Enhancing the macroprudential dimension of Solvency II

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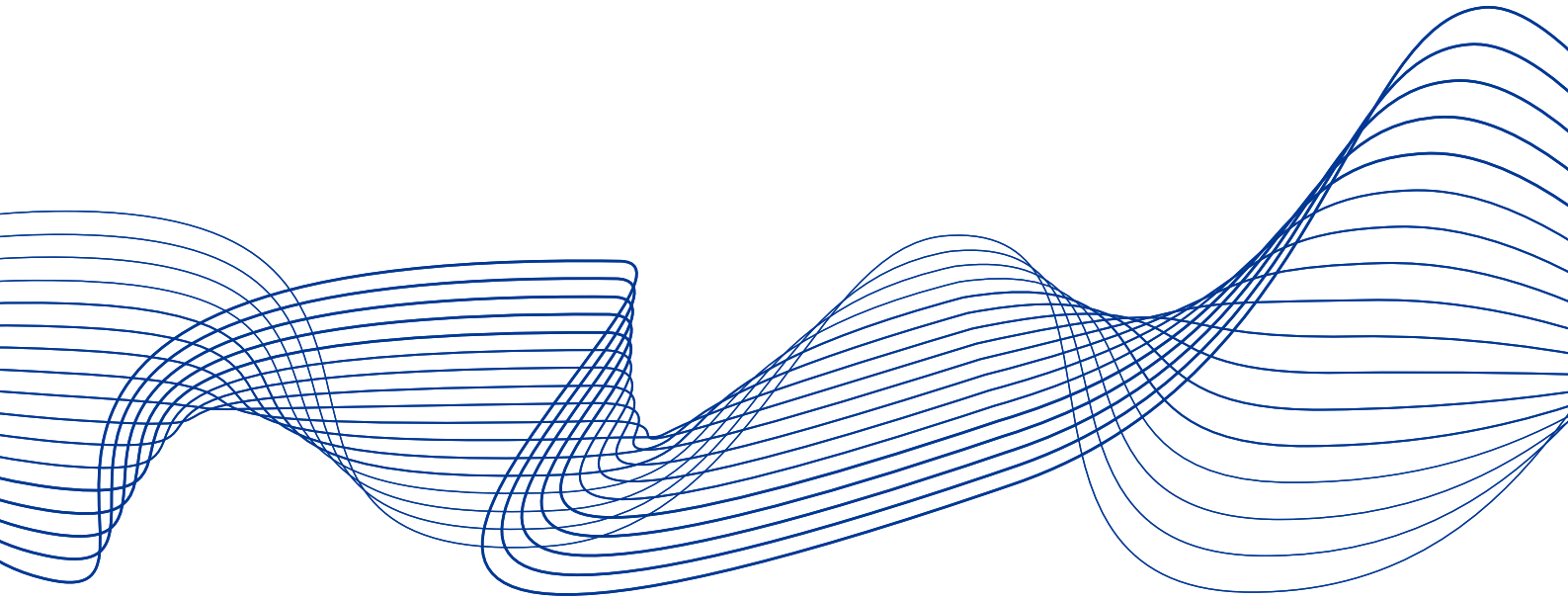

ESRB
European Systemic Risk Board
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Executive summary

This report is intended to inform the review of Solvency II in such a way as to enable it to enhance the regulatory framework for the insurance sector with tools that reflect macroprudential considerations. A previous report produced by the European Systemic Risk Board (ESRB) in 2018 (ESRB, 2018), as well as work by the European Insurance and Occupational Pensions Authority (EIOPA) and other institutions, identified options for provisions, measures and instruments for the insurance sector that would mitigate systemic risk and prevent its transmission to the real economy. The review of Solvency II, which is envisaged to be completed by the end of 2020, provides an opportunity to incorporate this toolkit into legislation. The tools proposed in this report would strengthen the macroprudential dimension of the regulatory framework for insurance. They are a subset of the possible tools identified by the ESRB in 2018. Reflecting the ESRB's cross-sectoral expertise, this subset focuses on those types of risk that are not necessarily specific to the insurance sector and proposes tools adapted to the risk profile and business model of (re)insurers. Some of the more insurance-specific tools identified by the ESRB in 2018 are considered in the EIOPA consultation paper, and the ESRB supports their inclusion in Solvency II.

This report focuses on solvency and liquidity tools aimed at preventing and mitigating procyclicality and horizontal tools for the direct and indirect provision of credit to the economy. Procyclical behaviour can arise when (re)insurers are forced to sell commonly held or correlated assets during times of stress, for instance if they react to market movements or as a result of liquidity needs stemming from the assets or liabilities side of the balance sheet. Procyclical behaviour can contribute to systemic risk. For example, selling specific assets into a falling market could amplify the initial fall in asset prices. Where (re)insurers provide credit to the real economy, such as directly through the origination of loans to households or indirectly through investment in corporate bonds, they are exposed to some of the same risks as banks, and these should therefore be treated in a consistent manner. This report focuses on three types of tool designed to address the above-mentioned sources of risk: i) solvency tools addressing cyclical risks via symmetric adjustments to the solvency requirements of (re)insurers; ii) liquidity tools addressing risks on the assets and liabilities side of the balance sheet; and iii) horizontal tools addressing risks from the direct and indirect provision of credit to the economy. The latter two types in particular provide scope for supervisors to use them in a proportionate manner.

Solvency tools addressing cyclical risks via symmetric adjustments

(Re)insurers are major investors, and the impact of changes in the market value of their investments on their solvency position can lead to procyclical behaviour. With assets of almost €11 trillion, (re)insurers are major investors in Europe. This reflects the nature of their business: they receive premiums up front, invest them in financial assets, and pay claims to policy holders if and when they arise. (Re)insurers may behave in a procyclical manner, for instance when a fall in the value of their assets threatens their solvency position (ESRB, 2015). As incentives to behave in a procyclical manner are more pronounced in a marked-to-market regime, Solvency II includes mechanisms to address procyclical behaviour.

The mechanisms in Solvency II to address procyclical behaviour lack the symmetry needed to build up (re)insurers' resilience during times of excessively rising market prices, and have shortcomings in the way they apply to internal models. This report focuses on how two of the existing mechanisms in Solvency II designed to address procyclical behaviour could be enhanced: the volatility adjustment (VA) and the symmetric adjustment (SA) for equity risk. The volatility adjustment aims to reduce procyclical investment behaviour in respect of (re)insurers' fixed income (e.g. government and corporate bond) portfolios. However, the methodology used results in an adjustment that is almost always positive. This means that during times of excessive price gains, when risk premia on fixed income assets are compressed, (re)insurers are not required to automatically build up a buffer of own funds that would absorb losses when the risk premia reverse. On the contrary, even during such times the volatility adjustment still provides some capital relief, which could lead to (re)insurers being under-capitalised. The symmetric adjustment for equity risk aims to mitigate procyclical investment behaviour by increasing (decreasing) the Solvency Capital Requirement (SCR) for equity risk when equity markets rise (fall). As the this adjustment only applies to equities, this leaves a gap, as other non-fixed income assets held by (re)insurers are not covered by either the symmetric adjustment or the volatility adjustment. The interaction with internal models also has shortcomings for both the volatility adjustment and the symmetric adjustment. For (re)insurers using an internal model, the volatility adjustment not only increases own funds but also decreases the SCR, resulting in double relief and thereby increasing the risk of under-capitalisation. The symmetric adjustment for equity risk does not apply to (re)insurers using an internal model.

Anti-procyclicality mechanisms should be enhanced by making the volatility adjustment symmetric and transparent and by addressing interaction with internal models. Anti-procyclicality mechanisms covering fixed income assets could be enhanced in two ways. First, to ensure that (re)insurers automatically build up a buffer of own funds during periods when risk premia on fixed income assets are compressed, the volatility adjustment should be made symmetric and applied automatically to all (re)insurers. Second, to make the (symmetric) volatility adjustment more transparent and ensure an unbiased valuation of insurance obligations, the (symmetric) volatility adjustment should form an additional own funds item rather than affecting the technical provisions (TPs). Anti-procyclicality mechanisms should apply to (re)insurers calculating their SCR with an internal model, since they cover roughly 40% of (re)insurers' investments: the volatility adjustment should not affect the SCR calculation since it already affects own funds, and internal model users should also be required to adapt the symmetric adjustment for equity risk to their models. More generally, the ESRB also sees merit in applying the symmetric adjustment to other non-fixed income assets, to increase resilience during times of excessive price gains.

Liquidity tools addressing risks arising on the assets and liabilities side

(Re)insurers are less exposed to liquidity risk than banks, but risks can nevertheless arise on both the assets and liabilities side of their balance sheets. In contrast to banks, which engage in liquidity transformation as part of their business model, (re)insurers receive premiums up front and pay out claims if and when they arise. This "reverse production cycle" usually shields the insurance sector from liquidity risk. Depending on the activities individual (re)insurers engage in, liquidity risk can nevertheless arise in some cases. On the assets side of the balance sheet, liquidity risk can arise from the need to pay a variation margin on derivatives positions, including

when derivatives are used for hedging. Analysis of end-2018 Solvency II data indicates that during times of stress, when repo markets might not allow the quick transformation of high-quality securities into cash, some (re)insurers might struggle to meet variation margin calls on their interest rate derivatives positions. On the liabilities side of the balance sheet, liquidity risk can arise when a large number of policy holders simultaneously exercise their option to surrender their policies and redeem their funds from certain insurance-based investment products. Such "mass lapse events" have materialised during past crises at some EU and non-EU insurers, and the intervention of authorities was required to reduce the negative effects.

The provisions for liquidity risks in Solvency II do not specifically address certain types of liquidity risk, such as those that might arise from large variation margin calls or mass lapse events. Solvency II includes a capital charge to cover the risk of mass lapse events. However, there is no quantitative requirement under Pillar 1 to ensure that assets are sufficiently liquid to allow the payment of surrender values and that (re)insurers hold enough cash or cashable assets to meet variation margin calls. In addition, the quantitative reporting templates of Solvency II provide little information on the likelihood of liquidity risk arising from certain insurance liabilities or how quickly this could take place. Liquidity risk is however embedded in the Pillar 2 requirements of Solvency II and the EIOPA guidelines on the system of governance call for short and medium-term liquidity needs to be included in in (re)insurers' risk management policy, including via an institution-specific liquidity buffer.

The framework for liquidity risk should be enhanced through (i) better reporting and measurement, (ii) stress-testing requirements, and (iii) Pillar 2 provisions enabling supervisors to set up liquidity buffers. There are three ways in which Solvency II should be enhanced to better account for liquidity risk. First, the information contained in the Solvency II quantitative reporting templates should be enhanced to enable supervisors to better assess the liquidity needs stemming from (re)insurers' liabilities. To illustrate the usefulness of such enhanced reporting, this report sets out simple liquidity indicators that compare surrender values with the stock of high-quality liquid assets (HQLA). These indicators could help assess liquidity risks at entity, country and EU level. Second, the Solvency II provisions on managing liquidity risk should be reinforced, in particular with a requirement for (re)insurers to perform internal stress testing. This should be complemented by supervisory stress tests that incorporate liquidity risk. Third, the Pillar 2 provisions in Solvency II should be enhanced to enable supervisors to require individual (re)insurers with a vulnerable liquidity profile to hold a liquidity buffer. To ensure consistent application across jurisdictions, this calls for common definitions of liquidity needs and liquidity sources. Such provisions would also anticipate the policy options set out in a recent report produced by the ESRB (ESRB, 2020), which considered whether financial institutions that use derivatives should be required to hold a cash buffer to meet variation margin calls.

Horizontal tools addressing risks stemming from the direct and indirect provision of credit to the economy

(Re)insurers may engage in activities that are typically associated with banks, such as the direct and indirect provision of credit to the real economy. Loans are usually originated by banks. In some Member States, however, notably the Netherlands and Germany, (re)insurers have a long tradition of providing residential mortgage loans to households. In the Netherlands, for

example, about 20% of new mortgages are originated by the insurance sector. (Re)insurers also provide loans to non-financial corporations, and on a more general level provide credit indirectly through their investments in corporate bonds.

The way in which the direct and indirect provision of credit is treated in Solvency II can create incentives for regulatory arbitrage and reduce the effectiveness of macroprudential measures. Different risk-bearing capacities between banks and (re)insurers can mean that the same credit risk is reflected in different capital requirements. When these differences become large, they can provide incentives for regulatory arbitrage. For example, in the case of a (re)insurer the loss given default (LGD) and thus the capital requirement for a residential mortgage loan that is less than 80% of the risk-adjusted value of the collateral can be zero. In contrast, the minimum capital requirement for the same loan made by a bank might be between 8% and 25% of risk-weighted assets. Differences in the way in which the provision of credit is treated in banking and insurance regulation can also reduce the effectiveness of macroprudential measures. For example, while credit provided by banks through loans falls within the scope of macroprudential measures for the banking sector, there is no corresponding toolkit for credit provided indirectly by (re)insurers through the purchase of corporate bonds.

The treatment of credit provision should be enhanced through capital-based tools for (sub-) sectoral exposures and by bringing (re)insurers within the scope of borrower-based tools. Capital-based tools would be at the discretion of authorities, which should have the power to set additional capital requirements to increase (re)insurers' resilience to systemic risk stemming from a specific sector or sub-sector. As a minimum, these capital-based tools should be able to target the following sectors: residential real estate, commercial real estate and legal persons such as non-financial corporations (NFCs). The proposed capital-based tools consist of two measures. First, an LGD floor should be introduced for residential mortgages to correct the inconsistency in microprudential capital requirements between the insurance and the banking frameworks, while at the same time recognising the different risk-bearing capacities of (re)insurers. This floor should be calibrated to meet the requirements of Solvency II under the SCR standard formula. Enabling authorities to increase this floor during times of excessive price gains in the residential real estate sector, as is the case in the banking sector, would make (re)insurers more resilient to future adverse developments. Second, a systemic risk buffer should be adapted to the insurance regulatory framework to allow targeting of sectoral and sub-sectoral exposures that could lead to systemic risk. This would increase the resilience of (re)insurers to risks that are not captured by the SCR standard formula and that also might not be reflected in internal models. In addition to capital-based tools, (re)insurers should also be brought within the scope of borrower-based measures to ensure consistency in the treatment of borrower credit risk and in the application of macroprudential policy. Finally, authorities should be granted the power to impose public disclosure of certain exposures, thereby incentivising market discipline.

Introduction

(Re)insurers provide a necessary service for the functioning of the economy, contributing to economic growth and financial stability. By pooling risks that would be unsustainable at an individual level, (re)insurers help mitigate the financial consequences when such risks materialise, thereby contributing to economic growth and financial stability. (Re)insurers also mobilise and invest households' savings. This provides households with a source of future income and helps fund the economy, with close to €11 trillion of assets under management as at the end of 2018.

There is a growing consensus that (re)insurance can contribute to systemic risks, for example via the withdrawal or failure of (re)insurance services and via contagion. A previous report produced by the ESRB (ESRB, 2018) described how the insurance sector can contribute to systemic risks by identifying two key systemic risk types for (re)insurance: systematic withdrawal or failure of (re)insurance services and contagion (both direct and indirect). Other institutions, including EIOPA in its work on macroprudential policy for insurance and the International Association of Insurance Supervisors (IAIS) in its work on a holistic framework for systemic risk in the insurance sector, have arrived at similar conclusions. See for instance EIOPA (2018d) and IAIS (2019).

To mitigate systemic risk, the macroprudential dimension of the regulatory framework for insurance needs to be strengthened. Solvency II helps make individual (re)insurers safer. Some of its provisions also address macroprudential concerns. This includes the volatility adjustment and the symmetric adjustment for equity risk, which both target procyclical investment behaviour. Solvency II was not specifically designed to address systemic risk, however, and lacks the completeness and consistency of a macroprudential framework. Given the importance of the insurance sector for the functioning of the economy, the macroprudential dimension of Solvency II needs to be strengthened.

The ongoing review of Solvency II provides an opportunity to strengthen its macroprudential dimension, and this report is designed to inform that review. The review of Solvency II is scheduled to be completed by the end of 2020 and will also take financial stability considerations into account. In particular, Article 77f of Directive 2014/51/EU (Omnibus II) amending Directive 2009/138/EC (Solvency II) highlights the financial stability dimension of long-term guarantees measures and of the measures on equity risk. The review thus provides an opportunity to strengthen the macroprudential aspects of Solvency II.

The tools proposed in this report are a subset of the broader set of tools identified by the ESRB in 2018. Reflecting the ESRB's cross-sectoral expertise, this report focuses on tools intended to address those types of risk that are not necessarily specific to the insurance sector, but in a way that reflects the risk profile and business model of (re)insurers. Some of the more insurance-specific tools identified in ESRB (2018) are considered in the EIOPA consultation paper on the Solvency II review.

This report focuses on solvency and liquidity tools aimed at preventing and mitigating procyclicality and on horizontal tools for the direct and indirect provision of credit to the economy. Procyclical behaviour can arise when (re)insurers are forced to sell commonly held or

correlated assets during times of stress, for instance if (re)insurers react to market movements or as a result of liquidity needs stemming from the assets or liabilities side of the balance sheet. Where (re)insurers provide credit to the real economy, such as directly through the origination of loans to households or indirectly through investments in corporate bonds, they are exposed to some of the same risks as banks, and these should therefore be treated in a consistent manner to avoid regulatory arbitrage and/or ensure the effectiveness of macroprudential measures across sectors. Liquidity and horizontal tools in particular provide scope for supervisors to use them in a proportionate manner.

The remainder of this report expands on three areas in which the macroprudential dimension of Solvency II could be enhanced. Section 1 sets out solvency tools addressing cyclical risks via symmetric adjustments to the solvency requirements of (re)insurers. Section 2 sets out liquidity tools addressing risks arising from the assets and liabilities side of (re)insurers' balance sheets. Section 3 sets out horizontal tools addressing risks stemming from the direct and indirect provision of credit to the economy. The final section sets out the conclusions of the report. The annexes provide more detailed information on each of the risks and tools identified and proposed in this report.

1 Solvency tools addressing cyclical risks via symmetric adjustments

(Re)insurers may react to market movements in a procyclical manner. The investment strategy of (re)insurers is typically liability-driven: (re)insurers aim to match the expected cash flows stemming from their liabilities with asset cash flows. Other factors also play a role in the investment strategy of (re)insurers, such as their risk appetite (which can also be driven by liabilities, for instance where insurers have guaranteed the return on investments to policyholders) or regulatory requirements, particularly in a marked-to-market regime. (Re)insurers therefore react to market movements. This can have a stabilising effect, but in some cases can also amplify market movements. ESRB (2018) describes in detail how such amplifying effects can occur when markets fall and when markets rise. For example, when asset prices fall sharply, (re)insurers might sell those assets to protect their solvency position against further falls. And when asset prices increase, (re)insurers' risk appetite might induce them to purchase those assets and contribute to a compression of risk premia.

