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Vaccinating insurers against pandemics
– a review of capital requirements for
pandemic risk

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Vaccinating insurers against pandemics – a review of capital requirements for pandemic risk¹

Highlights

- *The Covid-19 pandemic crisis provides an opportunity to review existing regulatory requirements and to sharpen them so that they remain appropriate for future pandemics. This is despite insurers, in general, not facing significant solvency issues from increased Covid-19-related deaths.*
- *Currently, most regulatory frameworks do not prescribe specific capital requirements for pandemic risks. Selected regulatory capital frameworks cover pandemics mainly in terms of mortality risk. Cross-jurisdictional comparison on relative levels of these requirements is complex given other determinants of the final capital requirement calculation.*
- *The Covid-19 pandemic crisis shows that risk exposures of insurers extend beyond mortality. Regulatory frameworks, though not necessarily through capital requirements, may consider incentivising insurers to address other risks that could arise from future pandemics, including heightened market, credit and operational risks, as well as their increased interdependencies.*

1. Introduction

The Covid-19 pandemic is an unprecedented event that has taken lives, destroyed businesses and changed the way we live and work. Notwithstanding disputes between insureds and insurers on certain coverage, particularly business interruption insurance, the devastating financial impact from the crisis has partly been cushioned through insurance. Such insurance includes paying out death claims to support families of those who perished due to Covid-19, covering medical and hospitalisation costs, and supporting lost business incomes due to public health safety measures. The experience underscores the importance of sound insurance supervisory frameworks in ascertaining that insurers can provide critical financial support in times of disaster and fulfil their obligations to policyholders even under such extreme circumstances.

From an insurance perspective, one of the most relevant impacts of a pandemic is the increased number of deaths. Compared with the Spanish flu over a century ago, which killed an estimated 50 million people worldwide,² the World Health Organization (WHO) has attributed over 4.57 million deaths (so far³) to Covid-19. There are views that the actual number of Covid-19 deaths is higher due to underreporting by countries, lack of testing and definition disputes (eg whether deaths caused by postponement of medical procedures due to hospital capacity constraints should be included). Nevertheless, the observed increased number of so-called “excess deaths” illustrates the human toll of the pandemic. Excess deaths are those over and above the expected number under normal circumstances. This measure provides a rough estimate of the total number of Covid-19-related deaths.

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² See History (2020).

³ As at 6 September 2021. See World Health Organization in References.

The WHO estimated at least 3 million excess deaths in 2020⁴ and yet, their financial impact on life insurers has been muted. This can be attributed to a large protection gap of uninsured lives⁵ especially in developing countries, diversification effects for insurers that offer pensions or annuity products (as higher mortality reduces their payout obligations) and government financial support packages. While the resilience of the global insurance industry was severely tested⁶ mainly due to financial market turmoil at the start of the pandemic in 2020, insurers have generally weathered the catastrophe relatively well. The International Association of Insurance Supervisors (IAIS) (2020) reported that although insurers in its Global Monitoring Exercise⁷ saw solvency ratios fall by 4% on aggregate, they continued to meet regulatory capital requirements. The report also pointed out that the sampled insurers expected only a slight increased impact from higher death claims⁸ but more adverse impact from higher than expected claims in other business lines, particularly event cancellation, business continuity and travel insurance.

Nevertheless, the pandemic illustrated that catastrophic events that are deemed very unlikely can and do happen in practice. This episode prompts a timely reminder for insurance regulators to review assumptions in their regulatory frameworks. It also provides an opportunity to ascertain that the intended prudential objectives of each regulatory instrument continue to be met. This paper reviews capital requirements related to pandemic risk as prescribed under standardised (and not internal model) approaches in selected insurance regulatory frameworks. The main focus of these regulatory frameworks in relation to pandemic risk is on life insurance underwriting risks, specifically on mortality risk arising from a pandemic scenario. As such, this Brief focuses on capital requirements for mortality risk in a pandemic scenario. Nevertheless, it is acknowledged that a pandemic crisis like Covid-19 affects other business lines (eg business continuity, travel or trade credit insurance) and other parts of an insurer's balance sheet including exposures to market, credit, operational and other insurance risks. It is also recognised that other regulatory requirements, for example governance and risk management, may also require a review to assess their effectiveness in a pandemic situation.

