collect data on the investment expense ratio and only four countries consider it to be critical or important for supervisory

and/or market surveillance (three countries for the purposes of macro-prudential surveillance). Those countries that use this ratio use different premium bases for the denominator – Austria uses gross premiums written, Italy uses gross premiums earned and Portugal uses both gross and written premium bases. The United States noted that it typically focuses on net investment yields (after expenses) as the key indicator on investment performance as opposed to the specific investment expense ratio.

- **Net investment income ratio:** Calculated as net investment income divided by premiums, this indicator provides an indicator of the amount of investment income earned per unit of premium. Only eleven countries use this ratio (slightly more than the investment expense ratio). The value of the indicator from a supervisory and/or market surveillance as well as a macro-prudential perspective was also slightly higher than in the case of the investment expense ratio (nine countries perceive it as critical or important for supervisory and/or market surveillance and seven countries for macro-prudential surveillance). Similar to the case of the investment expense ratio, different premium bases are used for this calculation in different countries.
- **Indicators related to changes in asset mix:** These indicators can be used to examine changes in the distribution of invested assets during a single period or over time and can be an important indicator for monitoring any move towards riskier assets (e.g. search-for-yield in a low interest rate environment). Almost all countries (twenty) collect indicators related to changes in asset mix and most countries (nineteen) consider such indicators to be critical or important for supervisory and/or market surveillance. Fourteen countries also consider indicators related to changes in asset mix as highly relevant for macro-prudential surveillance. Austria, Canada and Germany monitor asset allocations for individual companies and/or the broader market on a quarterly (or more frequent) basis. In Chile, the insurance supervisor evaluates changes in investment portfolios for each insurance company. The United States measures trends in various asset classes as a percentage of total assets, annual percentage changes in asset classes, and trends in bonds by investment category, among other indicators. Peru monitors the evolution of the percentage composition of the asset mix. In Turkey, the distribution of assets by risk level is regularly monitored.
- **Indicators related to counterparty/investment concentration:** These indicators can be used to determine whether there is a concentration of investment risk in a specific counterparty, sector or investment class. Almost all countries (nineteen) use indicators to examine counterparty/investment concentration. Eighteen countries consider such indicators to be critical or important for supervisory and/or market surveillance and fourteen countries for macro-prudential surveillance. Many countries impose limits on investment concentration. For example, Switzerland limits insurer's exposure to a single counterparty to 5% of total investments, with the exception of Swiss Government issues and receivables guaranteed by a AAA-rated country. The United States also imposes a guideline that generally limits individual investments to 5% of the shareholders' surplus. Peru has established issuer limits and economic group limits as a share of regulatory capital. Chile monitors the concentration by issuer, by counterparty and by industry for each insurance company. Portugal monitors the share of investments related to the same counterparty. In Russia, the share of investments allocated to an insurer's top five

and ten counterparties is regularly calculated. In Canada, the supervisor assesses the concentration limits established through insurance companies' own investment policies. In the United States, insurance companies' annual filings include a complete listing of every individual investment owned by the insurer. The NAIC has utilised this information, coupled with market information, to identify the impact of events as they occur. For example, during the financial crisis, the NAIC was able to quickly identify the financial impact of failed institutions/non-insurers both on individual insurers and on the industry as a whole. This data also allows the NAIC to perform stress testing for all individual insurers and at industry level.

Particular attention may need to be given to affiliated investments (e.g. the sum of receivables from and investment in parent, affiliate and subsidiary companies as a share of total invested assets and as a percentage of capital and surplus). A high-level of affiliated investment could indicate a significant exposure for the insurer to the performance of the parent, affiliate and/or subsidiary companies.

- **Indicators related to the level of investment in riskier assets:** These indicators can be used to determine whether there is a concentration of investment in types or classes of assets that may entail more risk of loss or impairment. Almost all countries (nineteen) use indicators on the level of investment in riskier asset classes. Eighteen countries consider such indicators to be critical or important for supervisory and/or market surveillance and fourteen countries for macro-prudential surveillance. The definition of what may be considered a riskier investment varies substantially across countries. Some countries monitor specific types of investments, such as non-investment grade bonds (United States, Australia, Peru, Russia), mortgage loans and real property investments (United States, Switzerland), private equity and other alternative investment funds (Austria, Chile, Estonia, Korea, Portugal, Switzerland), or derivatives, structured products and/or securities lending (United States, Turkey, Switzerland, Korea, Austria). Colombia, Peru (using a conditional value-at-risk measure), Switzerland and Turkey also monitor investments in equities (high-volatility equities in the case of Turkey). Portugal also monitors investments in corporate bonds issued by entities located in specific countries while Chile monitors investments in instruments issued by foreign entities more generally. Canada and Iceland monitor investments in assets with low liquidity and/or high volatility (including niche investment categories or assets with limited market activity in the case of Canada). Germany reviews allocations to assets that provide high yield ratios. Russia considers investments with low credit ratings. Colombia specifically examines the level of impaired assets.

  Specific attention may need to be given to investments in real estate and mortgage loans. Investment directly into real estate and property can expose an insurer to the risk of marketability, particularly illiquidity, owing to the non-standardised nature of the investment and the absence of structured capital markets. Investment in mortgage loans and real estate investment trusts (REITs) are alternatives to direct investment in real property, allowing insurance companies to control market risk to a certain degree although increasing their exposure to interest rate risk. For example, real estate and

mortgage loans do not necessarily reflect the prevailing market value of the property. Further, prevailing economic conditions affect real estate markets, thus exposing insurers to the risk of non-performing mortgage loans and loan portfolios. This risk can be proxy measured by the ratio of total real estate and total mortgage loans to invested assets (including cash holdings and equivalent).

- **Indicators related to the adequacy of investment income for meeting policyholder obligations:** The objective of insurance companies' investment operations is to provide (at a minimum) sufficient returns on investment to meet their obligations to policyholders. Indicators that measure the extent to which investment income is sufficient to meet policyholder obligations are therefore critical for understanding the longer-term sustainability of an insurance company's operations. Most countries (fourteen) use such indicators, almost all of whom (thirteen) consider such indicators to be critical or important for supervisory and/or market surveillance. Eleven countries also consider indicators related to the adequacy of investment income as highly-relevant for macro-prudential surveillance.

  A sufficiency of assets test (as used in Chile) as well as interest margin ratios and tabular interest earned (as used in the United States) would be some example of indicators used for this purpose. In the United States, the NAIC uses an adequacy of investment income indicator as one of the IRIS ratios to measure whether a life insurer's investment income is adequate to meet the interest requirements of its reserves. The NAIC calculates it as the ratio of net investment income to interest required, where the denominator is the sum of tabular interest involving life and disability contingencies, tabular fund interest on accident and health contracts and investment earnings credited to deposit-type contract accounts. Canada assesses the relationship between guarantees offered and technical provisions.