Solvency II may incentivise procyclical investment behaviour because it is a marked-to-market regime. The benefits of a marked-to-market regime are numerous: risks are immediately visible on the balance sheet, for example, and it is understandable to all market participants. However, it may incentivise (re)insurers to react to market movements. In particular, the combination of assets assessed under the transfer value concept and the SCR, which is risk-sensitive, might incentivise procyclical investment behaviour.[1]

One way of reducing incentives for procyclical investment behaviour is to use symmetric adjustments to the solvency position of financial institutions. Symmetric adjustments are designed to affect the solvency position of (re)insurers in a countercyclical manner. When market prices rise, symmetric adjustments would tighten regulatory requirements in order to increase resilience against future market falls and reduce incentives to build up exposure. When market prices fall, symmetric adjustments would lessen regulatory requirements in order to reduce pressure on the solvency of (re)insurers. Please refer to ESRB (2018) for further explanations of the rationale behind the use of such tools and how they can help mitigate procyclical investment behaviour.

Symmetric adjustments introduce a deviation from market-consistent valuation and can contribute to systemic risk if not properly calibrated. There is a trade-off between risk-correcting measures that mitigate procyclical behaviour by affecting regulatory requirements and potentially systematic under-reserving or under-capitalisation due to a deviation from market-consistent valuation. If they are not properly calibrated, symmetric adjustments could excessively delay reasonable adjustments to the investment portfolio. In particular, if symmetric adjustments are calibrated such that they provide excessive relief when markets fall, this could lead to industry-wide under-reserving or under-capitalisation, which can also contribute to systemic risk.

[1] Numerous research papers link marked-to-market regulatory balance sheets to procyclical behaviour, even though the empirical evidence is not fully conclusive. For references, see ESRB (2018); Fache Rousová and Giuzio (2019); and Landau (2009).

This section starts by conceptualising the key features of symmetric adjustments under Solvency II, and then applies these design choices to spread, equity and interest rate risks. It also reviews the existing adjustments and proposes ways to improve them. It also reviews how internal models treat the existing mechanisms and how these could be improved.

1.1 Principles behind the design of symmetric adjustments under Solvency II

1.1.1 Generic features

There are several options when designing symmetric adjustments; this section defines the generic features that symmetric adjustments should follow. The key generic features identified are (1) the comparison with the average (baseline formula); (2) the link with the SCR structure; (3) where symmetric adjustments should be applied on the Solvency II balance sheet; (4) the period of time over which the average should be calculated; (5) the portfolios used to calibrate symmetric adjustments; (6) the permanence of adjustments. To ensure their efficiency and avoid capital optimisation, symmetric adjustments should be applied automatically rather than being at the discretion of (re)insurers.

Baseline formula

Symmetric adjustments are calculated by comparing the value of an asset class with its average and taking a portion of this difference:

$$SA = \beta \cdot \left(\frac{CI - AI}{AI}\right) \quad (1)$$

where:

- β denotes an adjustment factor between 0 and 1 that reflects the portion of the difference taken in the symmetric adjustment
- *CI* denotes the current level of the asset class
- *AI* denotes the weighted average of the daily levels of the asset class over a certain period of time

This allows the adjustment to be symmetric. Adjustments can be applied to different items on the Solvency II balance sheet, including the SCR. This can lead to slight modifications of the baseline formula. The factor β is ½ in the case of the existing symmetric adjustment for equity risk, but a different factor could be chosen. ½ appears to be a good compromise between maintaining sufficient sensitivity to changes in market values and reducing procyclical behaviour incentives. For illustration purposes, β is set at ½ in the rest of the report.

Symmetric adjustments should follow the SCR structure of Solvency II

For assets other than fixed income, such as equity, symmetric adjustments should be based on the direct change in the value of these assets, in line with the way the SCR is calculated. The existing symmetric adjustment for equity risk is determined on the basis of the change in the value of an equity index. This is consistent with the way the SCR for such asset classes is calculated.

Fixed income assets contribute to the SCR for both interest rate risk and spread risk, so potential symmetric adjustments for these assets should target these two underlying risk factors separately. Bonds in particular, but also loans and securitisations, are within the scope of the sub-modules for interest rate risk and spread risk. This is a way for Solvency II to incentivise the matching of liability cash flows with cash flows from fixed income instruments, which are more certain than cash flows from other asset classes such as equity or property. Symmetric adjustments for fixed income assets should follow this split and separate changes in the value of assets due to changes in interest rates from changes in value due to changes in spreads.

Box 1
SCR standard formula principles

The SCR corresponds to the 99.5% Value at Risk of the variation of own funds of (re)insurers over a one-year period. In concrete terms, (re)insurers must first simulate what their balance sheet would look like in a year's time, following the specifications provided for under the standard formula in Solvency II. These specifications ensure that the confidence level of 99.5% is reached: they enable (re)insurers to simulate extreme events. The effect of these extreme events is reflected on the stressed balance sheet, since items are valued on a transfer value basis. The SCR is then calculated as the difference between own funds on the starting balance sheet and own funds on the stressed balance sheet.

The standard formula follows a modular approach that defines several risk factors. Calculation of the stressed balance sheet is carried out on a module-by-module basis. In practice, an SCR is calculated for each risk factor. The final SCR is calculated from these intermediate results via a formula which also accounts for diversification benefits.

The market risk module is subdivided into sub-modules, which cover risks stemming from:

- changes in the term structure of interest rates;
- changes in the level of credit spreads over the risk-free interest rate term structure;
- changes in the level of market prices of equities;
- changes in the level of market prices of real estate;
- changes in the level of currency exchange rates;
- a lack of diversification in the asset portfolio or from a large exposure to a single issuer of securities or a group of related issuers.

Symmetric adjustments avoiding procyclical behaviour should follow the same modular structure as the market risk module. Procyclical behaviour could be triggered by changes in any of the above risk factors. To ensure that symmetric adjustments are consistent with the Solvency II framework, one can follow the modular structure of the SCR standard formula. In practice, symmetric adjustments make sense where there is a risk of procyclical behaviour. This section focuses on equity, interest rate and spread risks.

Symmetric adjustments should be applied to the SCR or to own funds

Symmetric adjustments should affect the solvency ratio via either the SCR or own funds. The mechanism of symmetric adjustments is to tighten up or release the solvency position, in conjunction with changes in the value of assets and in the opposite direction. For that purpose, one can modify either the SCR or own funds.

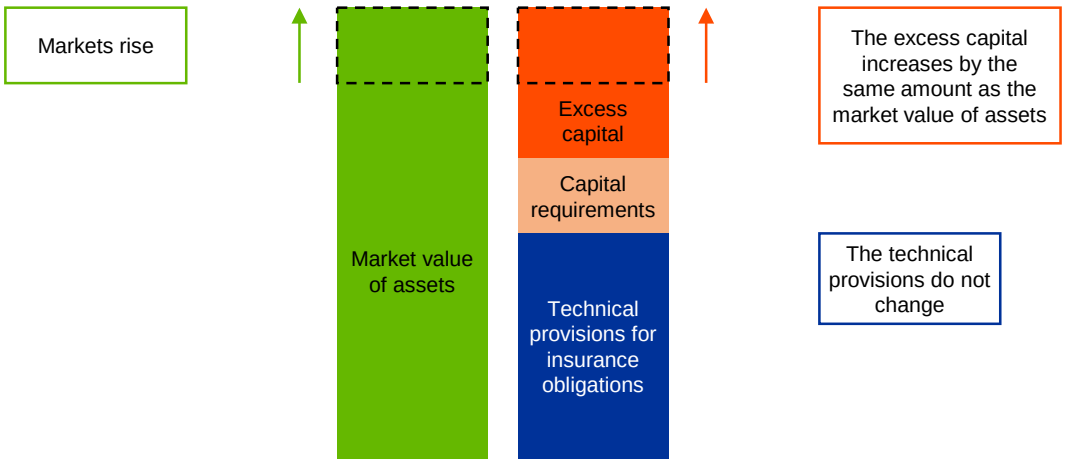
A symmetric adjustment to own funds could be applied to liabilities, assets or as an additional own funds item. In the Solvency II balance sheet, adjusting assets, liabilities or own funds directly has an equivalent end result. This is because the excess of assets over liabilities contributes to own funds via the reconciliation reserve.

A symmetric adjustment applied to liabilities decreases transparency and efficiency. It should instead be applied to assets or as an additional own funds item. The change in the value of assets is the trigger event for the potential procyclical behaviour, so adjusting assets is therefore the most straightforward option. An additional own funds item would have the benefit of keeping the Solvency II balance sheet unchanged. Adjusting liabilities is a less transparent option, as it makes comparing different (re)insurers more complex. This is particularly true for liabilities with options and guarantees which are not replicable using available financial instruments. Adjusting liabilities is also less efficient because it has unintended side effects. For instance, the discount rate of liabilities is also partly used to model future asset returns, which could be biased where the discount rate deviates from market consistency. An additional approach to ensure transparency would be to require (re)insurers to disclose their solvency position with and without the symmetric adjustment. Figures 1 to 5 below illustrate where symmetric adjustments could be applied under Solvency II.

Figure 1

Option 1: No symmetric adjustment

(stylised example)



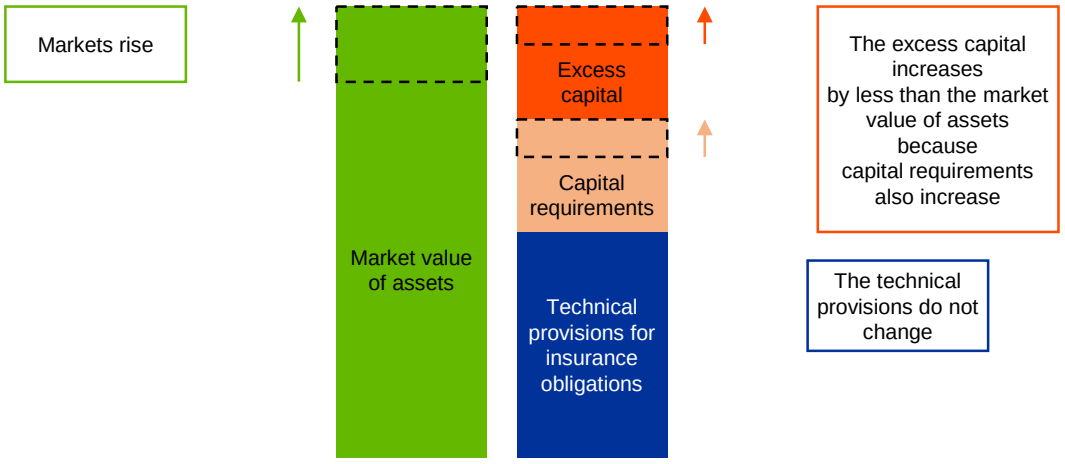
Source: ESRB.

Notes: In reality, even in the absence of a symmetric adjustment, the technical provisions could change due to a change in the market value of assets, for instance where the change in the market value of assets is due to a change in the risk-free interest rate term structure. This could also be the case where the insurance liabilities include a profit participation mechanism that distributes part of the investment return to policyholders. This applies to the other figures below. In addition, where the volatility adjustment applies, an increase in the market value of fixed income assets would lead to a decrease in the volatility adjustment and hence an increase in the technical provisions. In other words, the relief provided by the volatility adjustment is smaller in such cases.

Figure 2

Option 2: symmetric adjustment to capital requirements

(stylised example)

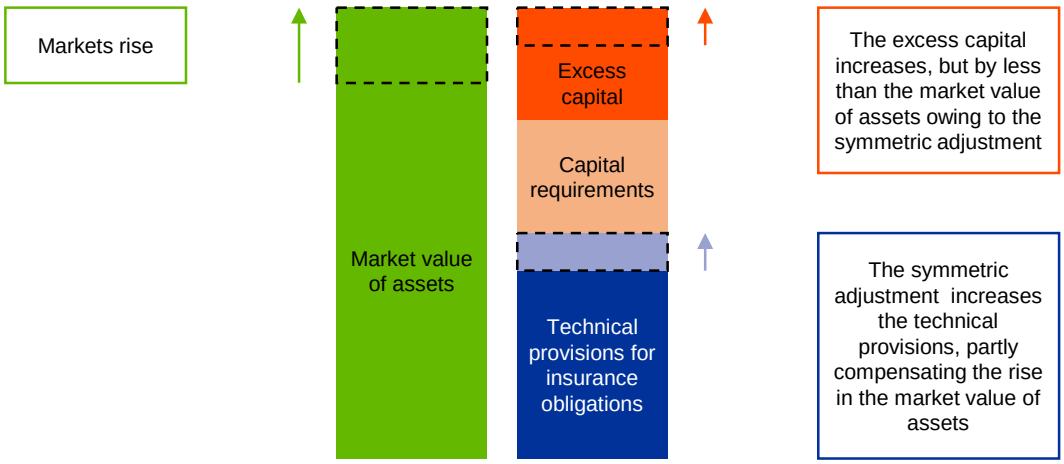


Source: ESRB.

Figure 3

Option 3: symmetric adjustment to liabilities

(stylised example)

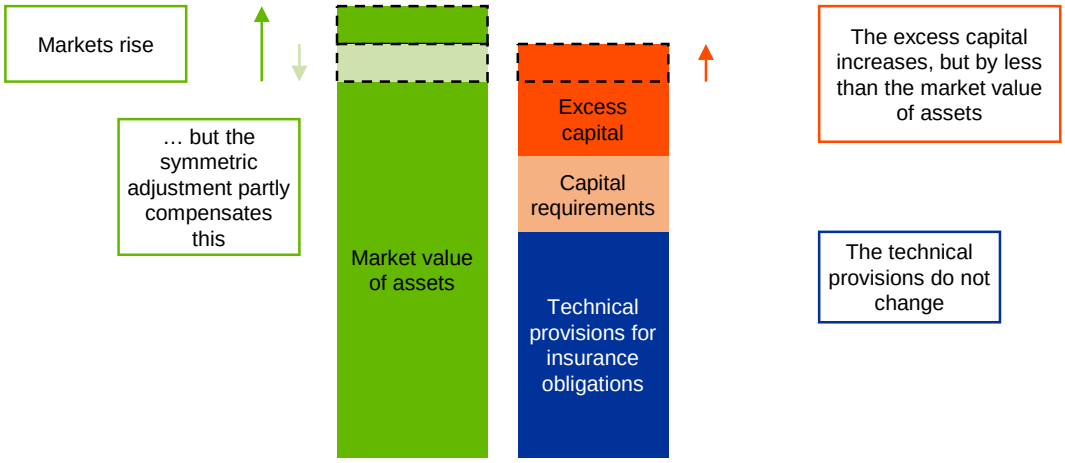


Source: ESRB.

Figure 4

Option 4: symmetric adjustment to assets

(stylised example)

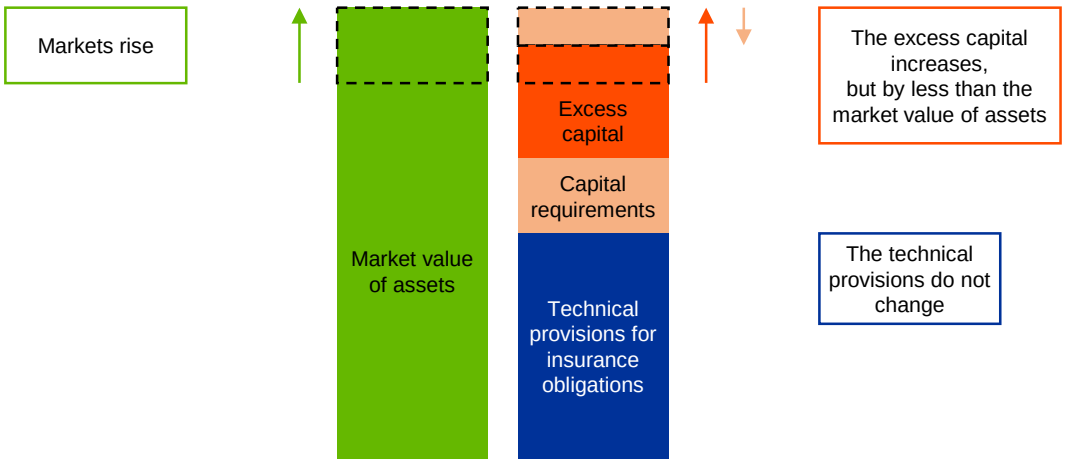


Source: ESRB.

Figure 5

Option 5: symmetric adjustment to own funds

(stylised example)



Source: ESRB Secretariat.

Period of time over which the average should be calculated

The mechanism of symmetric adjustments relies on a comparison between the current market value of assets and its average over a certain period. When the value of an asset deviates from its average, the symmetric adjustment is triggered and slows down the effect of the change in the value of the asset, which should avoid a procyclical reaction by (re)insurers. Assuming the asset value will subsequently remain constant, the average will slowly converge towards the new asset value, hence reducing the effect of the symmetric adjustment. Different rationales can be used to estimate this time period, such as estimating the length of the asset cycles, calculating the mean reversion process or using historical data to derive the length of crises. The deviation of the current market value can in theory be calculated as the deviation from fundamental mean values. In practice, however, this approach is difficult to implement since there are uncertainties regarding the time-varying length of fundamental mean values. An alternative approach (used for the existing symmetric adjustment for equity risk) is to calculate a moving average. It is therefore straightforward to calculate the adjustment, but harder to give an economic interpretation. The calibration is then based on other criteria such as the one set out in the paragraph below.

The time period over which the average is calculated is the time estimated to be sufficient for (re)insurers to adapt to the new situation. If the average is calculated over a one-year time period, this means that the solvency ratio will take full account of the new asset value after one year. In other words, (re)insurers would have one year to adapt to the new situation. The time period should therefore be long enough to avoid procyclical behaviour, but short enough to provide good risk management incentives and incentivise (re)insurers to adapt to the new situation.

Portfolios to calibrate symmetric adjustments

The average value of the assets against which the current market value is compared should be calculated on the basis of a portfolio that is representative of the assets held by (re)insurers. It is possible to take individual assets and calculate their average to produce an asset-specific symmetric adjustment, which has the advantage of perfectly matching the situation of individual (re)insurers. However, this makes the mechanism more complex and may incentivise risky behaviour by (re)insurers, who could try to optimise their asset portfolio in order to maximise the symmetric adjustment. Basing symmetric adjustments on a portfolio that is representative of the assets held by (re)insurers eliminates this risk. It does entail a basis risk, however, since the assets of an individual (re)insurer may differ from the assets used in the index, meaning that the value of the assets held by the (re)insurer might not change to the same extent as the value of the assets in the representative portfolio. These effects are referred to as under/overshooting effects. See also Box B on the volatility adjustment.

The portfolio can be country-specific, currency-specific or region (EU)-specific. The basis risk explained above may be irrelevant in cases where all assets, whether in the portfolio or not, would behave in a similar manner in periods of excessive valuation. In practice, evidence shows that there are still differences across EU Member States, for instance due to differences in market structure or in the products offered in each market, This gives rise to two main difficulties. The first is the currency mismatch it might create: the value of assets denominated in a given currency might behave differently from the value of assets denominated in a different currency. (Re)insurers need to match the currency of their assets with that of their liabilities. There is little room for a diversified portfolio unless they hedge their currency exposure with derivatives, which creates other types of risk (see Section 2). The second difficulty is the home bias that may be observed for certain asset classes. The value of assets in a given country may behave differently from that of assets in a different country. If these two countries use the same currency, the differences can be expected to be smaller and (re)insurers are able to diversify their portfolio easily. The appropriate choice between a country-specific, currency-specific or EU-specific index may differ according to the market structure and relative asset class.