Section 2 outlines the range of definition and scope of pandemic risk capital requirements in selected regulatory frameworks, followed by an elaboration of how the requirements are expressed. Section 3 discusses policy implications and considerations when designing capital requirements for pandemic risk, and Section 4 concludes.

2. Capital requirements covering mortality risk in a pandemic situation

In this section, we start by reviewing the relevant categories of capital requirements in selected capital frameworks as they relate to mortality risk in a pandemic scenario. We outline the scope and definition of these risk categories to illustrate the intended coverage of these capital frameworks. Then, we describe how the capital requirements are expressed.

⁴ According to the WHO, in 2020, the official Covid-19 death toll was 1.8 million, compared with the estimated actual deaths of at least 3 million.

⁵ Swiss Re (2021) estimated that less than 46% of uninsured households will be able to maintain their livelihoods if the primary breadwinner dies.

⁶ See Yong (2020) for a summary of regulatory and supervisory measures to support insurers' financial resilience and preserve continuity of insurance service provision at the onset of the pandemic.

⁷ The Global Monitoring Exercise (GME) is part of the IAIS's framework to assess global insurance market trends and developments and detect the possible build-up of systemic risk in the global insurance sector. The 2020 GME was repurposed to assess the impact of Covid-19 on the global insurance sector, covering 60 of the largest international insurers from 18 jurisdictions as well as input from insurance supervisors from 39 jurisdictions.

⁸ Although solvency of insurers was not adversely affected, some suffered operating losses. For example, Swiss Re reported a net loss of \$878 million in 2020 with mortality accounting for 24% of total Covid-19 related claims and reserves.

Scope of capital requirements

In quantifying the amount of capital that insurers need to hold in order to withstand unexpected losses arising from a pandemic event, it is critical to define precisely what such an event is. However, it comes as a surprise that there is no globally and scientifically accepted definition of “pandemic” despite the WHO having the power to declare a pandemic. The Merriam-Webster dictionary defines pandemic as an event “occurring over a wide geographic area (such as multiple countries or continents) and typically affecting a significant proportion of the population”. Such definitions are not precise enough to determine regulatory capital requirements. Singer et al (2021) found that different quantitative definitions of pandemic used in epidemiological models produce different estimates of a pandemic probability. Transposing this finding to regulatory capital requirements, different definitions of pandemic will lead to different levels of capital requirements. As such, it is important to be clear on what is and is not covered within capital requirements intended to address a pandemic situation.

In the sample of seven regulatory capital frameworks analysed in Table 1, pandemic risk is not a standalone risk category. Rather, the frameworks typically refer to life insurance catastrophic or extreme events, which would capture a pandemic situation. It is unclear if the existing definitions cover epidemics as none of the sampled frameworks make explicit reference to such events. Table 1 shows the closest definitions of risk categories in these frameworks relating to a pandemic scenario. The definitions are broad and contain common elements referring to adverse and extreme events affecting life insurance contracts that can negatively impact insurers’ solvency. Some of the definitions extend beyond pandemics to cover other extreme mortality events such as a nuclear disaster, terrorist attack or natural catastrophe.

Comparison of risk categories related to a pandemic situation

Table 1

Regulatory capital framework	Term	Definition
Australia ¹	Event stress	The “event stress” allows for the impact of single events that could commence in the 12 months following the reporting date and cause multiple claims. These events could include pandemics, terrorist attacks and natural catastrophes and may affect either or both mortality and morbidity experience.
Canada	Catastrophe risk	The risk arising from adverse experience from a one-time, large-scale event. ²
European Union Solvency II ³	Life-catastrophe risk	The risk of loss, or of adverse change in the value of insurance liabilities, resulting from the significant uncertainty of pricing and provisioning assumptions related to extreme or irregular events.
IAIS Global Insurance Capital Standard ⁴	Catastrophe risk	The risk of adverse change in the value of capital resources due to unexpected changes in the occurrence of low-frequency and high-severity events.
Mexico ⁵	Extreme event	The risk arising from underwriting insurance obligations taking into account extreme events in life insurance.
Singapore ⁶	Life insurance catastrophe risk	The risk associated with extreme or irregular events whose effects are not sufficiently captured in the other risk requirements under C1 (capital requirements for insurance risks) for life business.
South Africa ⁷	Life catastrophe risk	The risk of loss, or of adverse change in the value of insurance obligations, resulting from extreme or irregular events whose effects are not sufficiently captured by the other risk components of life underwriting risk.