Figure 10. **Use of investment indicators**

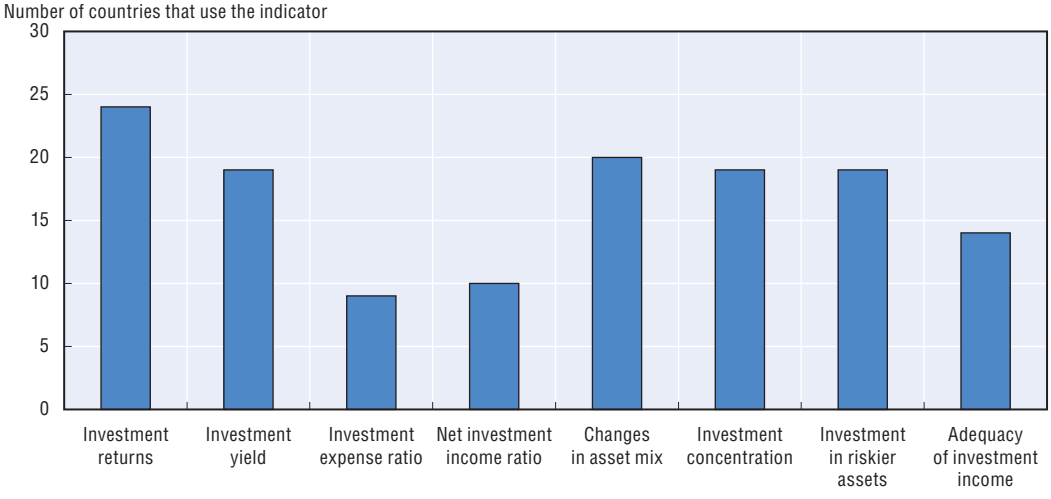
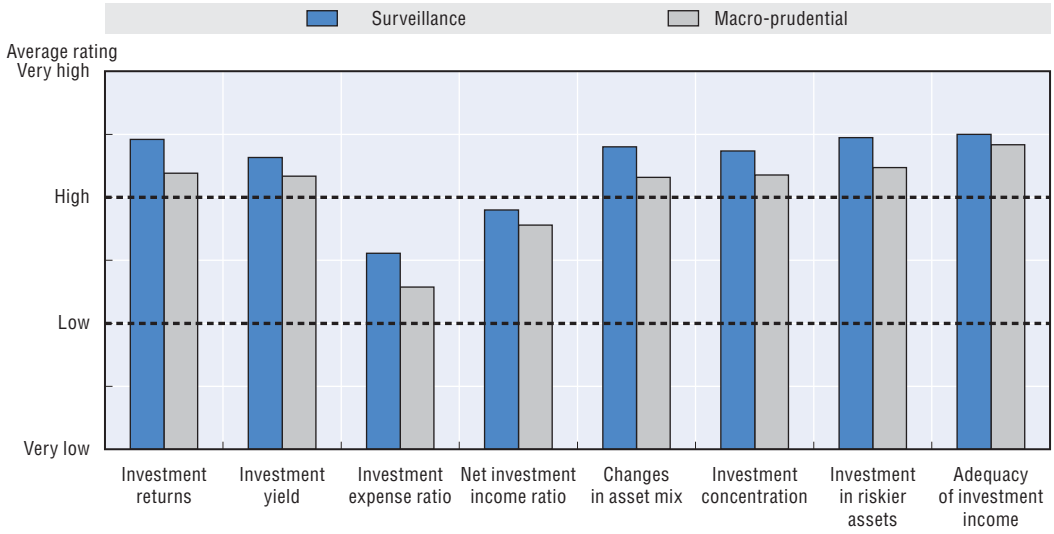


Figure 11. **Rating of the surveillance and macro-prudential value of investment indicators**



Note: The average rating was calculated based on countries' responses to the survey. Only ratings provided by countries that use the given indicator were included. For the purposes of calculating the average rating of market surveillance and macro-prudential value, the following numeration was applied: 0: Very low; 1: Low; 2: High; 3: Very high.

Reinsurance

Reinsurance, a risk sharing and financing tool for insurance companies, plays an important role not only in stabilising the premium income and loss experience for the parties in the contract but also in providing additional layers of capital to insurance markets. Quality and cost of reinsurance, capital cushion from reinsurance, insurer's dependency on reinsurance coverage and counterparty (credit) risk of reinsurers are thus important indicators for the measurement of the soundness of an insurer or market. The survey sought information on the use and importance of a number of indicators and ratios that are commonly used to evaluate reinsurance performance and risks for an insurance market or company:

- **Premium cession ratio:** In the reinsurance market, cession refers to the part of a risk (policy or risk portfolio) that an insurer transfers to, or finances with, another insurer. The balance of the risk (policy or risk portfolio) is what the ceding insurer retains. This ratio – reinsurance premiums divided by gross premiums – uses premiums as a proxy. The premiums for the ratio are more often on a gross-and-written basis than on a net-and-earned basis. The cession ratio can be calculated at the country level, by market, by line of business or even at the company level (and by line of business of the company). The lower the ratio, the greater the capacity of the domestic insurance market in covering local risks, *ceteris paribus*. Government controls on premium outflows from the domestic market, such as a compulsory reinsurance cession policy[22] or other restrictions on reinsurance premium outflows from the domestic market could lead to a lower cession ratio. The dependency on reinsurance can be measured using a retention ratio, the reciprocal of the premium cession ratio.[23]

Almost all countries (twenty-three) make use of cession ratios and consider such ratios to be critical or important for supervisory and/or market surveillance and fourteen countries for macro-prudential surveillance.

- **Reinsurance commissions to shareholders' equity (surplus):** Reinsurers may share the underwriting and other expenses that their insurance partners (are expected to) incur as well as the profits from providing reinsurance coverage. The sharing of expenses and profits depends in part on the reinsurance programme (e.g. proportional vs. excess-of-loss) and the hierarchy of a reinsurance contract within a programme (e.g. quota share vs. surplus vs. facultative-obligatory) that each insurer maintains. This sharing is commonly known as "reinsurance commissions" or "ceding commissions." The commissions can be large enough for lower layers of proportional contracts, which in turn may offer some relief in shareholders' equity (surplus) of the insurer. Alternatively, the higher the reinsurance-commission-to-shareholders'-equity (surplus) ratio, the greater the relief of surplus the insurer enjoys temporarily (which some countries, such as the United States, monitor as a share of total surplus/equity).[24]

  Fewer than half (seven) of the surveyed countries make use of this ratio and only four consider it to be critical or important for supervisory and/or market surveillance and macro-prudential surveillance (critical in all cases).

- **Claims paid by reinsurers to total claims:** This ratio provides an indicator of the sharing of claims between an insurer and its reinsurance partners or the sharing between direct insurance and reinsurance markets. Most countries (seventeen) calculate this ratio and fourteen countries consider it to be critical or important for supervisory and/or market surveillance. Eight countries also consider this ratio as highly relevant for macro-prudential surveillance.

- **Reinsurance assets/total assets:** Reinsurance assets can be broadly defined as the sum of receivables of premiums earned, receivables of ceding commissions, losses and loss adjustment expenses, recoverables and other receivables due from reinsurers.[25] If a reinsurance asset has become uncollectible, the insurer recognises it as a loss and its shareholders' equity (surplus) is reduced by the same amount. Accordingly, the ratio of reinsurance assets to total assets can be used not only to measure counterparty risk but also to estimate the impact of reinsurance assets on the insurer's overall underwriting capacity. Most countries (sixteen) calculate this ratio and ten countries consider it to be critical or important for supervisory and/or market surveillance. Six countries also consider this ratio as highly relevant for macro-prudential surveillance. Peru measures the importance of reinsurance assets against accounting equity (rather than total assets).

- **Reinsurance recoverables to shareholders' equity (surplus):** Reinsurance recoverables, an asset entry in the balance sheet, refers to the amount of claims payments that the insurer expects to receive from its reinsurance partners for their shares of the risk covered.[26] The larger the amount, the higher the insurer's dependency on reinsurance, *ceteris paribus*. When measuring the amount as a percentage of the insurer's shareholders' equity (surplus), this ratio can provide another indicator of the magnitude of counterparty risk related to reinsurance. Fewer than half (eight) of the surveyed countries make use of this ratio and only six consider it to be critical or important for

supervisory and/or market surveillance. Four countries consider this ratio to be critical or important for macro-prudential surveillance. In Peru, the sum of reinsurance assets and recoverables are measured against total claims (rather than equity).