Symmetric adjustments should be permanent

Symmetric adjustments should be permanent adjustments to smooth the transition between cycles. Symmetric adjustments can either be in place permanently or activated only when certain triggers are met. Procyclical behaviour that creates a risk to financial stability can be considered to occur only where the value of assets deviates significantly from its average. In such cases, a corridor can be specified outside which the symmetric adjustment would be activated. Inside this corridor the symmetric adjustment would be set to zero, as there would be no requirement to mitigate procyclical behaviour. The alternative is to have a symmetric adjustment which would always be non-zero (apart from in cases where the value of assets is exactly in line with the average). This would avoid creating a cliff effect and would simplify the whole mechanism, as a trigger would no longer be needed. From an economic point of view, a permanent symmetric adjustment of this kind helps to smooth the transition between cycles.

1.1.2 Applying the generic features to (re)insurers' asset classes

Symmetric adjustments could in principle cover all of (re)insurers' asset classes by being applied either to the SCR or to own funds. Table 1 provides an overview of the asset classes of (re)insurers in the European Economic Area (EEA) and the type of symmetric adjustments that could apply.

For assets subject to spread risk, Solvency II defines a volatility adjustment that could be transformed into a symmetric volatility adjustment. Box 2 provides a description of the volatility adjustment. Section 1.2 suggests improvements to the volatility adjustment. An alternative approach would be to introduce a symmetric adjustment to the SCR for spread risk. The pros and cons are discussed below.

For assets subject to equity risk, Solvency II defines a symmetric adjustment for equity risk. Once symmetric adjustments cover the fixed income and equity portfolio, most of (re)insurers' balance sheets would be captured. There are other asset classes, such as real estate, which could also be subject to a symmetric adjustment if (re)insurers also behaved in a procyclical manner towards them. This report does not develop such proposals any further, and they would benefit from further analysis.

Table 1
(Re)insurers' asset classes and possible symmetric adjustments

(weights expressed as a percentage of total assets)

Asset class	Weight	Treatment suggested
Corporate bonds	32.6%	Symmetric VA/SA for spread risk
Government bonds	31.5%	Symmetric VA
Mortgages and loans	5.6%	Symmetric VA/SA for spread risk
Structured notes	1.2%	Symmetric VA/SA for spread risk
Collateralised securities	0.8%	Symmetric VA/SA for spread risk
Equity	15.2%	SA for equity risk
Property	2.4%	SA for property risk
Collective investments	5.5%	Look-through approach
Cash and deposits	4.8%	N/A
Other investments	0.4%	Look-through approach

Source: Solvency II quantitative reporting templates.
Reporting reference date: fourth quarter of 2018.

Assets subject to spread risk

A symmetric adjustment for spread risk should cover both corporate and government fixed income portfolios. (Re)insurers are significant buyers of fixed income instruments, as they enable them to match the cash flows of their liabilities with greater certainty than other asset classes such as equities or real estate. In the EEA, (re)insurers hold around €3.5 trillion of government bonds

and €3.6 trillion of corporate bonds, representing around 32% and 33% of total insurance assets respectively. Procyclicality should be mitigated in both of these asset classes, so a symmetric adjustment for spread risk should cover them both.

The natural choice would be to apply a symmetric adjustment to the SCR for spread risk, but there is no capital charge for spread risk for EU government bonds. In the standard formula at least, Solvency II stipulates that there should be no capital requirements for spread risk for EU government bonds issued in the currency of their central governments (as is the case in other EU financial frameworks). This means that a symmetric adjustment to the SCR for spread risk would only mitigate procyclical behaviour in respect of corporate bonds. There are therefore two options.

The first option would be to split the symmetric adjustment for spread risk, applying it to the SCR for corporate bonds and to the balance sheet for government bonds. One advantage of this approach is that it would produce different calibrations of the main parameters (length of average, corridor, value of adjustment) that would then fit the risk profile of each asset class. However, this would ignore the effect that one asset class has on the other. In addition, the existing Solvency II mechanism designed to mitigate procyclical investment behaviour in respect of fixed income assets, namely the volatility adjustment, applies to both government and corporate bonds. It would therefore be necessary to split the existing volatility adjustment by (i) removing all corporate assets from the volatility adjustment and applying the symmetric adjustment to the SCR for spread risk to them, and (ii) retaining only government bonds in the volatility adjustment and transforming it into a symmetric volatility adjustment.

The second option would be to transform the volatility adjustment into a symmetric volatility adjustment. This would be the most straightforward option. One disadvantage is that symmetric adjustments for other risks apply more to the SCR: the diversity of adjustments makes them less transparent and understandable.

Both options are described in more detail in this report. Although the report concludes that it is preferable to transform the volatility adjustment into a symmetric volatility adjustment, it still provides a description of what a symmetric adjustment to the SCR for spread risk would look like. In doing so it informs policymakers of all possible options.

1.2 Symmetric volatility adjustment

This section proposes how to correct the lack of symmetry in the calculation of the volatility adjustment. Correcting the lack of symmetry in the volatility adjustment does not correct all deficiencies identified, such as basis risk (which leads to under/overshooting effects) and problems related to the timely activation of country components, which may also have an impact on (re)insurers' investment behaviour. This section also discusses how the new symmetric volatility adjustment could be combined with other elements of the volatility adjustment which are being reviewed by EIOPA and the European Commission, such as under/overshooting effects and how they could be minimised. Box 2 below presents the main characteristics of the volatility adjustment as currently defined in Solvency II.

Box 2
Volatility adjustment

The volatility adjustment aims to prevent procyclical investment behaviour by dampening the impact of market volatility stemming from changes in credit spreads on the Solvency II balance sheet. As balance sheets under Solvency II are based on market values, movements in government and corporate bond spreads automatically result in changes in the value of (re)insurers' bond portfolios. On the other side of the balance sheet, liabilities, particularly those with a long duration, may not necessarily fall due at times when bond values decrease. This means that (re)insurers do not necessarily need to sell assets at distress prices, although such selling could still happen. The volatility adjustment aims to dampen the impact of spread movements on the valuation of assets. It does this by adding part of the spread to the risk-free interest rate term structure, used to discount the expected future insurance cash flows.

The volatility adjustment is calculated by jointly computing the average spread at currency level and the average spread at country level. The spreads are calculated as the difference between the return rate of a reference portfolio, representing the investments of European insurance companies in both government and corporate bonds (including loans and securitizations), and the corresponding rate on the swap curve.

$$VA = 65\% * \left[RC_{currency} + \max\left\{RC_{country} - 2 * RC_{currency}\ ; 0\right\}\right] \quad (2)$$

where

- RCcountry (risk correction) > 100 basis points[2].
- The risk correction, measured as 30% or 35% of the 30-year average of government and corporate spreads respectively, is subtracted from the spreads. The resulting risk-corrected spread is multiplied by an application ratio of 65%, meaning that the volatility adjustment is equal to 65% of the risk-corrected spread.
- The reference portfolio, which is set annually by EIOPA, currently comprises 31% European government securities and 40% corporate bonds, set at the end of 2018. The country-specific component is based on a portfolio that is representative of each country's domestic market. It is only used to calculate the volatility adjustment in the event of exceptionally large increases in spreads that activate both the triggers set in the formula: to date it has been triggered in Greece (up to August 2016) and in Italy (in August, October and November 2018).

While the volatility adjustment could reduce the likelihood of fire sales by (re)insurers and their consequences for solvency positions, its current design may entail the risk of under-reserving and under-capitalisation (ESRB, 2018). The current volatility adjustment is designed in such a way that it remains mainly positive. The volatility adjustment mildly increases own funds and

[2] Co-legislators have agreed to lower the country trigger to 85 basis points, having assessed that a trigger of 100 basis points did not allow sufficiently frequent activation to mitigate procyclical investment behaviour.

hence the solvency position of (re)insurers in times of low spreads, while it strongly increases the solvency position of (re)insurers in times of high spreads (especially (re)insurers with long duration of liabilities). The volatility adjustment therefore results in quasi-permanent capital relief, the amount of which depends on the level of the volatility adjustment. In the event of prolonged periods of high spreads, the volatility adjustment actually leads to a permanent overestimation of the solvency position. This could have unintended consequences, as (re)insurers might not be incentivised to take steps to improve their financial position. To date, negative values have seldom occurred, as this would require spreads to be exceptionally low. Non-euro countries such as Bulgaria, Croatia, Iceland, Liechtenstein, Romania and Switzerland have experienced negative volatility adjustment values, especially Bulgaria which had a negative volatility adjustment value for almost two years (from June 2017 until April 2019). The asymmetry is greater for the country component of the volatility adjustment, which is activated when country spreads rise above a certain threshold.[3]

The volatility adjustment entails a basis risk, since it is not an entity-specific measure. The reference portfolio is representative of the weighted portfolio of assets held by European (re)insurers. An average currency spread implies that the measure only works well for those firms which exhibit a risk profile similar to that of the representative portfolio (duration and average credit standing aligned), while those firms which may deviate from the specific assets of the representative portfolio are exposed to a degree of basis risk. In the case of a high level of bond spreads, the solvency position of (re)insurers may improve. However, the level of the volatility adjustment would not reflect the level of bond spreads held by some (re)insurers with a different asset portfolio. This may lead to counterintuitive results such as the emergence of gains in periods of stress, known as overshooting[4]. The current adjustment uses the same amount for the whole market and is applied independently from the characteristics of the assets and liabilities of individual (re)insurers.

The under/overshooting effect is caused by three factors:

1. Mismatch in the duration of assets and liabilities: a company whose liabilities have a longer duration than that of its asset portfolio may benefit from overshooting effects (longer durations imply greater sensitivity of investments to interest rate risk, while shorter durations tend to immunise against this risk).

2. Difference in asset class allocation between the representative portfolios used by EIOPA to calculate the volatility adjustment and the specific portfolios of (re)insurers. For the euro, the representative portfolio comprises about 70% bonds (government and corporate): a (re)insurer with a bond component of less than 70% may have overshooting effects, and vice versa.

[3] Experience has also shown that it can be difficult to achieve the two conditions for triggering the country component (i.e. country risk-adjusted spread above 100 basis points and equal to at least twice the corresponding currency spread).

[4] Overshooting occurs when losses on the asset side caused by increases in credit spreads are more than offset by the increase in the volatility adjustment and therefore by the reduction in the relative technical provisions (typically for companies with little exposure to market spread risk and long liabilities). Similarly, some companies are regularly affected by undershooting because the benefit of reducing liabilities due to an increase in the volatility adjustment is less than the absolute value of the reduction in the value of activities (in the case of Italian companies).

3. Within a (re)insurer's bond portfolio, deviations from the representative portfolio in terms of both the duration and the credit standing of the issuers may determine under/overshooting effects.

The triggering of the country-specific component of the volatility adjustment entails cliff effects and might be activated too late. When country-specific spreads increase by more than currency spreads, and until the country component of the volatility adjustment is activated, the increase in the currency component is not sufficient to offset the decrease in the value of the assets of companies in the affected country, preventing the volatility adjustment from achieving its objective of preventing procyclical investment behaviour. In addition, when the domestic component is activated (re)insurers are exposed to further volatility in the value of own funds due to a cliff effect. If the country's spread fluctuates around the activation threshold for a prolonged period, the uncertainty regarding activation of the national component of the volatility adjustment results in uncertainty in the valuation of liabilities. This can also lead to further relative volatility in own funds and solvency ratios.

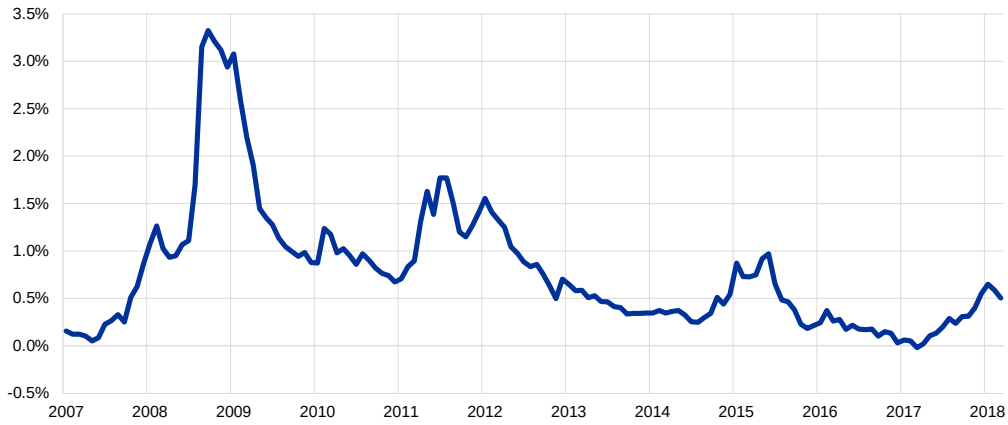
1.2.1 Lack of symmetry

Under the current methodology the volatility adjustment is almost always positive and thus almost always results in an increase in own funds. The volatility adjustment is designed to provide relief to (re)insurers corresponding to the portion of the spread that is assumed to be an "exaggeration". This exaggeration is measured by first correcting the spread for the risk of default (referred to as the risk correction) and obtaining the risk-corrected spread, then taking 65% of the risk-corrected spread. The risk-corrected spread is almost always positive because of the way the risk correction is calculated: it corresponds to 30% (35%) of the average of government (corporate) credit spreads over the last 30 years. This risk correction is almost always smaller than current credit spreads, which implies that (re)insurers are hardly ever confronted with a negative volatility adjustment and are therefore not required to build resilience (i.e. own funds) when spreads are low (in "good times"). Indeed, this was not the rationale behind the introduction of the volatility adjustment. In prolonged periods of high spreads, the volatility adjustment leads to permanent overestimation of the solvency position. Chart 1 shows the volatility adjustment for euro BBB-rated bonds over the period from 1998 to 2017 and confirms that the volatility adjustment is usually – in this case always – positive.

Chart 1

Volatility adjustment for euro BBB-rated corporate bonds

(in percentages)



Source: ESRB calculations.
Notes: This chart shows an approximation of the volatility adjustment for the years 2007-18, based on the spreads for euro non-financial BBB-rated bonds. The volatility adjustment is approximated as 65% of the risk-corrected spread and calculated for securities with a duration of 5.4 years, which corresponds to their duration in the representative portfolio as at the end of 2018.

One simple but effective way to make the volatility adjustment a symmetric tool is to relate credit spreads – CS_t – to their average – $Av(CS_t)$. Procyclical investment behaviour is triggered by a change in the value of assets. The reasons for this change can be difficult to identify, as credit spreads are often assumed to not only reflect the risk of default and downgrade, but also include other risk premia (such as a liquidity premium) and supposedly irrational behaviour of market participants (in the case of corporate bonds, see Giesecke et al., 2011; Lin et al., 2010). To increase the potential of anticyclical mechanisms, symmetric adjustments can be based on entire credit spreads without distinguishing between different components. In line with the definition of the symmetric adjustment for equity risk, half of the difference would form the new symmetric volatility adjustment ($SymVA_t$). If spreads remain high for several years, the situation can be assumed to be the new normal and the volatility adjustment effect will be phased out automatically. The phase-out period depends on the period set for calculating the average. The generic formula for the symmetric volatility adjustment using (1) can be expressed as follows:

$$SymVA_t = \frac{1}{2} \times \left(CS_t - Av(CS_t)\right) \quad (3)$$

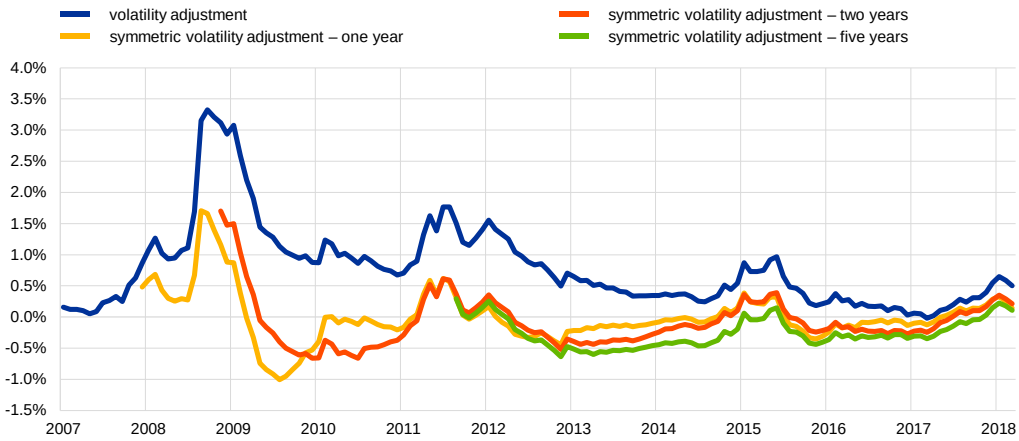
The period used for calculating the average is a key calibration parameter. Both a too long period or a too short period have disadvantages. Basing the average on a long period has the disadvantage that the volatility adjustment provides near-permanent relief, thus reducing its anti-procyclicality potential, particularly when credit spreads are compressed. However, a short period can lead to volatility in (re)insurers' balance sheets and could also hinder the effectiveness of the symmetric volatility adjustment as an anti-procyclical measure. Detailed calibration needs to be performed, along with an impact assessment on (re)insurers' solvency position. One criterion to

follow for calibration is to view the period over which the average is calculated as the amount of time given to (re)insurers to adapt to the new situation, considered to be the new normal. A number of different averaging periods are illustrated in this report.

The symmetric volatility adjustment would provide less relief than the current methodology during periods of wider credit spreads, but would increase resilience when they are compressed. The intensity of the resilience and relief provided would depend on the parameter chosen for the averaging period. This parameter should therefore be chosen such that the resilience gained would be sufficient to allow (re)insurers to absorb decreases in the market value of fixed income assets in periods of excessive risk premia values, thereby avoiding procyclical investment behaviour. Chart 2 provides values for the symmetric volatility adjustment when the average is set to one year, two years and five years.

Chart 2
Symmetric volatility adjustment over different averaging periods

(in percentages)



Source: ESRB calculations.
Notes: This chart shows the volatility adjustment for the years 2007-18, based on the spreads for euro non-financial BBB-rated corporate bonds with a duration of 5.4 years. The symmetric volatility adjustment is calculated by taking half of the difference between the full spread and its average calculated over one year, two years and five years.