¹ See Australian Prudential Regulation Authority (2012). ² Inferred from description in Office of the Superintendent of Financial Institutions (2021). ³ See European Parliament and European Council (2009). ⁴ See IAIS (2019). ⁵ See Comisión Nacional de Seguros y Fianzas (2021). ⁶ See Monetary Authority of Singapore (2021). The Monetary Authority of Singapore is currently developing the general insurance catastrophe risk requirement. ⁷ See Prudential Authority, South African Reserve Bank (2018).

Sources: Various.

The definitions in Table 1 reflect extreme or catastrophic events that are typically characterised as a “once in 200 years” type of event, which corresponds to the calibration level of a particular regulatory framework. Conceptually, the broad risk category definitions mean that regulatory capital requirements to address risks arising from a once-in-200-years pandemic should cover not only mortality risks, but also other risk categories such as market and credit risks. In practice, however, this is usually not the case due to calibration challenges (eg historical data used to set the level of capital requirements do not reflect a market risk event arising from past pandemics) as well as different regulatory approaches.

Formulation of capital requirements

Table 2 outlines the range of stress factors prescribed in selected regulatory capital frameworks to address mortality risk arising from a pandemic. They are typically expressed as an absolute increase⁹ in mortality rates when valuing insurance contracts. Effectively, this requires insurers to calculate how much more they need to set aside to pay out unexpected higher death claims in the event of a pandemic.

Regulatory capital framework	Risk category	Prescribed increase in mortality rates per 1,000 lives insured
Australia	Insurance risk – event ¹	+ 0.5 for two years following reporting date
Canada	Insurance risk – mortality risk	+ 1 to 2 (depending on geographical region of exposure) for one year following reporting date ²
European Union Solvency II	Life underwriting risk – life catastrophe risk	+ 1.5 for one year following reporting date ³
IAIS Global Insurance Capital Standard	Insurance risk – catastrophe risk	+ 1 for one year following reporting date
Mexico	Life underwriting risk – life catastrophe risk	+ 0.5 for every year following reporting date
Singapore	Life insurance risk – life insurance catastrophe risk	+ 1 for one year following reporting date
South Africa	Life underwriting risk – life catastrophe risk ⁴	Based on a prescribed formula ⁵ for each of the following three months after the reporting date

¹ In addition to mortality rates, disablement rates and durations are also stressed. ² For accidental death and dismemberment policies, the mortality stress factor is 20% of these shocks. ³ In cases where an insurer fulfils the proportionality criteria, it can apply a simplified calculation for life catastrophe risk, calculated roughly as 0.15% of the expected death payout less the amount held as provision. ⁴ In addition to stressing mortality rates, the life catastrophe risk capital requirement also requires stressing disability-morbidity rates. ⁵ The addition in monthly mortality rates is calculated as $\frac{4 \times \min[\max(0.2 \times \text{mortality rate per thousand} + 0.105, 0.125), 0.3]}{1,000}$.

Sources: Various.

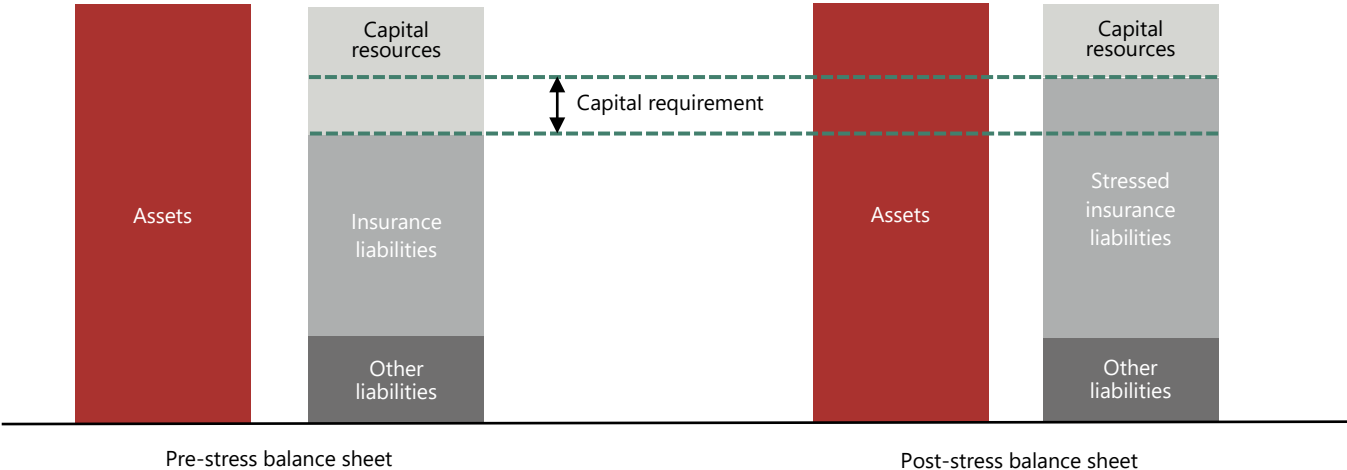
All frameworks in Table 2 use a stress approach¹⁰ in determining regulatory capital requirements for mortality risk arising from an extreme event such as a pandemic. IAIS (2019) defines the stress approach as a technique to calculate capital requirements by stressing the balance sheet of an insurer using prescribed stress factors. As shown in a stylised example in Figure 1, the reduced amount of regulatory capital resources after stressing the balance sheet represents the regulatory capital requirement. In