- **Overall reinsurance result:** Calculated as reinsurance expenses (including premiums ceded) minus reinsurance recoveries (including claims paid by reinsurers), this indicator provides an overall view of a direct insurance company's (or market's) financial results related to its relationship with reinsurers. Most countries (seventeen) monitor the overall reinsurance result and consider it to be critical or important for supervisory and/or market surveillance. Eight countries also consider this indicator as highly relevant for macro-prudential surveillance. Colombia evaluates the overall reinsurance result relative to shareholders' equity.
- **Indicators of counterparty risk related to the cession of premiums to reinsurers:** Given the significance of reinsurers for many insurance company's business operations, most countries (eighteen) monitor the counterparty risk of those relationships, whether due to a concentration of reinsurance arrangements with a few reinsurers or significant reinsurance relationships with reinsurers with more limited financial strength. Fifteen countries consider such indicators to be critical or important for supervisory and/or market surveillance while ten countries also consider these indicators as highly relevant for macro-prudential supervision. Australia focuses on the concentration of reinsurance arrangements while the United States looks at a number of metrics (e.g. ceded premiums, recoverables) for the most important reinsurance exposures. Chile, Peru and Portugal collect information on the distribution of reinsurance arrangements and the credit quality (ratings) of significant reinsurers. Russia considers credit quality of reinsurers as well as the distribution of reinsurance arrangements across countries. Korea applies a combined ratio approach for reinsurance market analysis and the Expected Reinsurer Deficit (ERD) model for an analysis of risk transfer adequacy. Canada uses a stress testing approach involving the default of an important reinsurer.

Figure 12. **Use of reinsurance indicators**

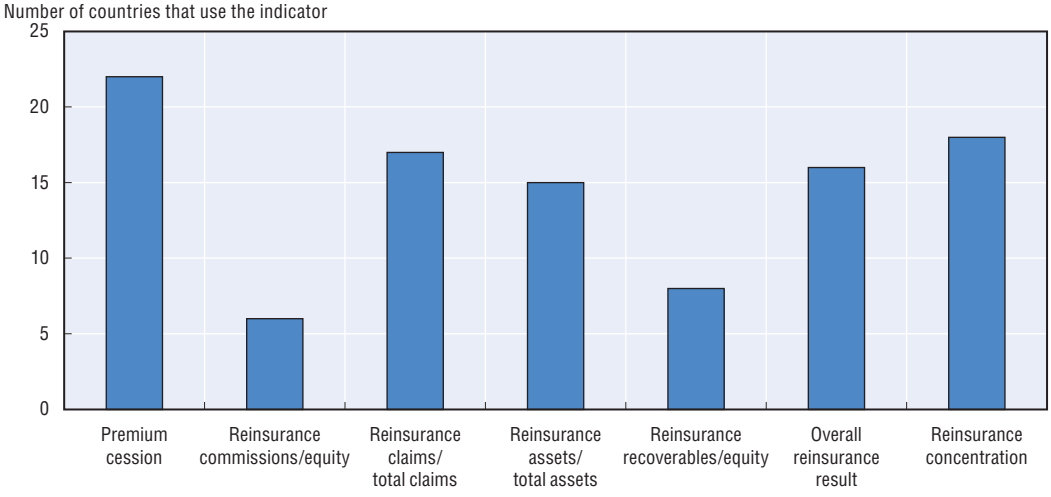
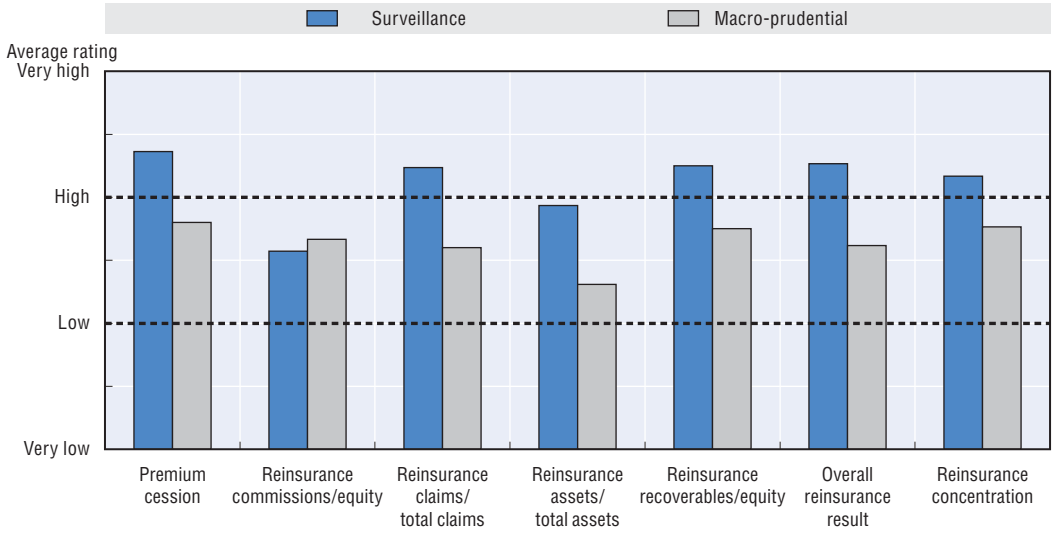


Figure 13. **Rating of the surveillance and macro-prudential value of reinsurance indicators**



Note: The average rating was calculated based on countries' responses to the survey. Only ratings provided by countries that use the given indicator were included. For the purposes of calculating the average rating of market surveillance and macro-prudential value, the following numeration was applied: 0: Very low; 1: Low; 2: High; 3: Very high.

Financial Market Indicators

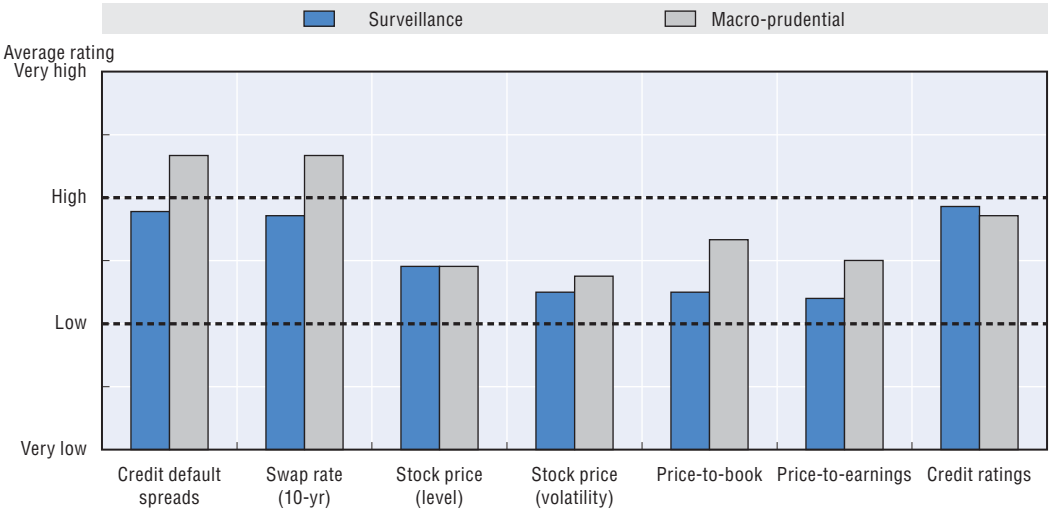
Where available, financial market indicators can also provide an important source of information to support market and macro-prudential surveillance and supplement the data collected from insurance companies and financial statements. The survey sought information on the use and importance of a number of financial market indicators that are commonly used to evaluate the performance and risks for an individual insurance company and/or the insurance market more generally:

- **Credit default spreads:** Credit default spreads (i.e. the difference in basis points between the interest rate charged to an insurance company for borrowing relative to a benchmark rate, such as LIBOR) can provide an indicator of the market's perception of default risk for that insurance company. Ten countries monitor credit default spreads and six countries consider spreads to be a critical or important indicator for supervisory and/or market surveillance. Nine countries also consider this indicator as highly relevant for macro-prudential surveillance. For example, Canada undertakes a quarterly analysis of spreads. Germany monitors a related indicator – single company credit default swaps (i.e. the price of insuring the debt of a company against default).
- **10-year swap rate:** Interest rate swaps are commonly used as a hedge against an insurance company's long-term liabilities and provide a signal of the market's perception of the future direction of longer-term interest rates (swap rates provide the fixed interest rate "price" that will be charged in the market for an interest rate swap). Eight countries monitor the 10-year swap rate although only five countries consider it to be a critical or important indicator for supervisory and/or market surveillance (and four countries from the perspective of macro-prudential surveillance). A few countries, including the United States and Germany, monitor differences in yield curves for different terms rather than (or in addition to) swap rates.