1.2.2 Combining symmetry with other objectives

The symmetric volatility adjustment achieves the objective of anti-procyclical behaviour and can be combined with other tools that achieve other objectives. The current design of the volatility adjustment can be seen as implicitly taking several objectives into account: mitigating procyclical behaviour due to spread exaggeration, reflecting the liquidity premium that (re)insurers might be able to earn, and accounting for the portion of credit spreads that is attributable to default

risk.[5] These objectives can be combined with the symmetric volatility adjustment as proposed in this report. A generic formula accounting for these different objectives is set out below:

$$SymVA_t = AR \times [(CS_t - RC(CS_t)) - (Av(CS_t) - RC(Av(CS_t))] \quad (4)$$

where:

- AR denotes the application ratio
- CS_t denotes the credit spreads at time t
- $Av(CS_t)$ denotes the average of the credit spreads over a certain period and calculated at time t
- RC denotes the risk correcton, which can be applied to CS_t or to $Av(CS_t)$

Application ratio

The symmetric volatility adjustment envisages an application ratio of 50% of credit spreads, whereas the current volatility adjustment has an application ratio of 65% of the risk-corrected spread. This implies that only 65% of the changes in risk-corrected credit spreads are reflected in the volatility adjustment. In other words, after removing the risk of default (and downgrade), Solvency II assumes that 65% of the remainder corresponds to an exaggeration of credit spreads that could trigger procyclicality. It is therefore difficult to analyse this application ratio without considering the risk correction at the same time. The application ratio can be assumed to reflect (i) the amount of relief necessary to mitigate procyclical behaviour and (ii) the liquidity premium that (re)insurers are supposedly able to earn. This application ratio should be calibrated in view of the different objectives that need to be reflected.

Risk correction

One drawback of the current volatility adjustment methodology is that it assumes that an increase in credit spreads has almost no implications for default risk. As Chart 3 shows, the risk correction RC hardly varies. This is a consequence of it being more or less a fixed value due to the very long period of time (30 years) over which the average is calculated. The current volatility adjustment therefore carries the implicit assumption that 65% of credit spread changes are exaggerations in bond spreads. In other words, credit spread changes are assumed to have almost no implications for the expected loss of a bond. This contradicts with the academic literature, which shows that a certain percentage of the credit spreads for corporate bonds relates to default risk (see Giesecke et al., 2011; Lin et al., 2010).

[5] See EIOPA (2019b), page 82.

Chart 3

Yield and risk correction for euro BBB-rated corporate bond

(in percentages)

Source: ESRB calculations.
Notes: The blue line denotes the yield of euro non-financial BBB-rated corporate bonds with a duration of 5.4 years for the years 2007-18. The yellow line denotes the risk correction for such bonds.

An alternative assumption would be that a bond's default risk is a fixed percentage ($ELPCT$) of the credit spread CS_t at time t. This fixed percentage is expressed as the expected loss percentage ($ELPCT$). The risk correction under the current legislation corresponds to "the portion of the spread that is attributable to a realistic assessment of expected losses or unexpected credit or other risk of the assets" in the reference portfolio (Solvency II Directive, Article 77d). Solvency II sets the risk correction at 30% of the long-term average of the spread of government bonds and at 35% of the long-term average of the spread of corporate bonds. However, there is some evidence that default risk accounts for around half of corporate bond spreads. In the academic literature, studies have indicated that default risk accounts for around 50% of yield spreads (see Webber and Churm, 2007; Giesecke et al., 2011; Lin et al., 2010). Based on these findings, the expected loss percentage for corporate bonds could be set at 50%, thereby implicitly assuming that the remaining 50% of credit spreads relate to non-default risks. A similar approach could be applied to government bonds, possibly with a different ELPCT. The risk correction would be expressed as:

$$RC(CS_t) = ELPCT \times CS_t \quad (5)$$

This approach would imply that the expected loss of a bond increases (decreases) pro rata as credit spreads increase (decrease).[6] Using this alternative expression for the risk correction in (5) and formula (4) results in:

[6] This approach assumes that default risk is always proportional to the level of spread, even in times of crisis. Such an approach does not qualify market movements as excessive or an overreaction and therefore includes the assumption that default risk increases in proportion to the level of spreads, which may not be the case.

$$SymVA_t = AR \times [(CS_t - ELPCT \times CS_t) - (Av(CS_t) - ELPCT \times Av(CS_t))] \quad (6)$$

which can be rewritten as:

$$SymVA_t = AR \times (1 - ELPCT) \times (CS_t - Av(CS_t)) \quad (7)$$

Expression (7) shows that the application ratio, the risk correction (expressed here as a percentage of observed credit spreads) and the length of the average are the key parameters to be calibrated.

Under/overshooting effects and transparency

As explained in Box 2, the volatility adjustment entails several under/overshooting effects. There are three main drivers of the under/overshooting effects. The first relates to the mismatch in the duration of assets and liabilities. The second relates to differences in asset class allocation between a specific (re)insurer's asset portfolio and the representative portfolio. The third relates to the differences in asset composition within each asset class between a specific (re)insurer and the representative portfolio.

The (symmetric) volatility adjustment should not be applied to the risk-free interest rate term structure used to calculate technical provisions, since it reduces its effectiveness and transparency and introduces a bias in the valuation of technical provisions. Applying a (symmetric) volatility adjustment to the risk-free interest rate term structure used to discount technical provisions raises three concerns. First, it contributes to under/overshooting effects where the duration of liabilities is different from that of assets (longer durations imply greater sensitivity to changes in interest rates) and where the size of technical provisions is different from the size of the fixed income portfolio (greater size implies greater relief). See also Box 2 on the volatility adjustment. Second, it is non-transparent and complex, as the adjustment targets assets but applies to liabilities. Third, the risk-free interest rate term structure is used not only to discount the future cash flows of insurance obligations but also to project the value of assets in the economic scenarios used to value options and guarantees. The (symmetric) volatility adjustment therefore has an effect on the value of all assets in the economic scenarios used to calculate technical provisions. It entails the risk that the value of options and guarantees, and hence also of technical provisions, could be miscalculated.

The symmetric volatility adjustment should be applied to the cash flows of fixed income assets and form an additional own funds item, thereby correcting one of the under/overshooting effects. Rather than revaluing technical provisions with a new discount rate term structure, (re)insurers should instead use the cash flows of fixed income assets to calculate the symmetric adjustment. This would correct the under/overshooting effect arising from the duration mismatch and the size of technical provisions versus size of fixed income portfolio mismatch. An alternative approach could be to use entity-specific ratios for duration mismatch and

the size of the fixed income portfolio. The symmetric volatility adjustment could be calculated as follows:

1. Calculate the annual effective rate (*AER)* of the fixed income portfolio (*FIP)*. This corresponds to the single discount rate that, when applied to the cash flows of fixed income assets, results in a value equal to the value of the *FIP. AER* is calculated such that:

$$\sum_{n=1}^{N} \frac{Cash\ Flows_n}{(1+AER)^n} = FIP \tag{8}$$

2. Recalculate the value of the *FIP* by adding to the *AER* the symmetric volatility adjustment (*SymVA)*. This gives rise to a new value FIP^*:

$$FIP^* = \sum_{n=1}^{N} \frac{Cash\ Flows_n}{(1+AER+SymVA)^n} \tag{9}$$

3. The symmetric adjustment for spread (SAS) that would form a new own funds item is equal to the difference:

$$SAS = FIP^* - FIP \tag{10}$$

Once the value of the symmetric adjustment has been calculated, this can form a new own funds item on the Solvency II balance sheet. It would be added directly to eligible own funds as a buffer that would increase or decrease (re)insurers' loss-absorbing capacity (See Section 1.1 for the principles). The volatility adjustment currently contributes to the Tier 1 own funds item via the excess of assets over liabilities. There is a discussion to be had on whether it would be more appropriate for the (symmetric) volatility adjustment to contribute to Tier 2 or Tier 3 own funds items, but this question is not examined any further in this report.

The remaining under/overshooting effect could be corrected by calculating the symmetric volatility adjustment at an individual level, using undertaking-specific credit spreads. This would more closely match the situation of each individual (re)insurer and avoid the second and third under/overshooting effects arising from differences in asset class allocation and asset composition compared with the representative portfolio. As explained in Section 1.1.1, this option may incentivise risky behaviour by (re)insurers, who would try to optimise their asset portfolio to maximise the symmetric adjustment. If this is the case, solutions for avoiding such risky behaviour should be considered.

Testing of parameters

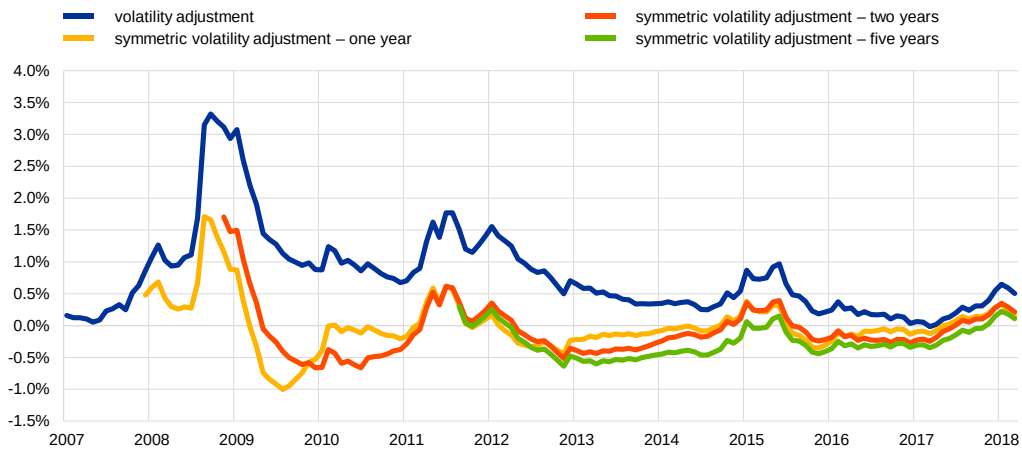
This section shows the symmetric volatility adjustment, as expressed in equation (7), for different averaging periods. The ELPCT is set at 50%, while the AR is set first at 100% and then at 65%.

Chart 4 shows the symmetric volatility adjustment derived using averages calculated over different time periods. As can be seen from the chart, the symmetric volatility adjustment is lower than the current volatility adjustment owing to the assumption regarding the ELPCT (or risk correction). Moreover, the symmetric volatility adjustment becomes negative when spreads are low relative to its long-term average spread. The chart also shows that the time horizon for calculating the average is highly relevant in terms of the level and sign of the symmetric volatility adjustment. Chart 5 shows the symmetric volatility adjustment for an application ratio of 65%.

Chart 4

Symmetric volatility adjustment under different long-term average settings – AR = 100%

(in percentages)

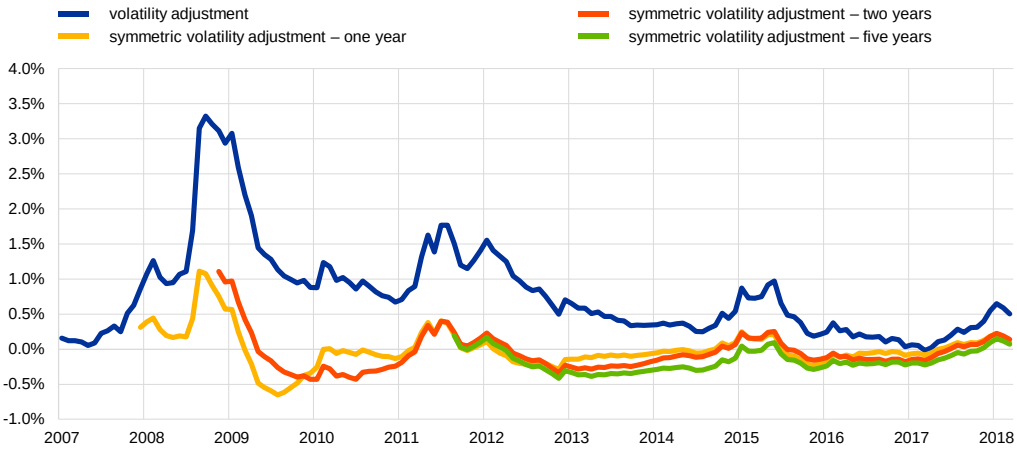


Source: ESRB calculations.
Notes: This chart shows the volatility adjustment and the symmetric volatility adjustment for the years 2007-18, based on the spreads for euro non-financial BBB-rated corporate bonds with a duration of 5.4 years, for several different averages.

Chart 5

Symmetric volatility adjustment under different long-term average settings – AR = 65%

(in percentages)



Source: ESRB calculations.
Notes: This chart shows the volatility adjustment and the symmetric volatility adjustment for the years 2007-18, based on the spreads for euro non-financial BBB-rated corporate bonds with a duration of 5.4 years, for several different averages.

The different parameters need to be calibrated and the impact of the new symmetric volatility adjustment assessed using (re)insurers' data. As shown above, the application ratio, risk correction and averaging period have an important effect on the final value of the symmetric volatility adjustment. The calibration of this set of parameters depends on the objectives set for the volatility adjustment. For a pure symmetric volatility adjustment, calibration could be based on full credit spreads and an application ratio of 50%. For a symmetric volatility adjustment that also includes other objectives, the parameters may be calibrated differently. A calibration exercise using (re)insurers' data is needed to obtain a mechanism that would indeed mitigate procyclical behaviour. The impact of this calibration on (re)insurers' solvency ratios should be analysed under different historical conditions.

1.3 Symmetric adjustments to the SCR standard formula

1.3.1 Equity risk

Box 3

SCR for equity risk

The equity risk sub-module distinguishes between different types of equities. Solvency II defines different types of equities with different risk profiles. For each of these types there is a specific stress value to be applied when calculating the SCR. There is also a correlation parameter between the different types of equities.

The different types of equities are type 1 equities, type 2 equities, strategic equity investments, duration-based equities, qualifying infrastructure equities, qualifying infrastructure corporate equities and long-term equities. Type 1 equities are equities listed in an EEA regulated market, strategic equity investments are equity investments of a strategic nature, duration-based equities are equities covering for pension liabilities, qualifying infrastructure equities and qualifying infrastructure corporate equities are equity investments in infrastructure project entities and corporate entities that meet criteria ensuring they are less risky, long-term equities are equities that form part of a portfolio of assets with an average holding period of at least five years, and finally type 2 equities are all other types of equities (unlisted or listed in a regulated market outside of the EEA).

The stress factor applied when calculating the SCR is 49% for type 2 equities, 39% for type 1 equities, 30% for qualifying infrastructure equities, 36% for qualifying infrastructure corporate equities and 22% for all other types of equities. The stress factors of 49% and 39% were calibrated on assumptions consistent with a one-year time horizon. These stresses are similar to those observed during the 2009 financial crisis. The stress factor of 22% was originally calibrated for duration-based equities with different assumptions, in particular a 12-year time horizon.

The stress factor of 22% that is applied to duration-based equities, strategic equity investments and long-term equities is based on dubious economic assumptions, may underestimate equity risk and could lead to (re)insurers being under-capitalised. The stress factor of 22% was derived on the assumption that equities would be held for at least 12 years. However, it makes little sense to apply a holding assumption for an asset which does not have a maturity. Even if equities were to be held for 11 years and 11 months, this would not prevent a drastic fall in their market value one month before the end of the 12-year period. If (re)insurers needed to sell these equities at the same time, they would incur a loss of own funds not covered by an appropriate SCR. In addition, although the 22% stress factor was derived assuming a 12-year time horizon, it is also applied to strategic equity investments even though there is no requirement to hold these for 12 years, and also to long-term equities even though these are subject to a five-year holding period. Finally, in the case of long-term equities the requirement to hold equities for five years on average applies not to each equity individually but to the whole subset of equities classed as long-term.

Solvency II defines a symmetric adjustment for equity risk which applies to type 1 and type 2 equities and to infrastructure equities held by standard formula (re)insurers. The scope of the symmetric adjustment for equity risk has not been extended to other types of equities, which are supposed to be held throughout the cycle. The symmetric adjustment decreases the capital requirement for equity investments during downturns (when equity prices fall) and increases it during upturns (when equity prices rise). It therefore discourages unsustainable build-ups and helps prevent a fire sale of equity exposures.

A precondition for applying the symmetric adjustment for equity risk to other types of equities is that these are subject to more realistic and higher stress factors. At present, the main prudential concern for equities which are neither type 1 nor type 2 equities appears to be the

low stress factor. A symmetric adjustment applied to the SCR needs to be based on a more realistic stress factor for it to be meaningful.

The symmetric adjustment for equity risk uses a unique index for all types of equities, and its value is capped. The value of the symmetric adjustment is calculated by comparing the value of an index against its average over the past three years. This index is based mainly on European listed equities. The symmetric adjustment has a positive value when the relative difference between the current value of the index and its average is greater than 8%. The symmetric adjustment is also capped and cannot be greater than 10 percentage points or smaller than -10 percentage points.

Box 4
Correlation of equity markets

To determine whether the index used to calculate the symmetric adjustment for equity risk should be a national or regional (EU) index, it is necessary to look at the correlation of equity markets. If equity markets are correlated, the index can be a regional index. Where a given index will fall (or rise) significantly, all other indices in the same region will behave in a similar manner.

The academic literature indicates that stock market correlation and comovement is stronger during crisis periods than non-crisis periods, regardless of the analysed group of countries in Europe. In the euro area, increasing short-term and long-term stock market integration and increasing comovements are found, driven by monetary integration.[7] Further integration of stock markets is also found within the EU between Member States that joined before 2004 and more recent members.[8] Another study demonstrated that monetary conditions have no influence on stock market comovements in the short term, but show a positive influence in the long term.[9] Some studies have looked specifically at stock market indices in Ireland, Greece, Spain, Italy and Portugal and found a high level of correlation with the S&P Euro index.[10] During the crisis, however, the indices in Portugal, Spain and Italy were correlated more with each other than with the European benchmark market. Comovements of stock market returns in this group of countries are also frequency-dependent (i.e. comovements for daily observations are different from those for monthly observations), and the degree of correlation is not constant over time.[11] Looking at Czech Republic, Poland and Hungary, one study showed strong correlations among these stock markets and between central Europe vis-à-vis the euro area. Furthermore, the correlations increased over time. The largest increase in the correlation was observed for the period after these countries entered the EU, and remained high during the financial crisis.[12] Another study found that the stock market indices of the Baltic countries have higher comovement with the United Kingdom, Germany

7 See Dewandaru et al. (2016).

8 See Pungulescu (2013).

9 See Tiwari et al. (2016).

10 See Faria et al. (2018) and Tiwari et al. (2016).

11 See Faria et al. (2018).

12 See Gjika and Horváth (2013).

and France than those of countries in central and south-eastern Europe (Bulgaria, Croatia, Romania, Slovakia and Slovenia).[13]

Our own calculations confirm that a regional (EU) index would be most appropriate for a symmetric adjustment for equity risk. To analyse the correlation of the markets of EU Member States in crisis and non-crisis periods, we used data starting from January 2000 and split it into four periods, namely pre-crisis (January 2000 – December 2006), financial crisis (January 2007 – December 2009), sovereign debt crisis (January 2010 – December 2012) and post-crisis (January 2013 – June 2019). Simple correlation coefficients were calculated using monthly data (using weekly data does not significantly change the results). The correlation of stock market indices was highest during the period of the financial crisis, with all country combinations exceeding the correlation coefficient level of 0.8. Furthermore, the correlation results were higher pre-crisis than during the sovereign debt crisis and post-crisis. During the sovereign debt crisis Denmark, Germany, Ireland, Sweden and the United Kingdom had a low correlation with the other countries, and in the post-crisis period the results were low for Croatia, Greece, Portugal and Spain. Overall, this confirms the appropriateness of using a regional (EU) index.