⁹ In South Africa, the stress factors are defined in terms of relative (and not absolute) increase in mortality rates.

¹⁰ In the United States, the risk-based capital requirements take a factor-based approach whereby risk factors are applied to net amount at risk (defined as the sums insured less reserves held). The requirements implicitly cover catastrophe risk arising from large, temporary mortality increase from a severe event. Pandemic risk is not explicitly mentioned. See American Academy of Actuaries (2011).

practice, this generally¹¹ means revaluing the insurance contracts or technical provisions using the more adverse mortality rates as described in Table 2 for the one-year period following the reporting date. For example, assuming that the mortality rate for a 40-year-old female is 0.0014, an insurer applying the IAIS Global Insurance Capital Standard (ICS) should use a mortality rate of 0.0024 (calculated as 0.0014 + 0.001) in the year following the reporting date when computing the stressed balance sheet. All else being equal, the higher mortality rates will result in higher death payouts, thus increasing the value of the insurance contracts or technical provisions that insurers need to set aside to meet increased life insurance claims in a pandemic scenario.

Figure 1: Stylised example of the stress approach in determining regulatory capital requirements



It is difficult to ascertain whether the mortality stress factors are appropriate based on reported Covid-19 deaths due in large part to unreliable data as well as significant geographical variations, for example different infection and vaccination rates. Moreover, insured lives typically have better mortality experience than the general population due to the insurance underwriting process. As at 8 September 2021, the Johns Hopkins Coronavirus Resource Center reported 2.77 Covid-19 deaths per 1,000 population in Brazil and 0.32 in India. Whether or not an increase of 1 per 1,000 lives insured (as described in some frameworks in Table 2) underestimates mortality pandemic risk in Brazil or overestimates the same risk in India is subject to various discussion points.

When comparing mortality or indeed any component of regulatory capital requirements across jurisdictions, it is important to consider each framework holistically. Comparing only one specific component, eg the risk factor for mortality risk, can give a misleading impression of whether one framework is more or less stringent than others. For example, a mortality shock of 1 per 1,000 lives insured is not necessarily more stringent than 0.5 per 1,000 lives insured. The end result might differ depending on factors such as the overall approach adopted for the capital requirement calculation as well as the extent to which insurers can reduce capital requirements due to recognition of diversification effects, eligible risk mitigation and management actions. In addition, differences in methodologies to value insurance contracts¹² as well as target calibration levels and variation in source data used for calibration can also affect the end result. For example, even though the ICS, the European Union (EU) Solvency II and the South African Prudential Standard are all calibrated against a once-in-200 years risk measure, they

¹¹ In Singapore, a different stress method is prescribed whereby the capital requirement for life catastrophe risk is determined as the difference between the additional death payouts assuming the stressed mortality risk factor and any reduction in technical provisions after applying the stress.

¹² Bell et al (2020) explain the interplay between valuation of insurance contracts and regulatory capital requirements. An example of a direct relationship is in regulatory frameworks that prescribe regulatory requirements for pandemic risk as a mortality stress on the value of the insurance contracts.

prescribe different stress factors, as shown in Table 2. The ICS was calibrated using insurance group-specific data,¹³ while Solvency II and the South African standard were based on different industry studies for developed¹⁴ and developing¹⁵ countries, respectively.