- **Insurance company stock price level:** Similar to credit default spreads, stock markets can provide an indicator of the market's perception of the performance/financial strength of an insurance company (particularly when taking into account more general financial conditions and the relative performance of peers). Eleven countries regularly monitor insurance company stock price levels. Six countries consider this indicator as important for supervisory/market surveillance purposes and five countries for macro-prudential surveillance (although no country indicated that stock price levels were critical from either perspective). Canada performs a relative comparison of the stock price to the prevailing financial condition of individual companies. In Germany and the United States, insurance company stock prices are also examined at the aggregate level. In Germany, this is done through monitoring of the insurance sub-index of DAX. In the United States, the review of stock performance and trends is undertaken from a perspective of identifying issues that could affect insurer's solvency standing, which is different than the analysis undertaken by investment managers and brokers. Korea uses insurance company stock price levels (and stock price volatility) as input variables for its EDF model, which estimates the default probability of insurance companies. In a number of countries, including Chile, Luxembourg, Portugal and Russia, insurance companies are not traded in the domestic stock markets which means there is no data on stock price level and volatility.
- **Insurance company stock price volatility:** The level of volatility in an insurance company's stock price, particularly when compared to the broader market or its peers, can also provide an indicator of the market's perception of an insurance company's performance and the sustainability of its earnings. Eight countries monitor insurance company stock market price volatility although only a few consider it to be important for market and/or macro-prudential surveillance (three and four countries, respectively). The United States reviews volatility for significant insurance companies and groups. The financial supervisor in Iceland (FME) has limited information on volatility but looks into trends and changes in the domestic market.
- **Price-to-book ratio and Price-to-earnings ratio:** These indicators can provide an indicator of market over- (or under-) valuation of an insurance company's stock. A high price-to-book or price-to-earnings ratio, particularly in relative terms, would be an indicator that the market is placing a higher value on a given company (which may or may not be justified by other considerations). Only four countries monitor both of these two ratios and one country (Canada) monitors only the price-to-earnings ratio. Only one country (Italy) considers these indicators to be important from both supervisory/market surveillance and macro-prudential perspectives while Austria considers these indicators as important for macro-prudential surveillance.
- **Insurance company credit ratings/outlook:** Credit ratings provide an independent assessment of the financial strength of an insurance company that is broadly used in the market for the valuation of equity and debt. Most countries (fourteen) monitor the credit ratings of insurance companies operating in their markets and eleven consider credit ratings (and/or credit outlooks) to be important for supervisory/market surveillance purposes. Ten countries also consider credit ratings to be highly relevant for macro-prudential surveillance.

Figure 14. **Use of financial market indicators**

Figure 15. **Rating of the surveillance and macro-prudential value of financial market indicators**



Note: The average rating was calculated based on countries' responses to the survey. Only ratings provided by countries that use the given indicator were included. For the purposes of calculating the average rating of market surveillance and macro-prudential value, the following numeration was applied: 0: Very low; 1: Low; 2: High; 3: Very high.

Insurance Market Risks

In addition to the analysis of the performance of – and risks to – individual insurance companies and markets using indicators and ratios for the various components of insurance operations, insurance regulators, supervisors and/or central banks have an important role in assessing overall (including systemic) risks to the broader insurance market (as well as other financial markets). This section discusses common tools that insurance regulators, supervisors and/or central banks may use to monitor insurance market risks, including through the use of periodic reviews, macro-prudential surveillance and stress testing.

A common analytical tool used in many countries is the completion of periodic reviews of particular risks to the functioning of insurance markets. This could be part of broader reviews or reports on financial stability or specific reviews or reports related to

particular insurance sector risks. Such reviews are undertaken in most countries (twenty countries) while many other countries are in various phases of establishing such reviews. In many countries, insurance market risks are reviewed as part of broader financial system (or stability) reviews published by central banks, usually on a semi-annual basis. The Central Bank of Costa Rica produces reports on specific financial stability issues as well as an annual Financial Stability Report which will include insurance sector risks although these reports are not publicly available. In a few countries, insurance (or financial market) regulators supplement the reviews undertaken by central banks with their own analysis of insurance market risks (mostly for internal purposes, although sometimes published as a quarterly review or periodic article). The Australian Prudential Regulatory Authority includes information on insurance market risks in its annual report and in occasional *Insight* articles. In the United States, regular reviews of insurance sector issues and risks are undertaken by the Federal Insurance Office and the NAIC while insurance issues are also regularly reviewed in the context of the work of the Financial Stability Oversight Council (a council comprising the main financial sector regulators in the United States). In Europe, insurance regulators and supervisors also contribute to the bi-annual Financial Stability Reports prepared by EIOPA.

Another common set of tools used in many countries (fifteen) are early-warning indicators, often including some of the indicators and ratios described above. SVS (Chile) has developed an early-warning indicator system to monitor key solvency and performance issues across the insurance industry. In Canada, OSFI gathers key company-specific and industry-wide data to monitor insurance risks, with a focus on regulatory capital ratios. The Bank of Korea uses a set of indicators related to changes in capital adequacy, growth, profitability (amongst other variables). The Austrian Financial Market Authority (FMA) undertakes periodic cross-sector analyses of selected indicators, such as credit quality. The Colombian insurance supervisor (SFC) has been using a set of 17 ratios for the life insurance sector and 15 ratios for non-life as part of its early warning test. The set of indicators is currently being reviewed with consideration being given to new indicators, particularly in the life sector. The Central Bank of the Russian Federation has developed a system to identify insurers' risk zones based on a set of dynamic financial stability indicators. The Italian insurance supervisor (IVASS) has developed its own internal risk dashboard (similar to that developed by the EIOPA – see Box 5) and closely monitors monthly data on investments, premiums and policy lapses.

The survey also sought information on the monitoring of indicators related to interconnectedness and changes in asset allocation, two risks that can potentially create systemic risks. The level of interconnectedness between the insurance sector and other parts of the financial system provides an indication of the potential for stress in the insurance sector to be transmitted to other parts of the financial system. Significant shifts in asset allocation across the insurance sector could be a signal of increased risk-taking behaviour which could have implications for other parts of the financial system should this lead to market stress.

Eighteen countries collect indicators related to interconnectedness. There are differences across countries in terms of the agency that monitors these issues. In many countries (e.g. Russia, Costa Rica, Canada), central banks play a critical role in monitoring interconnectedness across the financial system. For example, the Central Bank of Costa Rica (BCCR) is in the process of developing a network model that will provide information on connections between financial entities. The Bank of Korea's Flow of Funds

Box 5. **EIOPA's Risk Dashboard**

EIOPA publishes a risk dashboard on a quarterly basis, in consultation with insurance and pension regulators/supervisors from across Europe. The risk dashboard provides an assessment of the level, direction and impact of seven categories of risk affecting the insurance and pensions sector, including market risk, macro risk, profitability and solvency, interlinkages and imbalances, liquidity and funding, credit risk and insurance. The risks are presented in order of the level of risk (red, yellow, green) and provide an assessment of the direction of risk (increasing, stable or decreasing) and the potential impact should the risk materialise (high, medium, low) – which is derived based on a number of aggregate indicators of insurance, pension and broader financial system performance and risk. The dashboard also includes a qualitative description of the nature of each risk as well as key aggregate solvency and profitability (return on assets and return on equity) data.