The cap on the value of the symmetric adjustment for equity risk should be removed or at least increased so that the mechanism is more efficient. Capping the value of the symmetric adjustment for equity risk might be considered necessary, for instance to avoid reducing the SCR for equities to zero. However, the current cap of 10 percentage points could limit the effectiveness of the adjustment in reducing the risk of fire sales during an equity market crash similar to the one observed during the global financial crisis. See ESRB (2018) for further considerations on this proposal.

1.3.2 Spread risk

This subsection outlines an alternative to the symmetric volatility adjustment for mitigating procyclical behaviour in the corporate fixed income portfolio. As this proposal applies to the SCR for spread risk, it does not mitigate the potential for procyclical investment behaviour in government bonds. If policymakers were to opt for the proposal set out in this subsection, they would need to make sure that there is no double-counting with the volatility adjustment by removing corporate assets from the volatility adjustment.

The spread risk capital charge for bonds and loans is calculated as a decrease in the market value by a stress factor $stress_i$. The stress factor $stress_i(D_{mod}, CQS, a_i, b_i)$ depends on the credit quality step (CQS), the modified duration of the bond and loan and risk factors a_i, b_i, which vary by maturity bucket and CQS. The stress factor is a concave function of the modified duration, and for a fixed CQS it has the structure

$$stress_i(D_{mod},\ a_i, b_i) = a_i + b_i \cdot (D_{mod} - T) \tag{11}$$

[13] See Kiviahoet al. (2014).

where

- T denotes the maturity bucket, D_{mod} the modified duration and a_i, b_i the risk parameters specified in Article 176 (3) of Commission Delegated Regulation (EU) 2015/35.
- The risk parameters a_i, b_i are calibrated such that the stress factor $stress_i$ approximately reflects the 99.5% VaR of the annual year-on-year difference in credit spreads for the specific maturity bucket.

The main idea is to introduce a symmetric adjustment directly into the stress factor calculation in equation (11). Specifically, the stress factor calculation including the symmetric adjustment is

$$stress_i(D_{mod},\ a_i, b_i) = a_i - SA_{t,i} + b_i \cdot (D_{mod} - T) \tag{12}$$

where SA denotes the symmetric adjustment at time t for maturity bucket T and depends on the CQS i.

The symmetric adjustment can take both positive and negative values. It is calculated for each CQS and maturity bucket. The specification in equation (11) refers to the spread risk calculation for corporate bonds.

The symmetric adjustment is constructed as the deviation of the current spread level from its average. If the current spread level is above its average, this indicates a period of widening credit spreads. The symmetric adjustment then takes a positive value, the stress factor in equation (12) is reduced and thus the capital charge for spread risk decreases. The same rationale applies for a negative deviation of the credit spread from its average.

More formally, the symmetric adjustment is calculated as

$$SA_{t,i} = \alpha \cdot \left(s_t - \overline{s_t(n)}\right) \tag{13}$$

where s_t denotes the current level of the credit spread for maturity bucket T and a CQS and $\overline{s_t}$ is the moving average credit spread with a time-window of n and α is a parameter. The symmetric adjustment is also supposed to lie within a symmetric interval of [-y; y] basis points.

For the purposes of calibration, the parameter n and the symmetric interval are chosen first. The moving average time window should be chosen such that it captures a potential mean reversion behaviour of credit spreads. The parameter α is determined such that the symmetric adjustment for a given time window n lies within the symmetric interval with a sufficiently high empirical probability, e.g. 99.5%.

The symmetric adjustment is illustrated in the charts below. The calculation was performed with a dataset containing spreads to gilts on UK AA-rated ten-year corporate bonds. The original spread dataset used for the calculation runs from April 2002 to June 2019. It should be noted,

however, that the starting date for the symmetric adjustment calculation is 2005, as the first moving average credit spread with n = 3 years is available in 2005. The calibration parameters were set to n = 3 years and $\alpha = 50\%$. It can be observed that in periods of substantially widening credit spreads, such as during financial crises, the symmetric adjustment takes the highest values and would reduce the spread risk charge by up to 1 percentage point. In periods of low credit spreads, such as in 2014, the permanent symmetric adjustment would take negative values and increase the spread risk charge by up to 50 basis points.

Chart 6
Spreads

(in percentages)

Source: ESRB calculations.
Notes: This chart shows the development of the spreads for UK AA-rated ten-year corporate bonds.

Chart 7

Symmetric adjustment

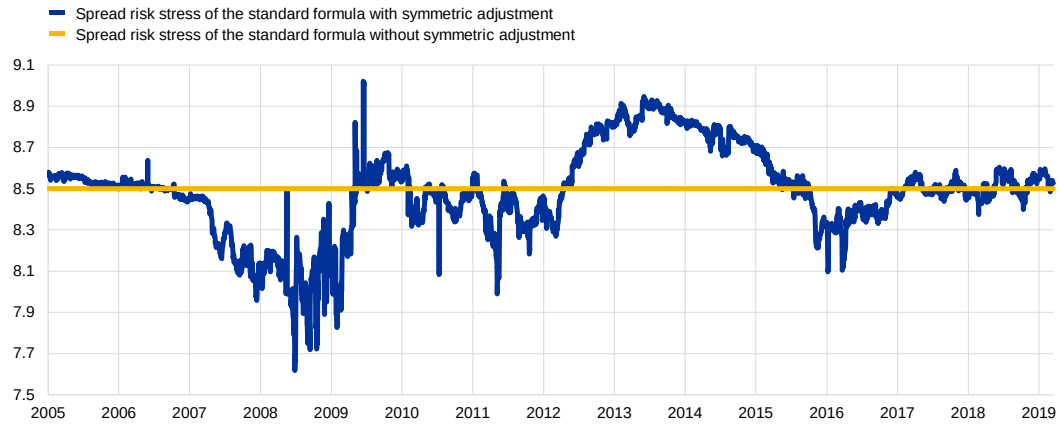
(in basis points)

Source: ESRB calculations.
Notes: The chart shows the symmetric adjustment in basis points calculated for UK AA-rated ten-year corporate bonds.

Chart 8

Spread risk stress

(in percentages)



Source: ESRB calculations.
Notes: The blue line shows the corresponding spread risk stress with symmetric adjustment according to equation (12). The yellow line shows the constant standard formula stress factor for a ten-year AA-rated corporate bond, which is 8.5% according to Article 176(3) of Commission Delegated Regulation 2015/35.

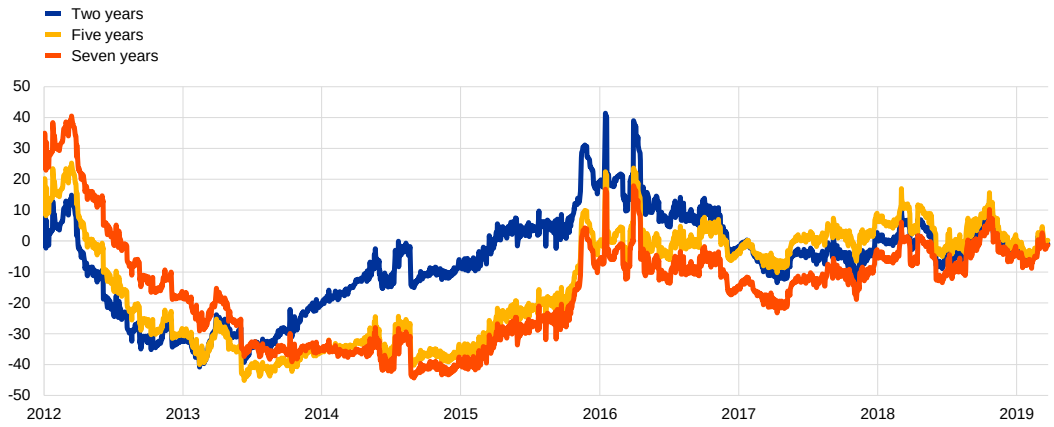
As a sensitivity analysis, the symmetric adjustment is illustrated for different calibration parameters α and different averaging periods. In Chart 9 the calibration parameter is fixed at 50% while different averaging periods are tested. As the number of data points varies with the averaging period, the chart was plotted for the overlapping period according to the averaging period of seven years starting from April 2012. The sensitivity towards the averaging period is highest

during 2014. It is lower during 2012 and from 2016 onwards. In addition, selecting a higher averaging period (seven years) results in a slightly more stable evolution of the symmetric adjustment over time than selecting a shorter period such as two years. In Chart 10, the same plot is generated with a higher calibration parameter α set at 65%. Here we can see that both the sensitivity towards the average and the size of the symmetric adjustment increase moderately with the higher calibration parameter.

Chart 9

Symmetric adjustment for $\alpha = 50\%$ and different averaging periods

(in basis points)

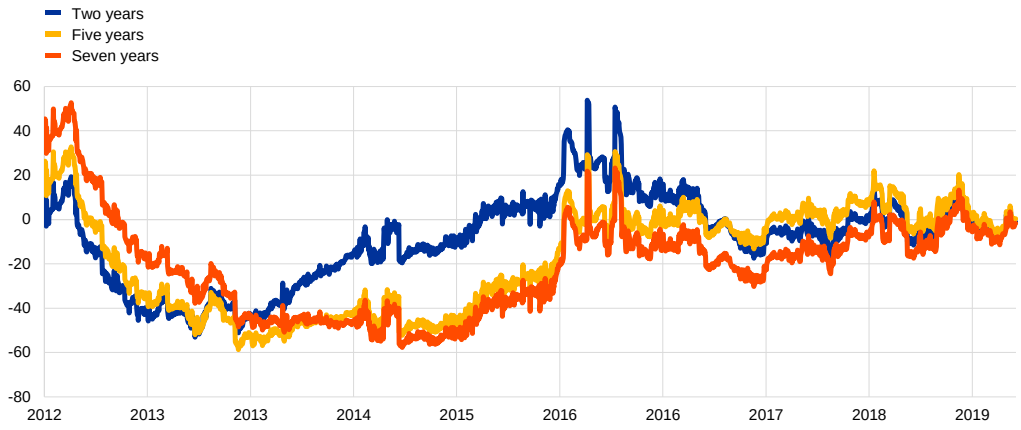


Source: ESRB calculations.
Notes: The symmetric adjustment has been calculated using averages over two years, five years and seven years. The chart shows the symmetric adjustment for a ten-year AA-rated corporate bond.

Chart 10

Symmetric adjustment for $\alpha = 65\%$ and different averaging periods

(in basis points)



Source: ESRB calculations.
Notes: The symmetric adjustment has been calculated using averages over two years, five years and seven years. The chart shows the symmetric adjustment for a ten-year AA-rated corporate bond.

Annex 1 defines another possible type of symmetric adjustment to the SCR for spread risk. The alternative approach introduces a corridor, with the symmetric adjustment only activated when the value of spreads is outside of this corridor. As this could introduce a cliff effect, the above approach has been preferred.

1.3.3 Interest rate risk

Box 5
SCR for interest rate risk

The interest rate risk sub-module of Solvency II defines an upward and a downward shock. The sub-module captures the sensitivity of the values of assets, liabilities and financial instruments to changes in the term structures of interest rates. For (re)insurers, the duration of assets is typically less than the duration of liabilities, which exposes them to the risk of interest rates decreasing. In some cases, however, (re)insurers are also exposed to the risk of interest rates increasing. This could be due to the presence of options in insurance liabilities: an increase in interest rates could trigger an increase in surrender rates among policyholders. Solvency II therefore provides for two shocks. The shock leading to the highest capital requirement is the one that the SCR takes into account.

The downward shock as defined in the standard formula appears to underestimate the decreases in interest rate risk observed over the last few years and should therefore be revised. As EIOPA notes in the advice it provided to the European Commission in 2018,[14] the decreases observed in recent years have been greater than the downward shock defined in the standard formula. This has led to (re)insurers holding insufficient capital to counter this risk. EIOPA notes that the lack of stress when interest rates are negative continues to create a risk of under-capitalisation. This deficiency needs to be corrected before a symmetric adjustment for interest rate risk is defined. In its 2018 advice, EIOPA proposed a new methodology for defining downward and upward shocks.

The academic literature is divided on whether (re)insurers behave in a procyclical manner as a result of changes in risk-free interest rates. Potential procyclical behaviour is a necessary precondition for defining symmetric adjustments. However, it is difficult to prove procyclical investment behaviour on the part of (re)insurers when risk-free rates change. If procyclical behaviour is defined as in this section – a trigger event which is amplified by the reaction of (re)insurers – it is doubtful that (re)insurers would have an effect on the whole risk-free interest rate term structure, since it is defined with interest rate swap rates in Solvency II. Even if a broader definition of procyclicality is taken, namely that changes in risk-free interest rates modify asset prices and (re)insurers react by amplifying these price movements, evidence of procyclical behaviour is still not clear. Indeed, predictions about the reactions of (re)insurers would depend on their assets and liabilities. For instance, where asset cash flows perfectly match those for liabilities,

[14] See EIOPA (2018g), pp. 158 to 162.

changes in interest rates would not affect the solvency of (re)insurers and therefore would not create the risk of procyclical behaviour. The reaction of (re)insurers therefore depends on the sign of the duration gap, on the structure of their liabilities and on the options and guarantees provided to policyholders. A recent paper on (re)insurers' investment strategies[15] includes a review of the academic literature on procyclicality, setting out the different conclusions. The paper itself concludes that (re)insurers tend to behave countercyclically after changes in the interest rate term structure.

The main argument for procyclical investment behaviour due to changes in risk-free interest rates relies on the "hunt for duration" phenomenon. Domanski et al. (2015) describe this phenomenon for the German insurance sector prior to the start of Solvency II. The authors argue that duration-matching strategies employed by long-term investors can amplify movements in long-term interest rates. The reasoning is that when long-term interest rates decline, the negative convexity increases the duration gap for a given bond portfolio. To close or reduce this duration gap, long-term investors need to buy more long-term bonds. The increasing demand leads to an increase in the price of these bonds and thus to a further decline in long-term interest rates. The theoretical argument is in line with the actual movements of yields during this time.

There is no evidence of mean-reversal behaviour for interest rates, so movements of interest rates can hardly be described as artificial volatility. This is illustrated by yield movements in the five years since Domanski et al. published their paper. In mid-2019, the yield curve is significantly below where it was in 2015, so with hindsight it was sensible risk management for (re)insurers to increase their asset durations in 2014/15. The duration-matching incentives in Solvency II were therefore effective in reducing risks.

In the absence of compelling arguments for procyclical behaviour, this section only provides ideas for further investigations. The symmetric adjustment is constructed to ensure that capital requirements are dampened in a lower-yield environment and increased in a higher-yield environment. From a technical perspective, a symmetric adjustment for interest rate risk could follow the same approach as for the spread risk sub-module. In line with the above description of the symmetric adjustment, the symmetric adjustment for a fixed tenor would take the form:

$$SA_t(m) = \alpha_m \cdot (r_t(m) - \overline{r_t(m)}) \quad (14)$$

where $r_t(m)$ denotes the risk-free rate for maturity m and time t, $r_t(m)$ the moving-average risk-free rate level for maturity m.

Unlike the spread risk module, the symmetric adjustment needs to be applied in two scenarios in the interest rate risk sub-module. If the symmetric adjustment is positive then the stressed interest rate curves are widened, while for a negative value they are narrowed. The symmetric adjustment is naturally applied to the stressed risk-free curves. More formally:

[15] See Fache Rousová and Giuzio (2019).

$$r_t^{stress,up}(m) = r_t^{up}(m) + SA_t(m) \quad (15)$$

$$r_t^{stress,down}(m) = r_t^{down}(m) - SA_t(m) \quad (16)$$

where r_t^{up} and r_t^{down} denote the stressed risk-free rates under the standard formula approach.

In its most general form, a potential symmetric adjustment for interest rate risk may be both currency and maturity-dependent. As the interest rate risk module itself provides currency-independent shocks, it seems useful to introduce a currency-independent symmetric adjustment for consistency reasons. The symmetric adjustment could be derived from the same dataset and currencies used to calibrate the interest rate risk sub-module. The main drawback of a maturity-dependent symmetric adjustment is that for currencies with potentially negative risk-free rates at the shorter end of the term structure, the adjustment would be negative for tenors with negative spot rates and positive for other tenors. This would imply that the stressed interest rate curves are first narrowed and then widened, which would be counterintuitive and not in line with the main macroeconomic objective of a symmetric adjustment.

For economic and simplicity purposes, a maturity-independent symmetric adjustment is discussed in this section. A maturity-independent symmetric adjustment can be constructed by first calculating maturity-dependent symmetric adjustments according to equation *(14)* and then aggregating these adjustments. One simple way to calculate the maturity-independent symmetric adjustment SA_t would be to take the minimum over the maturities *m*:

$$SA_t = min_m\{SA_t(m)\} \quad (17)$$

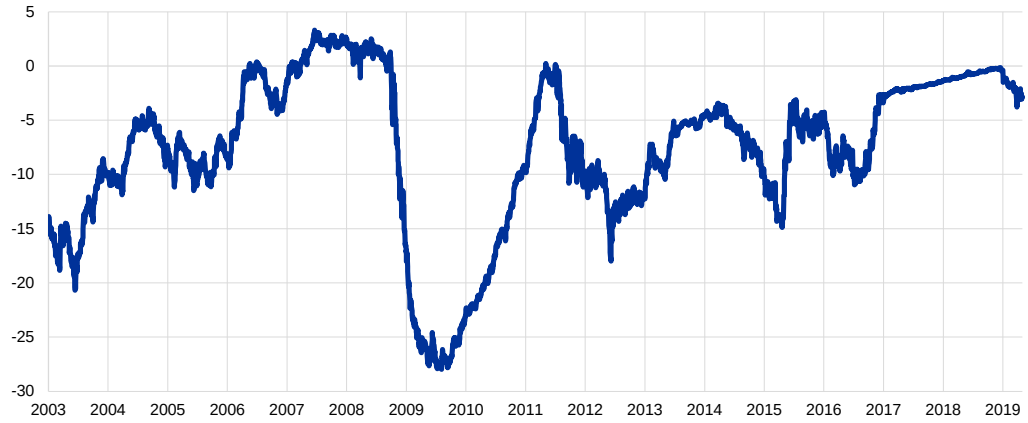
The specification in *(14), (15), (16)* and *(17)* ensures that in a low-yield environment with potentially negative spot rates, the entire stressed interest rate up(down) curve is shifted downwards (upwards). In a higher-yield environment, the specification results in an increase in the capital requirements for interest rate risk, which is lower in relative terms than the dampening effect in the low-yield environment.

Chart 11 shows the calculation of the constant permanent symmetric adjustment for interest rate risk. The calculation was performed with historical EIOPA risk-free data for the euro between January 2000 and May 2019. The calibration parameters were set to $\alpha = 10\%$ and n = 3 years. The chart demonstrates that the symmetric adjustment takes mainly negative values due to the constant decline in interest rates over the last two decades. The highest values for the symmetric adjustment were triggered by the substantial decline in interest rates in 2008.

Chart 11

Symmetric adjustment for interest rate risk

(in basis points)



Source: ESRB calculations.
Notes: The chart shows the permanent symmetric adjustment for interest rate risk calculated according to equations (14) and (17).