Unlike most risk-based capital adequacy frameworks, the Swiss Solvency Test (SST) is unique in that a standard scenario instead of a standard formula is prescribed. The box explains the pandemic scenario in the SST.

Box

Swiss Solvency Test – pandemic scenario

The SST[Ⓢ] is a unique regulatory capital adequacy framework for insurers as it prescribes a standard model instead of formulae for insurers to determine their regulatory capital requirements under the standard approach. The SST includes a pandemic scenario for which all insurers need to assess the impact on their balance sheets. The scenario is relevant for capital requirements if the model used does not sufficiently cover the risks described by the scenario. Table A outlines some of the risk factors prescribed under the pandemic scenario.

Selected risk factors under the SST pandemic scenario

Table A

Factor	Definition	Switzerland	EU
Attack rate	Number of sick people/population	25%	30%
	Total number of sick people	2,000,000	
Vaccination rate	Number of vaccinated people/population	40%	
	Total number of vaccinated people	3,200,000	
Hospitalisation rate	Number of hospitalisations/number of sick people	2.5%	1%
	Total number of hospitalised people	50,000	
Intensive care unit (ICU) rate	Number of people admitted to ICU/number of hospitalised people	15%	15%
	Total number of people requiring ICU	7,500	
Case fatality rate	Number of deaths/number of sick people	0.4%	0.37%
	Total number of deaths	8,000	
Mortality rate	Number of deaths/100,000 inhabitants	100	111
	Total number of deaths	8,000	
Absence rate	Number of absent employees/employed people	25%	
	Total number of absent employees	1,158,000	

Source: FINMA (2020).

The scenario requires insurers to take all aspects of their business activities into account. These include negative impacts of a pandemic on other insurance coverage such as business interruption and travel assistance, as well as potential positive impacts from cancelled non-essential medical procedures and from lower motor insurance claims. Market and credit risk exposures must be considered. For market risks, specific shocks for financial variables are defined in line with the financial market turmoil of March 2020. As the impact of a pandemic differs from insurer to insurer, the Swiss Financial Market Supervisory Authority (FINMA) expects insurers to make and justify assumptions used when calculating their capital requirements based on the prescribed factors.

[Ⓢ] See FINMA (2018).

¹³ See IAIS (2016).

¹⁴ See Committee of European Insurance and Occupational Pensions Supervisors (CEIOPS) (2010). CEIOPS was the predecessor of the European Insurance and Occupational Pensions Authority.

¹⁵ See Financial Services Board (FSB) (2015). The FSB was the predecessor of the Financial Sector Conduct Authority, South Africa.

3. Policy issues for consideration

Studies have shown that we can expect pandemics like Covid-19 to occur in the future. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2020) reported that the majority of emerging diseases such as Ebola and Zika and almost all known pandemics including HIV/AIDS and Covid-19 are zoonoses caused by microbes of animal origin. It estimated that there are 1.7 million undiscovered viruses existing in mammalian and avian hosts, with over 631,000 of these expected to have the ability to infect humans. With more than five new diseases emerging in humans every year, any one of which has the potential to become pandemic, it is possible that pandemics could become more frequent in the future. In addition, climate change is playing a role. Rockström and Edenhofer (2020) describe the increased interrelation between health, climate and biodiversity crises, citing an example of how deforestation accelerates global warming and destroys natural wildlife habitats. When coupled with human activities, this could result in disease outbreaks that spread from animals to humans. Against such evidence-based expectations on future pandemics, insurance supervisors are well advised to draw lessons from Covid-19 to enhance insurers' resilience against future pandemics.

While insurers have not been adversely affected by higher deaths arising from Covid-19, insurance supervisors can take this opportunity to review capital and other relevant requirements for pandemic risk, particularly business lines that have been badly hit eg event cancellation and business interruption. The ultimate objective is to ensure insurers will be able to honour their insurance obligations to policyholders in the next pandemic, which may be more catastrophic than Covid-19. Incentives should be put in place for well managed insurers to be able to continue offering much-needed insurance coverage under all plausible circumstances, including future pandemics.

To achieve this objective, further work is needed to define more clearly the scope of pandemic risk based on credible scientific sources and consideration on insurability of such global risks. Clarification may also be needed to specify whether epidemic risk is covered in existing frameworks. With a clear definition, insurance supervisors may consider improving capital requirements for pandemic risk that will support sustainable underwriting of mortality and other risks by insurers going forward. This is important to facilitate closing of the protection gap so that as many people as possible can afford life insurance coverage against future pandemics, thus alleviating the fiscal burden that may fall on governments in addressing the next pandemics.