Source: EIOPA (2016).

Accounts includes data on banking transactions with different types of counterparties, including insurance companies. In some countries (e.g. Chile), the main responsibility for monitoring this risk lies with a financial stability or macro-prudential committee. In countries with unified financial supervisors (i.e. with responsibilities for banking, insurance and securities), such as Austria, Iceland and Latvia, the unified supervisor will have access to the necessary data on different parts of the financial system and usually plays a significant role in monitoring interconnectedness. Countries with dedicated insurance supervisors will generally examine this risk through specific lenses, such as cross-ownership and related party transactions (United States) or dependence on banks in the distribution of insurance products (Turkey).

As noted above, twenty countries collect indicators related to changes in asset allocation and most consider this to be a critical or important indicator for supervision and/or market surveillance (see section on investment performance and risk). In addition, fourteen countries consider this issue to be critical or important from the perspective of macro-prudential surveillance. For example, the Bank of Estonia analyses the asset allocation of insurance companies (based on data provided by the Estonian Financial Supervision Authority) from a macro-prudential perspective. In Portugal, both the Banco de Portugal and the insurance and pensions supervisor (ASF) regularly examine data on insurers' portfolio composition in order to ensure any new trends or changes in behaviour are detected at an early stage.

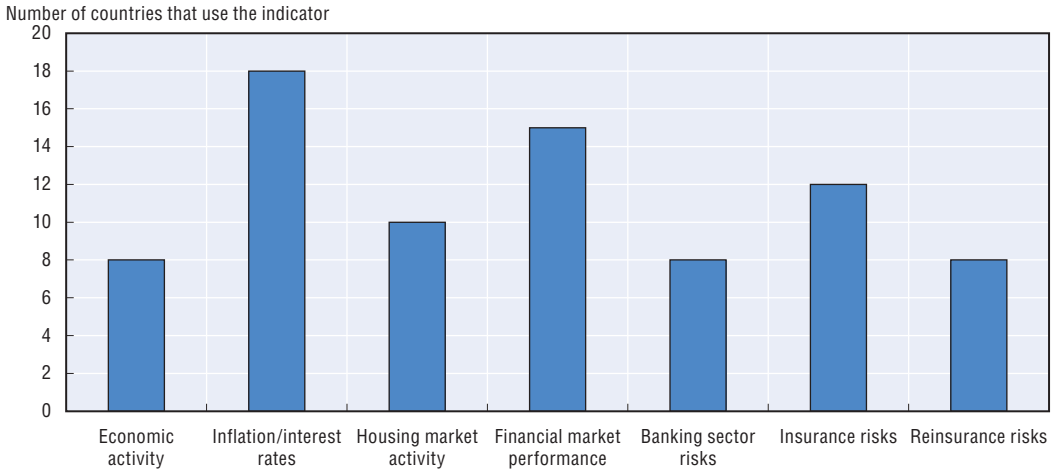
As a means to generate additional insight about the dynamics of the insurance market, especially when one or more significant market-wide or company-specific factors might affect the performance of the market or individual insurers, regulatory authorities may rely on scenario-based stress testing. The test results may show whether the market or insurance companies can withstand the variations in the external or internal factors and whether a plan exists for them to recover their usual risk-bearing capacity and thus to meet their contractual obligations to policyholders. There are variations in the scenarios as well as variations in the factors and their weights from one scenario to another. Commonalities nonetheless exist. Scenario testing is a forward-looking technique and simulates the impact of low-probability, high severity events. Most countries (twenty) undertake regular insurance market stress tests. In the European Union, common stress

tests co-ordinated by EIOPA are undertaken on a periodic basis (2011, 2014 and 2016). The survey sought information on the use of a set of common risk factors in the development of market stress testing exercises:

- **Economic activity:** Nine countries regularly include stress in economic activity in the scenarios that they develop for market stress tests. In Canada, macro-stress tests of the insurance sector are based on an adverse macroeconomic scenario that incorporates impacts on the economic environment as well as housing and financial markets. In Russia, reduced growth in GDP and declines in gross capital formation and wages and earnings are incorporated. In Germany and Austria, stress testing incorporates economic factors indirectly through their impact on financial markets, interest rates, lapse rates and/or other indicators. In Colombia, macroeconomic scenarios are used to evaluate the impact of economic performance (as well as interest rates and financial market performance) on insurance company investment returns.
- **Inflation/interest rates:** Nineteen countries regularly include unfavourable interest rate and/or inflation developments in the scenarios that they develop for market stress tests. OSFI (Canada) has used both rapid inflation and stagflation scenarios. EIOPA stress tests use a number of different interest rate scenarios, with a focus on a prolonged low interest rate environment. In Austria, a low yield interest rate forward curve is applied over a significant time horizon (100+ years). In Russia, increases in inflation and foreign exchange rates have been incorporated into past stress tests.
- **Housing market activity:** Ten countries regularly include stress in housing market activity in the scenarios that they develop for market stress tests. In Austria, Chile and Switzerland, changes in real estate prices are included in stress scenarios. EIOPA stress tests include a downward shock to residential and commercial property values. The NAIC asks companies to stress changes in pre-payments on mortgage loans as part of their internal stress testing exercises.
- **Financial market performance:** Sixteen countries regularly include stress in financial markets in the scenarios that they develop for market stress tests. In Austria and Switzerland, stress scenarios include changes in share prices and credit spreads. In Germany, Portugal and Chile, a shock to equity markets is considered. EIOPA stress tests include stress in equity and public and private bond markets. Korea considers stock price and exchange rate volatility.
- **Banking sector risks:** Eight countries regularly include banking sector stress in the scenarios that they develop for market stress tests. This risk is considered indirectly in EIOPA stress tests through shocks to bank equity and bond prices. In Austria, this risk is included through a broader increase in default risk. In Russia, a slowdown in retail lending is incorporated in stress testing. Portugal considers adverse developments in terms of credit risk, equity risk and interest rate risk in the banking sector.
- **Insurance risks** (e.g. longevity, catastrophe trends): Twelve countries regularly include specific insurance risks, such as a catastrophe event or unfavourable changes in longevity in the scenarios that they develop for market stress tests. EIOPA stress tests include probable maximum loss from 1-in-100 and 1-in-200 year catastrophe events, increases in longevity and mortality risk as well as increases in policy lapses. The NAIC requires companies to stress longevity, mortality and lapse rates in their internal stress testing exercises. In Turkey, earthquake risk is the main catastrophe risk considered.

- **Reinsurance market risks:** Eight countries regularly include adverse reinsurance market developments (e.g. major reinsurer failure, hard underwriting cycle) in the scenarios that they develop for market stress tests. In Canada and Switzerland, the most common scenario is the default of a significant reinsurer.

Figure 16. **Risks considered in stress testing**



Key findings and implications for the OECD *Global Insurance Statistics* framework

Based on the responses to a survey questionnaire, this report provides information on the use and perceived value of a set of indicators related to the depth and competitiveness of domestic insurance markets, various components of insurance operations and financial market indicators as well as indicators and approaches to the monitoring of insurance market risks, including potential systemic risks. The responses also provided some information on data gaps that may impede the monitoring of some insurance market variables. As a result, this report should provide a useful guide to the use of indicators and ratios by insurance market regulators and supervisors and contribute to the further development of the OECD *Global Insurance Statistics* framework.

Key findings

Most countries use a variety of indicators to monitor ***the depth and competitiveness of insurance markets***. Measures of insurance penetration (over density) and concentration of premiums or assets among the largest companies (over the Herfindahl index) were the most commonly used and valued indicators. A few countries place some emphasis on measures of foreign insurer companies' market share and the importance of brokers in the distribution of insurance products (commissions as a share of premiums) although these measures were rated as less important in terms of policymaking for the insurance sector.