This report does not conclude in favour of a symmetric adjustment for interest rate risk due to the absence of a compelling argument for procyclical behaviour and the deficiencies of the current sub-module calculations. The results of the investigations set out in this report contribute to the general discussion on symmetric adjustments and suggest ways to mitigate procyclical behaviour. Since the academic literature is divided on the procyclical behaviour of (re)insurers due to interest rate movements, however, the report does not propose the introduction of any such adjustments at this stage. In addition, the design of the interest rate risk sub-module does not take account of negative interest rates, which would also diminish the effectiveness of any symmetric adjustments.

1.4 Symmetric adjustments and internal models

1.4.1 Policy objectives

Symmetric adjustments should apply to all (re)insurers that are subject to Solvency II, whether they calculate their SCR with the standard formula or with an internal model. Even where the SCR is calculated with an internal model, there is a risk of procyclical behaviour. The same rationale used for the standard formula also applies to (re)insurers who calculate their SCR with an internal model. This is because the method of balance sheet valuation and SCR calibration is the same in both cases. (Re)insurers who calculate their SCR with an internal model manage a material share of insurance sector assets (almost 40% of total EEA assets, excluding unit-linked

assets[16]). In addition, the (re)insurers who use an internal model are usually big insurance groups whose reactions could have a bigger impact on asset prices than small (re)insurers who use the standard formula. If (re)insurers who use an internal model fall outside the scope of symmetric adjustments, this would reduce the effectiveness of the mechanism.

The existing symmetric adjustment for equity risk should be adapted and applied to (re)insurers who use an internal model to calculate their SCR. There is no economic reason why these (re)insurers would behave differently, so a symmetric adjustment for equity risk would also discourage them from procyclical behaviour. Given the approval process for their internal models, there could be two options for a symmetric adjustment for equity risk: either applying the same adjustment as defined in the standard formula – where the equity risk module within the internal model has a similar structure to that of the standard formula – or allowing (re)insurers who use an internal model to define a customised symmetric adjustment for equity risk. In both cases, supervisory approval of the internal model would provide prudential safeguards.

Symmetric adjustments for (re)insurers who use an internal model should be subject to supervisory approval, allowing (re)insurers to make them consistent with their internal model. (Re)insurers may develop internal models in a different way to the standard formula if this provides a better match with their risk profile. For example, (re)insurers may design an SCR for more granular asset classes or decide to aggregate their SCR in a different way. The symmetric adjustments described in this report are designed for the standard formula. (Re)insurers developing internal models may need to design symmetric adjustments in a different way to be consistent with the structure of their SCR. Where the symmetric adjustments modelled deviate from those defined for the standard formula, these should also be subject to supervisory approval.

Symmetric adjustments should not be double-counted. They should affect either the SCR or own funds, but not both at the same time. Where a symmetric adjustment affects the balance sheet (via liabilities, assets or directly via own funds), (re)insurers who use an internal model would benefit from this and could also model it in their SCR (see Box 6 for a more detailed explanation of how the SCR is calculated with an internal model), thus providing a double benefit. For example, where the value of a certain asset class falls, the symmetric adjustment on the balance sheet would increase own funds. (Re)insurers who use an internal model could also model this increase in own funds in their SCR, leading to a smaller SCR. This double-counting should therefore not be allowed, as it provides an advantage to (re)insurers who use an internal model.

Box 6
SCR internal model principles

(Re)insurers (or insurance groups) who calculate their SCR with an internal model need to ensure that the SCR corresponds to the 99.5% Value at Risk of the variation of their own funds over a one-year period. The relationship between the SCR and the variation of own funds is even more direct with internal models than with the standard formula. This is because (re)insurers who use an internal model have to calculate a probability distribution that models the variation of their own funds, whereas the standard formula is calibrated for all EEA (re)insurers. As

[16] See page 6 of EIOPA (2018c).

a result, (re)insurers willing to use internal models need to identify all the items on their balance sheet that could have an impact on their own funds and thus on the probability distribution. The SCR is derived from the probability distribution by applying the Value at Risk measure. This results in an SCR which corresponds exactly to the 99.5% confidence level.

Where symmetric adjustments are applied to the SCR, they temporarily modify the confidence level. Such symmetric adjustments do indeed temporarily increase or decrease the SCR depending on the position within the financial cycle. Modifying the SCR is equivalent to using a different confidence level to calculate the SCR. On average, however, symmetric adjustments lead to the 99.5% confidence level.

Since the confidence level is modified by symmetric adjustments, under the current regulatory framework internal models cannot take symmetric adjustments into account. Since (re)insurers who are willing to use an internal model have to comply with strong calibration standards to ensure that their SCR corresponds to the 99.5% confidence level, they cannot apply symmetric adjustments that temporarily modify this confidence level.

Where symmetric adjustments are applied at balance sheet level, they affect own funds and internal models may therefore take this effect into account when calculating the SCR. Since they affect own funds, symmetric adjustments also affect the probability distribution forecast of the variation of own funds. In other words, internal models could take account of symmetric adjustments in the starting balance sheet and in the stressed balance sheet. There would be double-counting: the variation of symmetric adjustments could be modelled and used to modify the SCR derived via internal models. Internal models could therefore anticipate the variation of symmetric adjustments even if they are not (yet) subject to the change in financial variables.

1.4.2 Internal models and dynamic volatility adjustment

(Re)insurers who use an internal model take changes in the volatility adjustment into account when they calculate their SCR for the risk of spreads widening. As explained in Box 6, internal model (re)insurers can model the volatility adjustment and its changes in the scenarios used to calculate the SCR. This modelling technique is referred to as the dynamic volatility adjustment.

The volatility adjustment is calculated by EIOPA on the basis of a portfolio that is representative of the assets of the whole insurance sector, so (re)insurers who use the dynamic volatility adjustment need to model changes to the asset portfolio of the whole sector. This is not realistic and could result in under-capitalisation. One feature of the volatility adjustment is that it is derived on the basis of a portfolio that is representative of all assets held by the insurance sector (there is actually a representative portfolio for each currency and country). EIOPA updates the representative portfolio annually to reflect the new asset composition, including the split between government and corporate bonds per type of issuer (country and financial and non-financial) and per CQS. EIOPA also takes account of the duration of each of these instruments. Internal models usually calculate their SCR using Monte Carlo simulations, i.e. scenarios that simulate thousands of situations each with specific risk premia values on fixed

income instruments. For the dynamic volatility adjustment to be calculated correctly, internal models need to anticipate the change in the asset allocation of the whole insurance sector under each scenario. This is highly unrealistic and could lead to severe underestimation of the risk and under-capitalisation of (re)insurers who use an internal model. To provide some prudential safeguards, EIOPA issued an opinion on the modelling of the dynamic volatility adjustment.[17] It is noted that dynamic volatility adjustment models were only approved if all credit risks are modelled, including sovereign risk for EEA exposures.

The use of the dynamic volatility adjustment leads to a substantial reduction in the SCR, providing a benefit of up to 57 percentage points for the solvency ratio of internal model (re)insurers. In its 2018 report on long-term guarantees measures[18], EIOPA estimated – via an information request – the impact on solvency ratios of removing the volatility adjustment. EIOPA distinguished between standard formula (re)insurers, (re)insurers who use an internal model but do not apply the dynamic volatility adjustment, and (re)insurers who use an internal model and apply the dynamic volatility adjustment. At EEA level, removing the volatility adjustment would result in an increase of 57 percentage points in the solvency ratio of dynamic volatility adjustment (re)insurers. See Chart 18.[19]

Using a dynamic volatility adjustment means that the countercyclical tool modifies both own funds and the SCR, giving rise to double-counting which provides undue benefit and is not necessary to prevent procyclical investment behaviour. As seen in Section 1.2, symmetric adjustments can be effective tools for incentivising countercyclical behaviour. To achieve this, they need to modify (re)insurers' solvency ratios either by modifying the SCR or by modifying own funds. Modifying both the SCR and own funds leads to double-counting. It also means there is a countercyclical incentive for both the current situation (via own funds) and for the situation in a year's time (via the SCR). A countercyclical tool needs to react to the cycle at a specific point in time: it does not make sense for it to be applied twice by anticipating what the cycle will look like in a year's time.

Internal models should not take the symmetric volatility adjustment into account when calculating the SCR. As explained above, the symmetric volatility adjustment should not be taken into account in the SCR calculated with an internal model, particularly if viewed as a countercyclical tool, and current legislation should be modified to prevent this. This would also ensure a level playing field between standard formula (re)insurers and internal model (re)insurers. It would also maximise the effectiveness of the macroprudential tool, which targets systemic risk and should therefore be applied consistently by the whole sector to mitigate systemic risk.

17 See EIOPA (2017b).

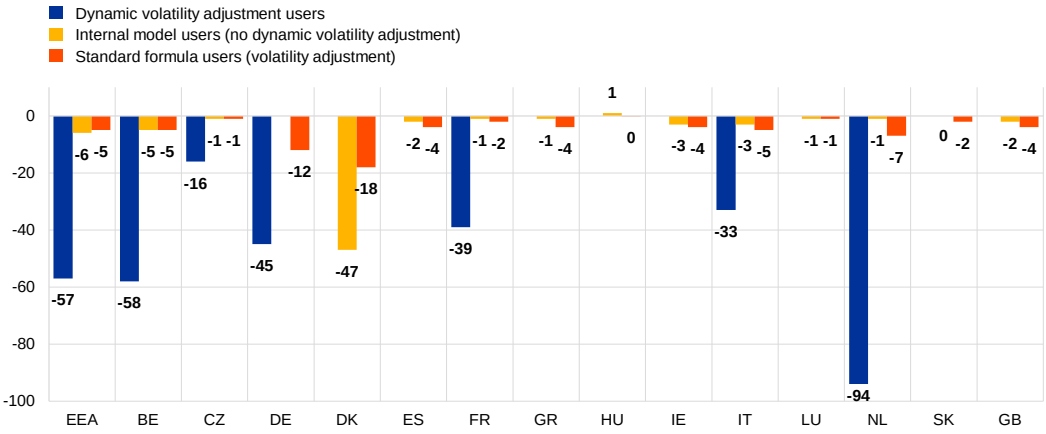
18 See page 139 of EIOPA (2018e).

19 See also EIOPA (2019b) for further analyses.

Chart 12

Average impact of removing the volatility adjustment on the SCR ratio of (re)insurers using the measure

(in percentage points)



Source: EIOPA (2018e).
Notes: The chart shows that removing the volatility adjustment can lead to a reduction in the SCR ratio by 57 basis points on average for EEA (re)insurers and by up to 94 basis points in individual countries.

2 Liquidity tools addressing risks arising on the assets and liabilities side

This section is divided into two parts. The first addresses liquidity risk arising on the assets side via the impact of margining practices for derivatives transactions. The second addresses liquidity risk arising on the liabilities side via mass lapse events.

2.1 Impact of margining practices for derivatives transactions on (re)insurers' liquidity management

(Re)insurers hold derivatives on their balance sheet, as these can help mitigate market risk in particular. There are good reasons for (re)insurers to hold derivatives for hedging purposes. Studies [20] have found that the largest class of derivatives is interest rate derivatives and in particular interest rate swaps (IRSs). These allow (re)insurers to reduce their duration gaps (where the duration of liabilities is higher than that of assets), which is particularly relevant in life insurance.

Since March 2017, the European Market Infrastructure Regulation (EMIR)[21] has required any participant trading in the European derivatives market to post variation margins. This push towards central clearing and margining practices for bilateral trades has positive implications because it reduces credit risk. However, it exposes (re)insurers who hold derivatives to higher liquidity risk.

Solvency II data are used to assess the extent to which liquid assets held by (re)insurers are sufficient to meet variation margin calls on their IRS portfolios. The liquid assets held by (re)insurers – cash, high-quality government and corporate bonds and money market fund (MMF) shares – can be compared with an estimate of the variation margin calls on their derivatives portfolios. This comparison helps assess the magnitude of liquidity risks stemming from the assets side of (re)insurers' balance sheets.

This section concludes with proposals for targeted policy interventions, for (re)insurers with a vulnerable liquidity risk profile. These policy interventions could mitigate the risk of liquidity shortfalls for vulnerable (re)insurers.

2.1.1 The use of derivatives by (re)insurers

(Re)insurers use derivatives to hedge against risks, but this also exposes them to derivative-specific risks that could potentially become systemic.[22] This topic gained traction

[20] See EIOPA (2018b) and Box 8 of ECB (2018).

[21] Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories (OJ L 201, 27.7.2012, p.1).

[22] See ESRB (2015).

following the near-failure of AIG in the midst of the financial crisis.[23] McDonald and Paulson (2015) examine the AIG case in detail and underlined that one of the key drivers of its near-failure was margin calls on its credit default swap portfolio.[24] In the EU, Solvency II has introduced market-consistent valuation of both assets and liabilities, recognises the benefits of hedging against market movements (contrary to Solvency I) and prevents the use of derivatives for speculative purposes (see Box 7). For example, Fache Rousová and Letizia (2020) find that the introduction of Solvency II had a significant and positive impact on (re)insurers' use of IRSs.

Box 7
Legal background to the use of derivatives by (re)insurers

The absence of regulatory limits on investments under Solvency II establishes the principle of freedom of investment (Article 133 of Directive 2009/138/EC), which implies that there are no regulatory limits on investments. This does not mean, however, that (re)insurers can take investment decisions without being prudent and without considering the interests of policyholders. Indeed, Solvency II (both in Directive 2009/138/EC and in Commission Delegated Regulation 2015/35) also requires (re)insurers to invest their assets in accordance with the prudent person principle (Article 132). Some of the main aspects of this principle cover asset-liability management, investments in derivatives, liquidity risk management and concentration risk management. Investments in derivatives are possible insofar as they contribute to a reduction of risks or facilitate efficient portfolio management. Section 10 of the delegated regulation (on risk mitigation techniques) sets out several criteria that (re)insurers need to meet if they are to recognise the benefits of hedging when calculating their solvency positions.

Under the Solvency II framework, in addition to the EIOPA guidelines for supervisory authorities, (re)insurers should implement procedures in line with their investment risk management policy to monitor the performance of derivatives. Where derivatives are used to facilitate efficient portfolio management, they should demonstrate how the quality, security, liquidity or profitability of the portfolio is improved without significant impairment of any of these features. Moreover, where derivatives are used to contribute to a reduction of risks or as a risk mitigation technique, (re)insurers should document the rationale and demonstrate the effective risk transfer obtained through the use of derivatives.

[23] See ESRB (2015).

[24] AIG was writing credit default swaps. From a financial standpoint, the risk is no different from investing in the asset underlying the swap. Insurance companies routinely invest in bonds. It could be argued that a direct or synthetic exposure is not much different. However, synthetic exposures through derivatives generate a constant flow of margins, i.e. cash or near-cash payments between counterparties. These are directly related to the price of the underlying assets. AIG received a large volume of margin calls from multiple counterparties, and did not have enough liquid assets to meet these calls. Regulation passed after the financial crisis has made it mandatory for derivatives counterparties to exchange margins. In other words, the cause of the AIG problem is now a legal requirement.

(Re)insurers are active in the following asset classes through derivatives contracts:

- **Interest rate derivatives**

Several existing studies have highlighted the need for (re)insurers to hedge interest rate exposures, as these typically represent a key risk in their balance sheets. Specifically, Berends et al. (2013) highlight how life insurers use derivatives to mitigate their sensitivity to interest rate changes arising from the long-term nature of their liabilities. This analysis is further expanded in Berends and King (2015), who investigate the cost arising from the new regulations on clearing and collateralisation. A recent paper by the Bank for International Settlements (BIS) on the impact of the low interest rate environment (BIS, 2018)[25] acknowledges that the insurance corporations and pension funds sector uses derivatives to manage interest rate exposure, but provides no further detail. However, Fache Rousová and Letizia (2020) suggest that euro area insurers primarily use interest rate derivatives to hedge the interest rate risk arising from their negative duration gaps (see Box 8 for a stylised example of a traditional life insurer and how it can hedge its risk through derivatives).

The analysis carried out in this report suggests that (re)insurers actively gain exposure to long-dated maturities through IRSs. This is the second type of permitted derivatives use, namely to facilitate efficient portfolio management. Insurers convert widely available floating rate cash investments into long and ultralong-dated fixed rate investments, which might not be deep and liquid in the bond cash markets. Focusing on EU data, Abad et al. (2016) show that the insurance corporations and pension funds sector would be the one most affected by a change in interest rates owing to its net position in the IRS market, even though it is significantly less active in the derivatives market than other sectors in terms of notional amounts traded.[26]

- **Currency derivatives**

Currency risk is the exposure to fluctuations in exchange rates[27]**.** A (re)insurer is exposed to currency risk when its assets are in a different currency to that of its liabilities. In line with sound risk management and the principle of currency matching, (re)insurers should hold assets to cover anticipated payments of insurance obligations in the same currency as they are expected to occur. Movements in exchange rates would then affect anticipated payments of insurance obligations and assets equally and therefore have no impact on (re)insurers' financial risk. Alternatively, unmatched currency positions should be hedged by using derivatives.[28] In this respect, Fache Rousová and Letizia (2020) show that the use of currency derivatives among euro area (re)insurers increases in line with the share of non-euro-denominated assets in their portfolios, which suggests a hedging

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25 See Committee on the Global Financial System (2018).

26 The study shows that the marked-to-market value of plain vanilla fixed-for-floating six-month EURIBOR interest rate contracts held by EU insurance corporations and pension funds would decrease by €344m following a parallel increase of one basis point in the six-month EURIBOR forward curve (results based on November 2015 data).The marked-to-market value of the same type of contracts held by the largest 16 derivatives dealers (G16) would decrease by just €21m under such a scenario, although the notional value of these contracts held by G16 dealers is 28 times higher than that for insurance corporations and pension funds.

27 Solvency II defines currency risk as: "The sensitivity of the values of assets, liabilities and financial instruments to changes in the level or in the volatility of currency exchange rates".

28 In any case, if the unmatched currency position remains, the Solvency II Framework Directive requires currency risk to be assessed over the following 12 months to calculate an insurer's SCR.

motive given that a large portion of euro area insurers' liabilities are also payable in euro. They also show that foreign exchange forwards are the derivatives contracts most traded by euro area reinsurers.

- **Equity derivatives**

Derivatives on equities or equity indices allow (re)insurers to either gain or hedge exposure and therefore manage and diversify their investment portfolios. They can also reduce the effect of equity market volatility.

- **Climate derivatives**

There are a variety of "exotic" derivatives such as catastrophe swaps that (re)insurers can use to hedge against massive potential losses due to a natural disaster (e.g. a hurricane).

- **Credit derivatives**

(Re)insurers can use credit derivatives not only to hedge against the credit profile of their cash portfolios but also to gain synthetic exposure to specific credit that is not available through the cash market. For example, the profile of a five-year euro-denominated bond issued by a large US company (which does not exist because the issuer only issues in US dollars) could be replicated by purchasing a five-year euro-denominated sovereign bond and entering into a five-year credit default swap on the US corporate debt.