Learning from the Covid-19 experience, desirable features of a pandemic risk capital requirement under a standard method¹⁶ include:

- identifying risks arising from a pandemic beyond mortality risk, that is, including market risk, credit risk, operational risk and other insurance risk categories such as business interruption, and assessing how best to address them
- clarifying components of regulatory capital requirements that address pandemic and epidemic risks to avoid blind spots and double-counting (for example, the mortality risk capital requirement could be addressing the same risk as in a pandemic or catastrophe life insurance risk category)
- reviewing correlation and diversification assumptions between risk categories (for example, market risk and mortality pandemic risk could be more correlated than expected)

¹⁶ Insurers have more flexibility to be more precise in capturing various drivers of pandemic risks in an internal model approach to determining regulatory capital requirements. Boumezoued and Titon (2020) describe good practices in such internal models, including allowing for contamination rate, incubation and contagion periods, population density and interaction between age-specific mortality rates, and availability of hospital beds.

- reviewing actual management and risk mitigation actions (for example, vaccine availability and efficacy) to ascertain the credibility of assumed actions in offsetting capital requirements
- specifying more granular capital requirements for mortality risk by geographical regions and age groups (for example, Covid-19 kills more older people than younger ones)

In addition to reviewing capital adequacy frameworks, supervisors may review qualitative requirements relating to own risk and solvency assessment (ORSA) as well as supervisory stress tests. Insurers with significant exposure to pandemics and associated risks can use ORSA to undertake a comprehensive assessment of how relevant risks arising not only from increased mortality but also other risks due to public health safety measures can affect their solvency. From a supervisory standpoint, stress tests that consider all relevant risk factors from a pandemic situation (similar to the SST pandemic scenario described in the box) may be useful to understand potential vulnerabilities of insurers to the next pandemic.

4. Concluding remarks

Capital adequacy frameworks are intended to serve as an early warning tool that supervisors can use to assess how well insurers can continue to honour the obligations to policyholders over the next year or so, under adverse scenarios. It is difficult to ascertain whether the calibration and design of existing capital requirements are appropriate, not least because pandemic risk is mainly captured implicitly (that is, not as a standalone or explicit risk category) in terms of increased mortality. The fact that until now the solvency of insurers has not been severely affected by increased Covid-19 mortality does not necessarily imply that existing regulatory requirements will remain appropriate for future pandemics. As such, it is important to continuously sharpen this tool based on new experience and information, including from real life events such as the Covid-19 pandemic, so that regulatory requirements remain fit for purpose. Nevertheless, the limitations of any such forward-looking quantitative measures must be duly acknowledged as they are based on assumptions and historical data that may not reflect future developments.

Capital adequacy is only one of a range of supervisory tools to assess future solvency of insurers. A sound insurance regulatory framework would consider other measures such as ORSAs that insurers undertake to assess their own capital needs. Other qualitative measures such as governance and enterprise risk management requirements are equally important to guide the business strategy of insurers and signpost risks that they are willing and able to accept, including those arising from future pandemics. Supervisors may similarly take advantage of lessons learnt from this pandemic experience to review such requirements. Ultimately, insurers should run their business in a sound manner, providing crucial insurance coverage against pandemic risks (including mortality risk) while at the same time recognising the need to manage their risk exposures properly. They should consider appropriately diversifying their insurance risks across geographies (in recognition of the limitations arising from a global pandemic) and demographics in order to minimise concentration risk, especially against a global pandemic such as Covid-19.

Insurance supervisors have a critical role to play in supporting the financial resilience of households and businesses against future pandemics. They can do so by establishing appropriate regulatory frameworks that strike the right balance between enabling insurers to provide such coverage viably while at the same time achieving their prudential objectives.

Recalling the title of this Brief, while capital requirements can serve as a “vaccine” for insurers against future pandemic risks, booster shots are probably needed in the form of other regulatory and supervisory tools as deeper understanding and experience are gained from the current Covid-19 pandemic. In other words, supervisors are well advised to continuously review regulatory requirements and adapt supervisory assessment tools to ascertain they remain fit for purpose in the fight against future unexpected, adverse events such as Covid-19.

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