In terms of ***profitability and income generation***, measures of the return on equity and assets were the most commonly used and valued among insurance regulators/supervisors. Measuring returns against premiums or revenues was a less common approach although a few countries considered these indicators to be valuable for supervisory and/or market surveillance purposes. A number of countries also monitor dividend levels although few countries viewed the measure as particularly valuable. The operating ratio, which provides an

overall measure of operating profitability, is widely used and valued across countries. A small number of countries reported data concerns related to profitability and income generation, mostly related to the capacity of insurance companies to provide high-quality data.

In terms of ***adequacy of capital/provisions and leverage***, there was widespread use of most of the indicators identified in the survey. In particular, measures related to the adequacy of provisions (provisions relative to equity and premiums and particularly measures related to deficiencies in provisions) are widely used and highly valued. However, there are significant differences in the way that countries measure these indicators, especially in the case of deficiencies in provisions which often involve complex statistical analysis. Indicators related to leverage are commonly in use although less valued than the measures related to the adequacy of provisions. Only a few countries considered measures related to leverage in the funding structure or leverage related to liabilities to be highly-relevant for supervisory and/or market surveillance purposes. Similar to the case of the adequacy of provisions, there is a broad range of approaches to measuring leverage.

In terms of ***liquidity***, most countries focus their efforts on asset liquidity, asset-liability matching and policy surrenders. A smaller number of countries also monitor liquidity from a cash flow perspective and/or a funding perspective. A slight majority of countries also use some form of liquidity coverage ratio to monitor the extent to which companies' (or the sector) maintain sufficient liquidity to meet obligations to policyholders. There are differences in how countries define different liquidity metrics. There is no standard for a liquidity coverage ratio while asset-liability matching often involves the use of complex statistical analysis rather than a single indicator. There are some limitations in terms of the availability of data needed for the supervisor to properly evaluate asset-liability matching, including a lack of supervisory data that is sufficiently granular in Portugal and limitations in the collection of liability data in the United States. The same holds for cash flow liquidity metrics as cash flow data might only be available for certain product lines (such as annuities).

In terms of ***underwriting performance and risk***, all of the underwriting indicators and ratios included in the survey (net underwriting income, claims ratio, combined ratio for non-life companies and underwriting expense ratio) are commonly used and highly valued by insurance regulators/supervisors from a supervisory and/or market surveillance perspective. These indicators are also generally well-defined. Indicators related to concentration of insurance activities in certain business lines/classes of insurance and growth in certain business lines/classes of insurance are also commonly used although slightly less valuable from a supervisory and/or market surveillance perspective. There was much more limited use of (and value placed in) indicators related to the importance of non-traditional non-insurance activities, although this likely reflects the fact that this is a relatively new issue for insurance regulators/supervisors.

In terms of ***investment performance and risk***, investment return (and to a lesser extent, investment yield) are commonly used and highly-valued by insurance supervisors/ regulators. Indicators related to risks in the investment portfolio (changes in asset mix, investment concentration and investment in riskier assets) are also highly-valued and commonly used – in relatively equal proportions, suggesting that these indicators are often used together to provide an overall view of risks in the investment portfolio. Indicators related to investments expenses and effectiveness (investment expense ratio and net investment income ratio) are less commonly used and not as highly-valued as return and portfolio risk indicators although many countries consider indicators related to the

adequacy of investment income as important for supervisory and/or market surveillance. However, there is no common approach across countries to measuring the adequacy of investment income and many countries use complex statistical tests. In some countries, more limited financial market activity (and liquidity) makes the use of indicators related to asset (and specifically asset values) more challenging.

In terms of ***reinsurance performance and risk***, indicators related to the significance of reinsurance in insurance company's operations (premium cession, reinsurance claims as a share of total claims, reinsurance assets as a share of total assets) are commonly used and considered to be valuable (at least in the case of premium cession and reinsurance claims/total claims). Ratios that measure reinsurance transactions against shareholder equity/surplus (i.e. commissions and recoveries) are less common and less valued than the ratios that compare the reinsurance share of the total. A measure of the overall reinsurance result and indicators related to reinsurance counterparty risk are also common and highly-valued although not as standardised as the indicators on premiums, claims and assets.

A number of countries supplement the data they collect from insurance companies and their financial statements with ***financial market indicators*** that can provide an indicator of market perception of the performance of individual insurance companies – although others make less use of such indicators or have more limited access (particularly where insurance companies are not publicly-listed). Credit ratings (and outlooks) and insurance company stock prices are the financial market indicators that are most commonly monitored.

The survey also sought information on approaches to analysing ***insurance market risks***, including potential systemic risks in the insurance sector. Most countries use a number of approaches to monitoring these issues, including through periodic reviews (commonly as part of broader financial stability reviews completed by central banks), the use of early-warning indicators and stress testing. Many countries use similar variables in the construction of stress testing scenarios, with particularly significant use of interest rate and financial market indicators. The survey also sought information on the use of indicators for two key potential sources of systemic risk: interconnectedness and changes in asset mix, and found that most countries monitor these issues in some way. Finally, by seeking information on the value of various indicators from the perspective of macro-prudential surveillance, some observations can be made on the types of indicators that are considered valuable for the monitoring of systemic risks. The survey results indicate that indicators related to core insurance functions (combined ratio, claims ratio, adequacy of investment income, investment returns, investments in riskier assets and investment concentration) are deemed to have the most value in terms of macro-prudential surveillance.

Implications for the OECD Global Insurance Statistics *framework*

The value of the GIS for its users could potentially be enhanced by increasing the coverage of the key analytical tools used and valued by insurance regulators/supervisors and thereby offering a source for comparing insurance sector performance across countries.

The survey sought suggestions from countries on specific indicators that could make a contribution to the overall value of the GIS for its users. A number of countries made specific suggestions for inclusion, including: return on assets, return on premiums, the ratio of financial leverage to shareholder's equity, leverage related to funding structure, the ratio of provisions to shareholder's equity, deficiency in gross technical provisions, ratio of premiums to shareholder's equity, liquidity coverage ratios, indicators related to funding liquidity, indicators related to asset liquidity, indicators related to asset-liability matching

net investment income ratio, asset mix indicators, types and levels of guarantees, premium cession, reinsurance claims as a share of total claims, overall reinsurance result, indicators of reinsurance counterparty risk, the ratio reinsurance commissions to shareholder equity and the ratio of reinsurance recoveries to shareholder equity. In addition, some suggestions were made for modifications to the presentation of indicators already included in the GIS, including presenting the combined ratio on both a gross and net basis, calculating the combined ratio for the life sector and including the components of combined ratio (expense ratio and claims ratio – which has been done starting for the 2014 data year). A number of countries also supported the inclusion of more financial market indicators, particularly in the context of the annual report on *Global Insurance Market Trends*. Table 7 provides an overview of the use and value of a set of indicators as well as some potential challenges in terms of including this data in the GIS.