Box 8
The use of interest rate derivatives by a stylised life insurer

A traditional life insurer offers its policyholders life insurance policies with guaranteed rates and a long contract duration, typically spanning several decades. To pay out the guaranteed return on the policies to the policyholders, the stylised life insurer aims to invest the premiums received from policyholders in fixed income instruments (e.g. bonds) which have a higher rate of return than the insurance policies but a similar duration. Such fixed income instruments are not necessarily available in the market, however, and even if they are the insurer may want to follow a different asset strategy by purchasing instruments with shorter durations.[29]

This results in a negative duration gap where the duration of the liabilities (future payments to policyholders) exceeds that of the assets (bond portfolio). This gap in turn exposes the insurer to interest rate risk. More specifically, suppose that the duration of an insurer's liabilities is 8 years and the duration of the matching asset portfolio is 6.5 years, resulting in a negative duration gap of around 1.5 years. The market value of the assets is €1 billion and that of the liabilities €0.9 billion, resulting in an equity value of €0.1 billion (or 10% of assets). If interest rates decline by 100 basis points (or 1% or 0.01), both assets and liabilities are revalued. The value of the assets increases to €1.065 billion (derived as €1 billion x 6.5 years x 0.01). The value of the liabilities also rises, but to a higher extent than the value of assets, to €0.972 billion (derived as €0.9 billion x 8 years x 0.01). As

[29] See Möhlmann (2020).

a result, the equity value drops to €0.093 billion (calculated as the difference between €1.065 billion and €0.972 billion) or 8.7% of the value of the assets.

The insurer chooses to hedge the interest rate risk arising from the negative duration gap using derivatives, specifically interest rate swaps (IRS).

An IRS is an agreement (contract) between two parties to exchange one stream of payments for another over a period of time on specific dates (e.g. quarterly). The most common type of swap traded is the plain vanilla IRS, which involves exchanging fixed rate cash flows for floating rate cash flows commonly based on LIBOR (London interbank offered rate). The cash flow payments are determined by multiplying the fixed or floating rate by a notional amount (principal amount). If the floating rate exceeds the fixed rate, the party paying the floating rate pays the difference to the party paying the fixed rate (and vice versa).

Therefore, if an insurer wishes to close the negative duration gap it can enter into an IRS contract in which it pays the floating rate and receives the fixed rate. At the initiation of the contract, the market value of the contract is zero (as the fixed rate is set such that the expected value of the fixed rate cash flows is equal to that of the floating rate cash flows). In the scenario of a 100-basis point decline in interest rates, the insurer continues to receive the set fixed rate but pays a lower floating rate. The market value of the contract therefore becomes positive for the insurer. If the insurer opted for an IRS with a duration of ten years and a notional amount of €0.1 billion, the market value of the hedge increases to €0.01 billion (calculated as €0.1 billion x 10 years x 0.01). By adding the value of the IRS hedge to the value of the assets, the insurer's equity rises to over €0.1 billion (or around 9.7% of the assets).

Interest rate derivatives are the most prominent asset class in the derivatives portfolios of EU (re)insurers. Based on Solvency II data as at the end of 2018,[30] interest rate derivatives accounted for more than half of the total derivatives exposure of EU (re)insurers in terms of notional amount (49%), followed by currency derivatives (37%), equity derivatives (5.5%) and credit derivatives (1.1%). Derivatives used to manage catastrophe and weather-related risk, commodity risk and mortality risk each accounted for less than 1%, while derivatives used to address other non-categorised risk types made up around 7%[31]). See Chart 13.

The use of derivatives by EU (re)insurers is concentrated in the life insurance business. According to the Solvency II data, the total notional amount of derivatives held by EU (re)insurers stood at €5.11 trillion (€3.4 trillion in non-unit-linked portfolios and €1.7 trillion in unit-linked portfolios) as at the end of 2018. 74% of this total was held by life insurers. Composite insurers held approximately 21% of the total, probably due to their significant life business, while the derivatives exposures of non-life insurers and reinsurers accounted for less than 22% and 3% respectively.[32]

30 Unless otherwise specified, all data referred to in this chapter are taken from the Solvency II quantitative reporting templates as found in the EIOPA central repository.

31 The EMIR data available to the ECB for euro area (re)insurers also depict interest rate derivatives as the most prominent asset class (71%; 42% accounted for by IRSs only), followed by currency derivatives (10%), while credit default swap use is fairly small (less than 1%). Data refer to the end of September 2018.

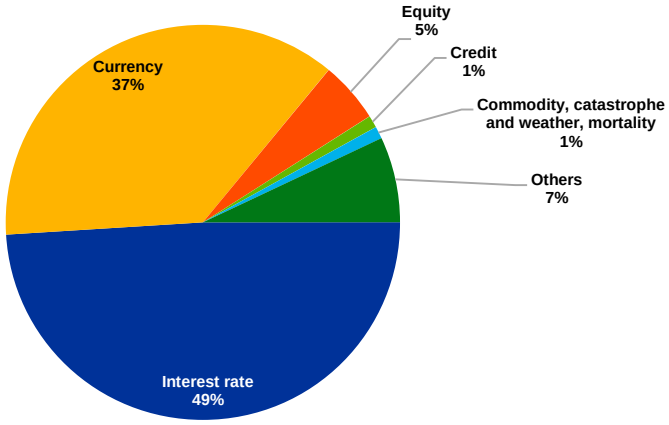
32 The life insurance sector is also the largest in terms of total assets, holding more than half of the total assets of all insurers in the EU (56.7% as at the end of 2017). The composite, non-life insurance and reinsurance sectors account for 26.6%, 12.2% and 4.5% respectively.

Furthermore, the notional amount of derivatives equalled 75% of total investments for life insurers, 39% for reinsurers and 16% for non-life insurers, confirming that life insurers are the main users of derivatives.[33] At the same time, the market values of derivatives are small in relation to total investments. As at the end of 2018 they accounted for just 0.44% for life insurers, 0.1% for non-life insurers and 0.11% for reinsurers.

Chart 13

Use of derivatives in the EU insurance industry: notional amount breakdown by risk category

(in percentages)



Sources: Solvency II Quarterly Reporting Templates.
Notes: Reporting at solo level. Reporting reference date: fourth quarter of 2018.

Exposure to derivatives is concentrated in just a few countries and (re)insurers. As at the end of December 2018, around 88% of the gross notional amount held by all EEA [34] (re)insurers was concentrated in five countries: Denmark, France, Germany, Netherlands and the United Kingdom. The concentration is also high when looking at individual (re)insurers. In December 2018, roughly 80% of notional amounts for derivatives was concentrated in 30 (re)insurers. (Re)insurers are also found to conduct transactions with a small number of counterparties, mainly banks. In the EEA, around 80% of (re)insurers have no derivatives exposure, but the 20% who do account for approximately 85% of the total investments.[35] See Charts 14 and 15.

[33] This is further confirmed by the data on the share of insurers who use derivatives within each type of business. As at the end of 2017, the share was substantially higher for life and composite insurers (35.7% and 30.1% respectively) than for non-life insurers and reinsurers (12.9% and 15.7% respectively).

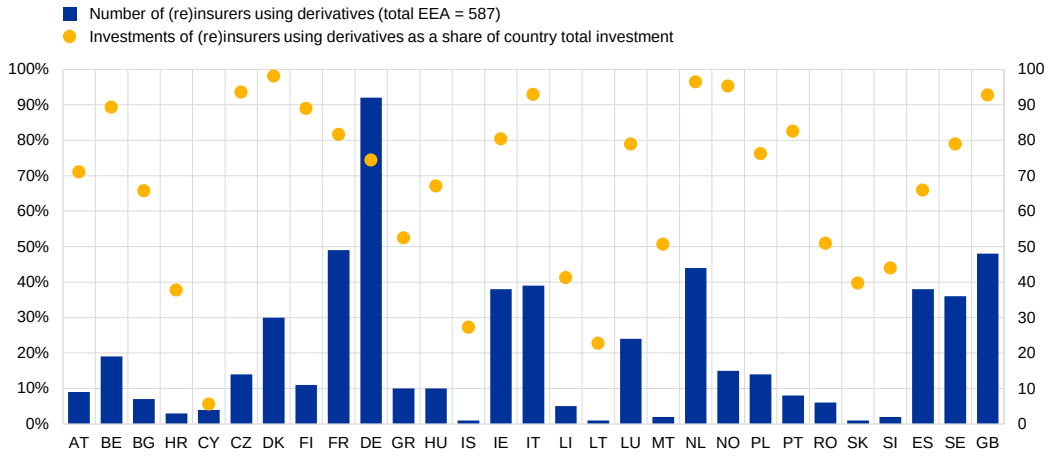
[34] According to the ECB's Financial Stability Review, November 2018, as at the end of September 2018 around two-thirds of the gross notional amount held by all euro area (re)insurers was concentrated in just two countries, France and the Netherlands, with each holding a similar amount.

[35] The difference between total assets and total investments is due to the following: goodwill; deferred acquisition costs; intangible assets; deferred tax assets; pension benefit surplus; property, plant & equipment held for own use; reinsurance recoverables and receivables; and own shares. As at the end of 2018, EEA total assets were €11.3 trillion and EEA total investments €10.7 trillion.

Chart 14

EU (re)insurers with derivatives exposures by country

(left-hand scale: percentages; right-hand scale: number of (re)insurers)

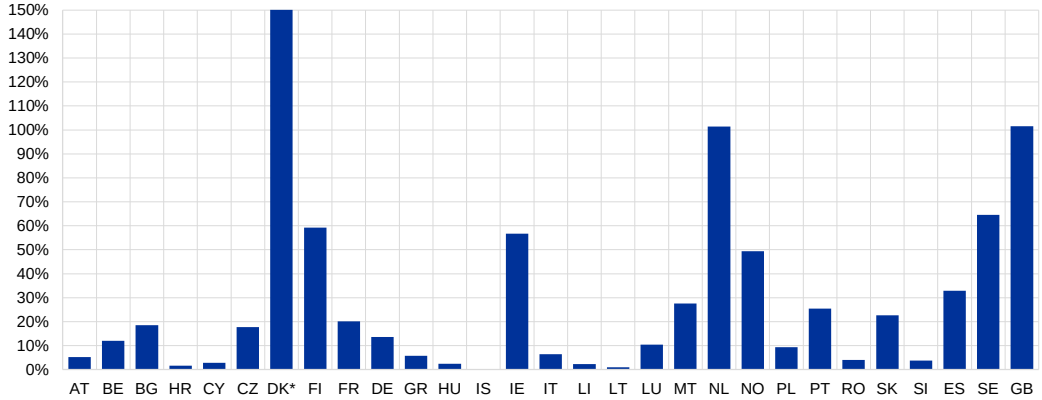


Sources: Solvency II Quarterly Reporting Templates.
Notes: Reporting at solo level. Data include unit-linked assets. Reporting reference date: fourth quarter of 2018.

Chart 15

EU (re)insurers' notional amount of derivatives relative to total investments held by (re)insurers using derivatives, by country

(in percentages)



Sources: Solvency II Quarterly Reporting Templates.
*Notes: Reporting at solo level. Bars show the notional amount of derivatives as a percentage of total investments for those (re)insurers that hold derivatives. (Re)insurers that do not hold derivatives are excluded from the total investments per country. Data include unit-linked assets. Reporting reference date: fourth quarter of 2018. * Denmark value = 367%.*

2.1.2 Margining practices for derivatives transcations

Recently introduced regulatory requirements have changed the risks associated with derivatives transactions from counterparty credit risk to liquidity risk. The need to reduce counterparty credit risk became apparent in the aftermath of the financial crisis. This has been addressed by introducing new rules for margining in centrally cleared and bilateral derivatives transactions. In particular, EMIR has introduced a requirement to exchange variation margin calls within a narrow time window. This calls for prudent liquidity management and may prove to be a challenge for some (re)insurers.

EMIR requires the most commonly used types of derivatives contracts[36] to be centrally cleared. The clearing obligation is determined by the European Securities and Markets Authority (ESMA) and is based on prescriptive criteria for liquidity, standardisation and risk for central clearing counterparties (CCPs). ESMA publishes a register listing all derivatives subject to the central clearing obligation. As a result of this, counterparties (including (re)insurers) need to gain access to a qualified CCP, either by becoming a direct clearing member or, more commonly, by becoming a client of a clearing member that also provides an indirect clearing service. Once clearing arrangements are in place and contracts are being cleared, counterparties become subject to a requirement to post cash to cover the CCP for replacement costs in the event of their own default (initial margins) and following the daily revaluation of their positions (variation margins).

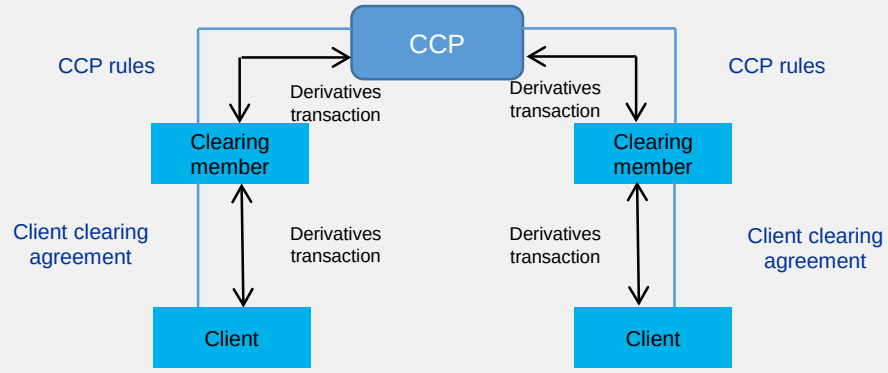
For over-the-counter (OTC) interest rate derivatives, the clearing obligation applies to both EU financial and non-financial counterparties, including (re)insurers, above a clearing threshold. EMIR introduces precise rules for determining which counterparties are subject to the clearing obligation and from what date. (Re)insurers with a gross exposure of more than €3 billion in OTC interest rate derivatives are subject to the obligation.[37] Counterparties below this threshold are exempted from clearing obligations, but could be still required to meet them bilaterally.

[36] The EMIR clearing obligation requires certain classes of OTC interest rate and credit derivatives to be cleared by authorised or recognised CCPs. For example, (a) fixed-to-float IRSs denominated in euro, pounds sterling, Japanese yen, Polish zlotys, Swedish kronor and US dollars and (b) several series of credit default swaps denominated in euro are subject to the clearing obligation. The details of the derivatives subject to the clearing obligation are listed in ESMA's **Public Register for the Clearing Obligation under EMIR**, last updated on 6 December 2018.

[37] EMIR Refit introduced the category of small financial counterparties, i.e. counterparties with gross notional amounts below the clearing threshold as specified in Article 10(4)(b). Small financial counterparties are not subject to the clearing obligation but remain subject to both the reporting obligation and the risk mitigation techniques for derivatives not cleared by a CCP referred to in Article 11.

Box 9
How does clearing work in practice?

Figure A
European client clearing model



Source: International Financial Law Review (2015).

Centralised clearing was originally introduced to improve settlement efficiency in multilateral cash markets such as stock exchanges. Members of the exchange would normally buy and sell the same security from and to each other during a typical trading session. By replacing these trades with equivalent trades with a single "riskless principal" middleman, who then became the seller to the buyer and the buyer to the seller (novation), the settlement of large volumes of offsetting trades was significantly simplified. It allowed sales to one member to be netted against purchases from another, with only the balance differences actually being exchanged. As a useful side effect, the institution of a single centralised counterparty for all trades executed on the exchange removed the counterparty-specific risk, making price the only relevant feature and significantly improving liquidity, as it no longer mattered who the counterparty was. Once established, CCPs (as these middlemen were called) were also used to clear derivatives.

CCPs have developed mechanisms to reduce counterparty credit risk. The main issue for a CCP is how it can stand in for each and every member. How can it underwrite them all? A practical solution was quickly developed by asking members to margin their exposures towards the CCP. A CCP is just marginally exposed to counterparty credit risk. For every exposure to a counterparty, a CCP has an opposing exposure to another counterparty resulting inherently from the novation of the original contract. Over the course of a day, however, the value of a clearing member's (or their client's) position will change due to market swings, which could lead to the default of the clearing member and hence expose the CCP to counterparty risk. To reduce this counterparty risk, the CCP calculates the value of a clearing member's portfolio at the end of each trading session. The result is that some clearing members are creditors vis-à-vis the CCP (their positions having gained due to price action), while others instead become debtors. The nature of the novation mechanism means that the sum of the CCP's credits and debts vis-à-vis its members always nets to zero, as all CCP positions are mirror images of each other. CCPs collect all credits due from clearing members and use the proceeds to settle any debts owed to clearing members. This daily process removes any outstanding counterparty credit risk from the CCP system.

CCPs have defined default management procedures in the event that a clearing member defaults. What happens if a member is unable to make the variation margin call? What can a CCP do to make good with the other members? Post-novation, the CCP is fully responsible for the trade to each of its members, regardless of whose trade it was originally. Modern CCPs operate by asking members to contribute prepaid resources to insure against their own default. If a member is unable to meet a variation margin call, this is interpreted by the CCP as a default event. The CCP then initiates default management procedures, which are typically sequenced as follows:

1. The CCP appropriates all positions and pre-paid resources of the defaulting member.
2. It uses the prefunded resources first and foremost to meet variation margin calls to the other members.
3. It then tries to liquidate the defaulting member's portfolio, either by selling it on the market (if small) or by arranging auctions among the other members. In exceptional cases the CCP can forcefully allocate positions among its members or even tear up contracts. The prepaid resources of the defaulting member – if correctly calibrated – should cover any execution shortfall. As a reference, in the Lehman default liquidation losses for the CCP were around one-third of the Lehman initial margins, as these prefunded resources are called.
4. If the initial margins are not enough, residual losses are mutualised across CCP capital and the surviving clearing members through contributions to a dedicated default fund.

CCPs usually require variation margins to be posted in cash. CCPs are complex risk managers who primarily collect and redistribute profits and losses across the network of their members on an ongoing basis. They compute, collect and maintain the initial margins required to insure all portfolios against the default of their clearing members. From a member's perspective this materialises as daily – and sometime even intraday – rebalancing of margins. These have to be discharged quickly, typically through transfers of cash that are ultimately linked to the price movements of each member's portfolio. Even though CCPs will generally accept highly liquid collateral[38], variation margins are usually posted in cash. This is because cash is cheaper and quicker to transfer and does not give rise to any questions over its valuation, thus facilitating redistribution.

It is not necessary to be a member of a CCP to access clearing services. Membership is rather expensive, requiring good standing, capital, but most importantly the technical and operational capability to interact with CCPs. Less sophisticated counterparties – or counterparties whose volumes do not justify setting up the infrastructure – can rely on existing members to "lend" them their capacity and access the CCP through their accounts. This is called indirect clearing, where the clearing member acts as a middleman between the client and the CCP: calling margins from clients on behalf of the CCP and posting collateral to the CCP on behalf of clients. In Europe, the prevailing model for indirect clearing is a principal model, where the clearing member is fully

[38] CCPs may accept other types of collateral, subject to certain provisions specified in Article 46 of Commission Delegated Regulation 153/2013 of 19 December 2012.

responsible for clients towards the CCP and then deals with the client relationship on a bilateral basis (as opposed to a model where the clearing member acts in an agency capacity and there is a direct relationship between the CCP and the client). This brings both benefits and drawbacks. The benefits stem from the softening of CCP requirements, for example by buffering intraday margin calls which some clients may not be able to meet operationally. The drawbacks are the additional credit risk of the intermediary and the bilateral nature of the clearing arrangement, which can require higher margins or lower protections than a direct clearing membership.