Table 7. **Indicators for possible inclusion in the GIS**

Indicator	Share of countries collecting (%)	Market surveillance value (average) 0: Very low; 1: Low; 2: High; 3: Very high[1]	Integration into GIS (comments)
Market concentration	..	2.08	Some data about the five largest insurance companies in terms of assets and premiums is collected – would need to seek additional data on concentration by sector/ line of business
Return on assets	92	2.14	Data is collected and could easily be included
Operating ratio	79	2.50	Data is collected and could easily be included
Gross technical provisions/equity	67	2.13	Data is collected and could easily be included
Indicator of deficiency in technical provisions	79	2.74	Common definition of indicator would need to be developed
Indicator of leverage related to funding structure	75	1.83	Common definition of indicator would need to be developed and additional data would likely be required
Indicator related to the liquidity of assets	75	2.11	Common definition of indicator would need to be developed
Indicator related to asset-liability matching	79	2.37	Common definition of indicator would need to be developed
Indicator related to the level of policy surrenders	73	2.27	Common definition of indicator would need to be developed
Net underwriting income	96	2.48	Data is mostly collected (although usually based on premium earned rather than written)
Claims ratio	100	2.71	Data is mostly collected (although usually based on premium earned rather than written)
Underwriting expense ratio	96	2.48	Would require more granular data on expenses
Combined ratio	100	2.79	Already included in GIMT (although usually based on premium earned rather than written)
Indicator related to concentration in certain classes of insurance	75	2.24	Data on life and non-life classes of insurance is collected for premiums
Indicator related to premium growth in certain classes of insurance	88	2.19	Data on life and non-life classes of insurance is collected for premiums
Investment returns	100	2.46	GIMT reports investment yield
Indicator related to changes in asset mix	83	2.40	Included in GIMT (as a description of trends). A more direct approach may require a common definition and potentially more granularity in terms of asset classes.
Indicator related to investment (counterparty) concentration	79	2.37	A common definition would need to be developed and additional data would need to be collected
Indicator related to investment in riskier assets	79	2.47	A common definition would need to be developed and additional data would need to be collected
Indicator related to the adequacy of investment income	58	2.50	A common definition would need to be developed and additional data would need to be collected
Premium cession	96	2.35	Data is collected and could easily be included
Claims paid by reinsurers/total Claims	71	2.24	Data is collected and could easily be included
Overall reinsurance result	71	2.28	Some data about premiums and claims is collected although additional data on expenses may be necessary
Reinsurance concentration	75	2.17	A common definition would need to be developed and additional data would need to be collected

1. For the purposes of calculating the average rating of market surveillance value, the following numeration was applied: 0: Very low; 1: Low; 2: High; 3: Very high.

There are other data consistency issues that would also need to be addressed, including the use of gross or net, written or earned premiums in many of the ratios commonly calculated. The definitions of shareholder equity and provisions also may need to be checked to ensure consistency across countries. Other areas where further definitional clarity may be needed include the definition of a foreign-owned company as well as the appropriate treatment of health insurance (life, non-life or a third category).

Notes

1. This publication succeeds *Insurance Statistics Yearbook*, published annually for data years 1998 through 2010.
2. The reinsurance database contains information about reinsurance premiums assumed and ceded by type (proportional vs. non-proportional) by market (and by line for non-life: property, liability and financial).
3. This report succeeded the *Global Reinsurance Report*, published in 2008, 2009 and 2010.
4. See, for example, the IAIS (2015).
5. In the United States, surplus line insurers provide coverage for risks that are declined by the standard underwriting and pricing processes of admitted insurance companies. Surplus line insurance companies are regulated, though on a different basis than the admitted market.
6. The 2015-16 survey does not include this indicator.
7. Mathematically, it can be presented as $HI = MS_1^2 + MS_2^2 + \ldots + MS_n^2$, where HI and n denote the Herfindahl index and the total number of companies, respectively.
8. The Gini coefficient is commonly used in the measurement of income distribution within a country but could also be used to measure the distribution of premiums across insurance companies. It portrays the share of income (or premiums) earned by different segments of the population.
9. The learning modules in the core curriculum do not necessarily reflect the official position of the IAIS.
10. Through the FSAP, the IMF and World Bank (in developing countries) undertake periodic assessments of financial markets at the country level. The programme was initially established by the IMF in 1999 and has since been conducted for 142 countries (as of January 2016). Participation in the assessment is in principle voluntary although, following the 2007-08 crisis, the G20 countries committed themselves to this assessment. In September 2010, the IMF adopted a policy that requires 25 jurisdictions with "systemically important" financial sectors – thus having the potential to impact on global financial stability – to undergo this assessment every five years (extended to 29 jurisdictions in 2013).
11. The acronym stands for Capital adequacy, Asset quality, Reinsurance, Adequacy of claims and actuarial, Management soundness, Earnings and profitability, Liquidity and Sensitivity to market risk.
12. The NAIC is the US standard-setting and regulatory support organisation created and governed by the chief insurance regulators from the 50 states, the District of Columbia and the five US territories. NAIC members, together with the central resources of the NAIC, form the national system of state-based insurance regulation in the United States.
13. The evaluation of invested assets can further be restricted by the accounting convention of the country (e.g. admitted vs. non-admitted assets). For example, the NAIC (US) uses the Non-admitted to admitted asset ratio to measure the potential impact of either nonproductive assets or risky investments. The NAIC defines the usual range for this ratio 10% or less.
14. Refer to the "Underwriting Performance and Risk" section for the description of the loss ratio, the expense ratio and the combined ratio.
15. Loss reserves often include loss adjustment expense reserves.
16. Insurance companies are technically in the debt instrument-issuance business in that they collect premiums in advance while making a promise for coverages of loss events in the future. Accordingly, insurance regulatory authorities discourage companies from borrowing money or limit the amount they can borrow (i.e. financial leverage).

17. The NAIC (US) notes that changes in accounting principles and losses from non-admitted assets can affect shareholders' surplus, although such changes or losses, respectively, are rare or limited to the countries with Statutory Accounting Principle.

18. Italy uses them not only for monitoring the management of the interest rate risk but also for monitoring the forecast returns level of the segregated funds of insurance companies.

19. A lapse in life business occurs when the policyholder has failed to submit the minimum required premium to keep a policy effective (before the expiry of the grace period). A surrender refers to policyholder's voluntary cancellation of an otherwise valid insurance policy, for example, to cash out the surrender (cash) value of the policy.

20. Some inconsistencies exist in empirical findings. For example, Cummins and Weiss (2013) find that the core-activities of US non-life insurance are not systemically risky but separate accounts and group annuities – which reflect more of savings/investment than risk underwriting – in life insurance may be associated with systemic risk.

21. Reinsurance or retrocession is a contract between a primary insurer and reinsurer or between two reinsurers, respectively. No reinsurance contracts involve a policyholder as a party of the contract unless it is done through a cut-through provision.

22. Compulsory cession policies are commonly imposed in proportional quota share reinsurance arrangements for non-life – more specifically in property – risks.

23. When measuring underwriting performance of an insurance company, another type of "retention" ratio may also be used. This ratio (for business renewal) measures an insurer's success in retaining existing insurance policies for renewal, or a ratio of the number of policies renewed to the number of policies subject to renewal. All other things being constant, the higher the ratio, the better the insurer is at retaining existing customers. However, prevailing economic conditions, market environment (e.g. soft vs. hard market) and the underwriting policy of the insurer can affect this ratio.

24. It should be treated as a temporary relief as compared to a permanent relief from injection of additional capital.

25. For further discussion of reinsurance assets, refer to International Financial Reporting Standards (IFRS 4).

26. A similar measure can also be used to measure counterparty risk related to agents/brokers. In direct insurance markets, agents and brokers that collect premiums (and settle claims) on behalf of their insurers may settle their accounts on a regular basis, for example, monthly, with the insurers. A significant rise or delay in premiums collection can affect the insurer's capital negatively. If such a rise or delay signals deterioration in claims management or a rise of insolvency risk of the insurer, it calls for further examination. The ratio of agents' balances to shareholders' equity (surplus) can be used as an indicator of this risk.

References

A.M. Best (2013), *Insurance Facts and Stats 2013*, A.M. Best Company, Oldwick.

A.M. Best (1992), "Best's Insolvency Study: Life/Health Insurers 1976-1991", *Best's Review*, A.M. Best Company, Oldwick, June, pp. 18-24, 130-133.

A.M. Best (1991), "Best's Insolvency Study: Property/Casualty Insurers 1969-1990", *Best's Review*, A.M. Best Company, Oldwick, August, pp. 16-23.

BarNiv, R. and J. McDoland (1992), "Identifying Financial Distress in the Insurance Industry: A Synthesis of Methodological and Empirical Issues", *Journal of Risk and Insurance*, Vol. 59(4), pp. 543-574.

Barwell, R. (2013), "The Design of Macroprudential Policy", in R. Barwell, *Macroprudential Policy: Taming the World Gyrations of Credit Flows, Debt Stocks and Asset Prices*, Palgrave Macmillan, London, pp. 33-75.

Browne, M., J. Carson and R. Hyot (1999), "Economic and Market Predictors of Insolvencies in the Life-Health Insurance Industry", *Journal of Risk and Insurance*, Vol. 66(4), pp. 643-659.

Browne, M. and R. Hyot (1995), "Economic and Market Predictors of Insolvencies in the Property-Liability Insurance Industry", *Journal of Risk and Insurance*, Vol. 62(2), pp. 309-327.

Chen, A. and M. Suchanecki (2007), "Default Risk, Bankruptcy Procedures and the Market Value of Life Insurance Liabilities", *Insurance: Mathematics and Economics*, Vol. 40(2), pp. 231-255.

Chen, R. and K. Wong (2004), "The Determinants of Financial Health of Asian Insurance Companies", *Journal of Risk and Insurance*, Vol. 7(13), pp. 469-499.

Cummins, J.D. and M. Weiss (2013), "Systemic Risk and Regulation of the US Insurance Industry", in J. Biggs and M. Richardson, *Modernizing Insurance Regulation*, pp. 85-135, Wiley, New York.

Cummins, J.D., M. Grace and R. Phillips (1999), "Regulatory Solvency Prediction In Property-liability Insurance: Risk-based Capital, Audit Ratios and Cash Flow Simulation", *Journal of Risk and Insurance*, Vol. 66, pp. 417-458.

Cummins, J.D., S. Harrington and R. Klein (1995), "Insolvency Experience, Risk-based Capital and Prompt Corrective Action in Property-Liability Insurance", *Journal of Banking and Finance*, Vol. 19, pp. 511-527.

EIOPA (2016), *EIOPA Risk Dashboard: March 2016 – Q4 2015 data*, European Insurance and Occupational Pensions Authority, Frankfurt, *https://eiopa.europa.eu/Publications/Standards/EIOPA-RiskDashboard-March%202016.pdf*, accessed 28 April 2016.

European Commission (2013), *Consultation on a Possible Recovery and Resolution Framework for Financial Institutions Other Than Banks*, retrieved from *http://ec.europa.eu/finance/consultations/2012/nonbanks/docs/consultation-document_en.pdf*.

Geneva Association (2012), *Insurance Resolution in Light of the Systemic Risk Debate: A Contribution to the Financial Stability Discussion in Insurance*, The Geneva Association.

Grace, M., S. Harrington and R. Klein (1998), "Risk-based Capital and Solvency Screening in Property-liability Insurance: Hypotheses and Empirical Tests", *Journal of Risk and Insurance*, Vol. 65, pp. 213-243.

IAIS (2015), *IAIS Global Insurance Market Report (GIMAR)*, International Association of Insurance Supervisors, Basel.

IAIS (2013a), *Global Systemically Important Insurers: Policy Measures*, International Association of Insurance Supervisors, Basel.

IAIS (2013b), *Global Systemically Important Insurers: Initial Assessment Methodology*, International Association of Insurance Supervisors, Basel.

IAIS (2011a), *Paper on Resolution of Cross-border Insurance Legal Entities and Groups*, International Association of Insurance Supervisors, Basel.

IAIS (2011b), *Insurance and Financial Stability (November)*, International Association of Insurance Supervisors, Basel.

IAIS (2010), *Application Paper on Info Gathering and Analysis*, International Association of Insurance Supervisors, Basel.

IMF (2010a), *Integrating Stability Assessments under the Financial Sector Assessment Program into Article IV Surveillance: Background Material*, International Monetary Fund, Washington, DC.

IMF (2010b), "United States: Publication of Financial Sector Assessment Program Documentation", *FSSA Country Report*, No. 10/247, International Monetary Fund, Washington, DC, retrieved from *www.imf.org/external/pubs/ft/scr/2010/cr10247.pdf*.

IMF (2005), *Financial Sector Assessment: A Handbook*, the International Bank for Reconstruction and Development, the World Bank and the International Monetary Fund, Washington, DC.

Kwon, W.J. (2015), *Insurer Resolution Processes and Supervision of Insurance and Non-Traditional and Non-Insurance (NTNI) Activities*, International Insurance Society, New York.

Kwon, W.J. (2013), "The Significance of Regulatory Orientation, Political Stability and Culture on Consumption and Price Adequacy in Insurance Markets", *Journal of Risk Finance*, No. 4.

Leadbetter, D. and S. Dibra (2008), "Why Insurers Fail: The Dynamics of Property and Casualty Insurance Insolvency in Canada", *The Geneva Papers*, No. 33, pp. 464-488.

McDonnell, W. (2002), "Managing Risk: Practical Lessons from Recent Failures of EU Insurers", *Occasional Paper Series*, No. 20, Financial Supervisory Authority.

Munch, P. and D. Smallwood (1980), "Solvency Regulation in the Property-liability Insurance Industry: Empirical Evidence", *Bell Journal of Economics*, Vol. 11(1), pp. 261-279.

NAIC (2015), *Insurance Regulatory Information System Ratios (IRIS) Manual*, National Association of Insurance Commissioners, Kansas City.

Pottier, S. and D. Sommer (2004), "The Effectiveness of Public and Private Sector Summary Risk Measures in Predicting Insurer Insolvencies", *Journal of Financial Services Research*, Vol. 21(1/2), pp. 101-116.

RBC Dependencies and Calibration Working Party (2012), "Solvency II Standard Formula and NAIC Risk-Based Capital (RBC)", *CAS E-Forum*, Vol. 2, pp. 1-38, retrieved from *www.casact.org/pubs/forum/12fforumpt2/RBC-DCWPRpt3.pdf*.

Rossiter, S. (2006), *Risk-based Supervisory Framework Template for Insurance Companies*, US Agency for International Development, Washington, DC, retrieved from *http://pdf.usaid.gov/pdf_docs/Pnadx425.pdf*.

Segovia-Vargas, M.J., S. Salcedo-Sanz and C. Bousoño-Calzón (2004), "Prediction of Insolvency in Non-life Insurance Companies Using Support-vector Machines, Genetic Algorithms and Simulated Annealing", *Fuzzy Economic Review*, Vol. 9(1), pp. 79-94.

Sharma, P. (2002), "Prudential Supervision of Insurance Undertakings", Report of the London Working Group on Solvency II, Conference of Insurance Supervisory Services of the Member States of the European Union.

Standard & Poor's (2013), *What May Cause Insurance Companies to Fail: And How This Influences Our Criteria*, RatingsDirect, June.

Swiss Reinsurance (annual), *World Insurance*, Swiss Reinsurance Company, Zurich.

UNCTAD (1990), *Statistical Survey on Insurance and Reinsurance Operations in Developing Countries 1983-1990*, United Nations Conference on Trade and Development, Geneva.

From:
OECD Journal: Financial Market Trends

Access the journal at:
http://dx.doi.org/10.1787/19952872

Please cite this article as:

Kwon, W. Jean and Leigh Wolfrom (2016), "Analytical tools for the insurance market and macro-prudential surveillance", *OECD Journal: Financial Market Trends*, published online first.

DOI: http://dx.doi.org/10.1787/fmt-2016-5jln6hnvwdzn

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

You can copy, download or print OECD content for your own use, and you can include excerpts from OECD publications, databases and multimedia products in your own documents, presentations, blogs, websites and teaching materials, provided that suitable acknowledgment of OECD as source and copyright owner is given. All requests for public or commercial use and translation rights should be submitted to rights@oecd.org. Requests for permission to photocopy portions of this material for public or commercial use shall be addressed directly to the Copyright Clearance Center (CCC) at info@copyright.com or the Centre français d'exploitation du droit de copie (CFC) at contact@cfcopies.com.