(Re)insurers access clearing services for IRSs via indirect clearing. There is no evidence of (re)insurers being direct clearing members of CCPs for contracts subject to the clearing obligation. Given the concentration of the client clearing service business, the implication is that the European insurance sector is reliant on a handful of clearing members. These clearing members provide access to just two CCPs which clear these contracts.

Non-centrally cleared derivatives are subject to specific margin requirements.[39] Bilateral counterparties above specific thresholds must exchange daily variation margins and post initial margins to each other. The exchange of two-way initial margins is a new feature of the Regulation and has both operational and cost implications.

The most complex aspect of posting initial margins bilaterally is operational. Whereas for cleared contracts, the CCP (or clearing member in the case of indirect clearing arrangements) carries out the operational task of computing the amounts of initial and variation margins due, and also provides custody for any margin posted, for bilateral transactions these functions must be carried out by the counterparties. Variation margins are one-way flows offsetting the daily change in the net profit or loss of the entire derivatives position between two counterparties. Their calculation – or validation by the counterparty receiving the margin call – requires only the ability to value the reciprocal portfolio. Where counterparties decide not to adopt the standardised method[40], however, to compute initial margins, the CCP-like risk model must be replicated internally, including producing stressed time series and back testing. Counterparties are not required to share the same models to call initial margins, meaning that two counterparties can call each other different initial margins for the same position. However, counterparties are required to agree on the margins being called, implying validation of the other counterparty's model. This could in turn lead to validations being run for multiple models, one for each counterparty, in addition to one's own.

Collateral management is an additional complexity. Once the initial margin has been determined and exchanged, it must be kept segregated from all other assets in a bankruptcy remote configuration. This means that it should be readily accessible to the posting counterparty in the event of the (re)insurer's default. It also implies that the (re)insurer holding the collateral must be able to value it daily, including the application of appropriate haircuts, to ensure that it is at least equivalent to the initial margin due and trigger additional margin calls whenever the value falls

[39] For details of risk mitigation techniques applicable to non-centrally cleared derivatives, see Article 11 of EMIR and the related **Commission Delegated Regulation (EU) 2016/2251 of 4 October 2016**.

[40] For details on the standardised method for the calculation of initial margins for the purposes of EMIR Articles 9 and 11, see Annex IV of Commission Delegated Regulation (EU) 2016/2251.

below the initial margin. In short, the management and maintenance of bilateral contracts entail material costs.

The daily exchange of margins involves a number of concurrent calculations. In practice, bilateral risk mitigation techniques require counterparties to assess, on a daily basis, the combined effect of the profit and loss of reciprocal derivatives exposures, the adequacy of the margins posted against the expected risks in the event of default, and the changes in the value of the posted non-cash collateral, and to request a top-up of any shortfall – or return any excess – accordingly.

The regulation provides scope for non-cash variation margins to be exchanged for non-centrally cleared derivatives. Unlike for cleared derivatives, the regulation allows the exposure from variation margin calls to be collateralised with non-cash collateral. Although there is little evidence on non-cash variation margin payments, this could be an attractive option for (re)insurers who are asset rich but cash poor.

The scope of these requirements depends on a combination of factors. While all counterparties have been subject to the exchange of variation margins since March 2017, the obligation to exchange initial margins is due to be phased in gradually.[41] As of 1 September 2019, the requirements apply in all cases where both counterparties have, or belong to groups that have, an aggregate average notional amount of non-centrally cleared derivatives that is above €750 billion. This threshold will then be lowered to €8 billion as of 1 September 2020.

The liquidity risk arising from these margining practices for bilateral trades is similar to that associated with cleared trades. In principle, however, the liquidity risk arising from variation margin calls is somewhat less severe than for centrally cleared transactions. This is because unlike for cleared transactions, the collateral that can be used to meet variation margin calls is not limited to cash alone. However, market intelligence suggests that cash is usually the only instrument which can be exchanged within a very short time frame (such as a day or even intraday). In practice, therefore, the imminent daily liquidity risk from variation margin calls on non-centrally cleared transactions is almost the same as for centrally cleared contracts. If the variation margin posted in cash remains substantial over a longer period, in the case of bilateral trades it can be replaced by other types of collateral. If a substantial volume of variation margins is posted in non-cash collateral, however, there can be an additional trigger for a liquidity squeeze, namely a decline in the value of the collateral.

2.1.3 Implications of margining practices on the liquidity management of (re)insurers

This section:

1. **provides information on the current practices applied by (re)insurers and summarises market intelligence collected from different EU markets (Box 10);**

[41] For detals on the phase-in schedule see article 36 of the Commission Delegated Regulation (EU) 2016/2251.

2. **summarises a quantitative analysis that simulated variation margin calls on IRSs held by (re)insurers.**

2.1.3.1 Current practices applied by (re)insurers

Clearing may be a voluntary choice. Notwithstanding the regulatory requirements, there is evidence to suggest that (re)insurers may wish to clear products voluntarily. One reason could be to avoid the complexity of managing (multiple) bilateral relationships in-house and the potential for netting that clearing provides. Another possible reason is that as trading moves progressively to multilateral platforms, the market for cleared contracts becomes more liquid and their costs might decrease. Accessing best prices and deep liquidity comes at the price of being able to clear them. This also applies to contracts that are not yet covered by the clearing obligation. Finally, there could be mounting pressure from banks to favour (price or commission-wise) cleared contracts over bilateral ones on the basis of capital and operational costs.

European (re)insurers rely on client clearing rather than being clearing members themselves. Being a clearing member of a CCP can be costly and requires special competencies. Clearing members are obliged to contribute to the CCP's default contribution fund and participate in auctions on the positions of a defaulted clearing member. Clearing members are typically large banks, who have both the need to clear and the resources available to become members. (Re)insurers who are part of a financial conglomerate are likely to make use of its banking arm for transaction clearing. In such cases, collateral management is also likely to be centralised. Where an external (i.e. not part of the group) broker or treasury is used, in addition to acting as the clearing member it could also take on other functions such as collateral management and the transformation and prefunding of margins.

This client clearing model entails certain risks. (Re)insurers tend to rely on a small number of agents acting as clearing members, giving rise to operational and concentration risk. Should the relationship cease for any reason, it will take time to enter into a relationship with another clearing member, and this could be costly. The (re)insurer may lose access to the cleared derivatives market during this time.

Bilateral trades still constitute the bulk of transactions. The obligation to exchange initial and variation margins is not yet fully applicable to (re)insurers: it will be some time before new trades replace the legacy trades that are not covered by the requirements. Some (re)insurers have expressed a preference for bilateral trades over cleared transactions, as these seem less costly for them overall. However, others have indicated that counterparties seem less eager to trade bilaterally.

For bilateral and centrally cleared transactions, the variation margin call is received at the end of the day and should be delivered the next day. (Re)insurers have expressed concerns about the short timespan between the moment they receive the variation margin call and the moment they have to deliver the variation margin in cash. As European financial markets have settlement at T+2, it will not be possible for (re)insurers to sell assets to meet variation margin calls. Some (re)insurers have stated that large margin calls would cause a sell-off of assets in anticipation of or in preparation for future margin calls. If these large margin calls are due to an

increase in interest rates, a sell-off of assets could reinforce this increase in interest rates. As derivatives contracts have cross-default trigger clauses, the inability to meet margin calls on one part of the portfolio could trigger calls from other parts of the portfolio. (Re)insurers are therefore highly incentivised to meet margin calls.

In conclusion, (re)insurers are already required to post variation margins on a certain share of their derivatives portfolio and usually need to post cash, which creates a liquidity risk. For bilateral transactions, the requirement to post a variation margin is already in place. The variation margin can in theory be posted either in cash or via high-quality collateral. In practice, market intelligence suggests that counterparties usually require cash. In addition, other requirements entering into force (such as the clearing obligation for new IRSs applicable since 21 June 2019[42]) will increase the need for (re)insurers to manage their liquidity position and adapt their asset allocation.

Box 10
Experiences from selected national markets

Some Danish insurers and pension fund companies have a significant share of long-term guaranteed liabilities. The present value of these guaranteed liabilities is heavily dependent on the interest rate curve used for discounting, exposing the companies to interest rate risk. Buying assets with a similar degree of interest rate risk, such as government and mortgage bonds, can act as a hedge against interest rate changes. In addition to buying interest rate-sensitive assets, the companies also use interest rate derivatives to hedge the interest rate risk on their liabilities. IRSs are the most commonly used interest rate derivatives among Danish companies. Many of the Danish companies considered in the sample are pension funds and are therefore currently exempted from the obligation to centrally clear certain standardised derivatives.

In France, (re)insurers essentially use derivatives for hedging purposes (more than 90% of the notional amount). The main risks covered are interest rate risk, equity risk and foreign exchange risk. The most frequently used derivatives are call options, swaps (interest rate), interest rate caps and put options. According to data submitted by (re)insurers under Solvency II, the notional amount of derivatives held by the French insurance sector accounted for slightly more than 20% of total investments in 2017. Market intelligence shows that two of the largest players in the French insurance market have mainly long positions on derivatives, for which they only pay up-front fees and variation margin calls are not required. For one of them, over 99% of its notional amount relates to bilateral transactions and less than 1% to centrally cleared derivatives. The insurer, which is already EMIR-compliant, only pays variation margin calls for the latter. Its variation margins are thus low compared with the total amount of investments and liquid assets (more than 8% of total investments). The insurer's liquidity is mainly invested in MMFs and variation margin calls are entirely financed by the insurer.

Dutch insurers have a high proportion of derivatives on their balance sheet (4%). A relatively large share of the overall Dutch insurance business concerns life and pensions products, meaning that their liabilities have relatively high maturities. Derivatives are therefore key for Dutch insurers

[42] For counterparties below the €8 billion threshold.

as a means of efficient risk and portfolio management. Around one-quarter of insurers' derivatives are cleared centrally, with only a few insurers conducting intragroup derivatives transactions. Around two-thirds of insurers organise their collateral management internally. The majority of insurers take the variation margin into account in their liquidity management. Even before the introduction of EMIR, insurers mainly used cash as collateral for bilaterally traded derivatives, and most of them are prepared for initial margin requirements. With regard to liquidity risk, the main consequence of EMIR is the introduction of the initial margin for bilateral trades. The foreseen risks stemming from EMIR include collateral management requirements, a preference for cash as a variation margin and access to clearing members not being guaranteed (clearing members having limited capacity).

In Italy, the exposure of insurers to derivative financial instruments accounts for less than 1% of total investments, lower than the European average of 2%. Insurers mainly use derivatives for hedging purposes. The main risks covered are interest rate risk, currency risk and equity risk, while the main derivatives contracts are swaptions (call), forward exchange agreements, IRSs, interest rate and currency swaps, equity and index options (put). According to the data submitted by insurers for Solvency II reporting at the end of 2018, OTC contracts account for 84% of the total derivatives portfolio at solo level and 91% at group level. 99% of OTC derivatives transactions are bilaterals with financial counterparties. The use of derivatives is concentrated in a limited number of large life or composite insurers belonging to groups, who are typically big players at domestic level. The Italian Institute for the Supervision of Insurance (IVASS) recently set up half-yearly monitoring aimed at verifying the potential macroprudential vulnerabilities of the insurance sector related to the use of derivative instruments. In 2019, IVASS launched a market intelligence survey on derivatives, focusing on OTC derivatives contracts based on a representative sample. The main findings were as follows. First, the biggest insurers stated that during the initial phase in which they enter into an OTC derivatives contract subject to clearing by a CCP, management with the CCP is more expensive than for the same type of contract negotiated bilaterally with a financial counterparty. This is due to the collection and submission of portfolio data required for the clearing process. Moreover, this type of derivatives does not seem to contribute to efficient portfolio management due to the high costs involved (fixed and variable). Second, insurers' counterparty risk is mitigated by a high quality rating (82% of the financial counterparties have a rating between A+ and AA-) and a good level of diversification among the financial counterparties. Third, as regards the risk mitigation technique adopted, many insurers have procedures for collateral management, with daily valuation of the contract and existing collateral agreed by the counterparties, and the variation margin posted to reflect any changes. The collateral is predominantly cash. Fourth, highly liquid government and corporate bonds are accepted to cover variation margin calls under a wide range of bilateral agreements, with the Italian insurance sector making limited use of repurchase agreements. Finally, many insurers consider their derivatives exposure to be immaterial for liquidity management due to the low share of derivatives in the investment portfolio and the type of risk mitigation techniques adopted.

2.1.3.2 Simulating variation margin calls for derivatives held by (re)insurers

This section analyses the extent to which the liquid assets held by European (re)insurers are sufficient to meet potential variation margin calls on their IRS portfolios. It focuses on the main derivatives class in (re)insurers' portfolios – IRS – and simulates the size of variation margin calls that would arise from a parallel upward shift in interest rate curves, ranging from 25 basis point steps to a one percentage point change[43]. The resulting variation margin calls are then compared with (re)insurers' liquidity positions. The liquidity positions can be assessed based on different types of assets.

1. Cash – the analysis distinguishes between all cash available to (re)insurers and cash available on their IRS portfolio, calculated as the share of cash corresponding to the share of the IRS portfolio in the total derivative portfolio. As it is assumed that the calls need to be paid at short notice, cash may be the only instrument that can be used in practice.

2. Cash and AAA and AA-rated government bonds.

3. Cash, AAA and AA-rated government bonds and MMF shares.

4. Cash, AAA and AA-rated government bonds, MMF shares and AAA and AA-rated corporate bonds.

For the parallel upward shifts of 75 and 100 basis points, haircuts of 10% and 7% respectively have been applied to the government and corporate bonds, as the rise in interest rates would also have a negative effect on the price of these bonds posted as collateral. The use of haircuts does not significantly change the conclusion. The analysis summarised below is described in more detail in an ESRB Occasional Paper (De Jong et al., 2020, forthcoming).

The analysis is based on end-2018 Solvency II data and covers (re)insurers that account for 47% of total EEA insurance investments. Of the 1,940 (re)insurers that reported data under Solvency II as at the end of 2018, 224 (12%) use IRSs. After data cleaning, the sample ultimately includes around 35,000 IRS contracts held by 170 (re)insurers with total investments of €4.8 trillion (9% of the EU insurance sector in terms of the number of (re)insurers, 47% in terms of total investments). Table 2 provides an overview of the results.

[43] Since (re)insurers typically hedge potential (further) declines in interest rates by means of IRSs, an upward shift in the interest rate curve generates a positive variation margin call (when netted on aggregate).

Table 2

Simulated variation margin calls against liquidity position

(percentages and number of (re)insurers with a liquidity shortfall)

Upward parallel shift (basis points)	Cash				Cash and government bonds				Cash, AAA/AA government bonds and MMF shares		Cash, AAA/AA government and corporate bonds and MMF shares	
	Cash available for IRSs		Cash		Cash and AAA government bonds		Cash and AAA/AA government bonds					
	no netting	netting	no netting	netting	no netting	netting	no netting	netting	no netting	netting	no netting	netting
100	40%	30%	24%	18%	6%	4%	4%	3%	2%	1%	2%	1%
	68	51	40	31	11	7	6	5	3	2	3	2
75	35%	25%	22%	17%	5%	4%	2%	2%	2%	1%	1%	0%
	60	42	37	29	9	7	4	4	3	2	2	0
50	29%	21%	18%	15%	5%	4%	2%	2%	1%	1%	0%	0%
	50	36	31	26	9	7	4	4	2	2	0	0
25	24%	17%	14%	10%	4%	2%	2%	2%	1%	1%	0%	0%
	40	28	24	17	6	3	4	3	2	2	0	0

Sources: ESRB calculations and Solvency II quantitative reporting template data.
Notes: The figures at the bottom of each cell indicate the absolute number of (re)insurers with a liquidity shortfall; the percentage figures above indicate the share of (re)insurers in the sample of 170 companies with a liquidity shortfall. Reporting reference date: fourth quarter of 2018.

40 (re)insurers, corresponding to 24% of the sample, would not have enough cash to meet variation margin calls following an upward parallel shift of 25 basis points in interest rates. It is likely that calls would need to be paid at short notice, meaning that in practice only cash could be used. Even if we consider the full cash amount (and not just the cash available for IRSs), 24 (re)insurers (14% of the sample) would face a liquidity shortfall following an interest rate movement of 25 basis points. The cash shortfall in such cases is estimated to be €15 billion on aggregate. This is a sizeable amount when compared with the overall cash buffer for the sample (€50 billion) and the initial Solvency II value of the derivatives portfolio (€22 billion).[44] The total investments held by these (re)insurers also represent a relatively sizeable share (19% of total investments in the sample). In the event of a more severe interest rate movement, e.g. 100 basis points, 68 (re)insurers (40% of the sample) would not have enough cash and would therefore experience a liquidity shortfall.

The number of (re)insurers that would experience a liquidity shortfall decreases significantly if we consider other liquid assets in addition to cash. Widening the scope to also include other types of assets such as AAA and AA-rated government bonds assumes that (re)insurers would

[44] The Solvency II value of the derivatives portfolio broadly corresponds to the market value of the portfolio. For this reason, no distinction is made between centrally and non-centrally cleared transactions, even though in the latter case other types of collateral could be considered to be exchanged in principle. This scenario also assumes that offsetting of positive and negative contributions from different contracts cannot take place (no netting), as the timing of the collateral inflow (positive contribution) and outflow (negative contribution) may not coincide.

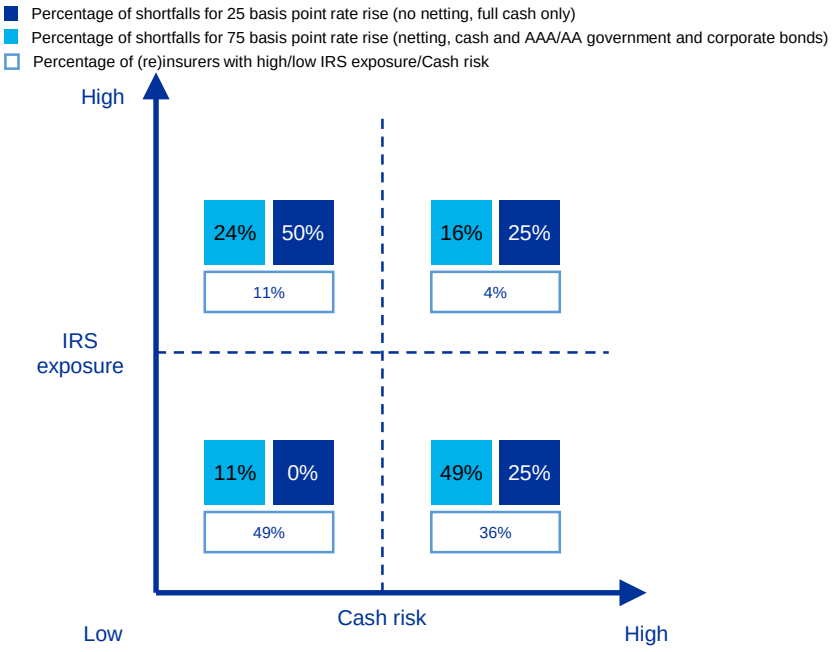
have sufficient time to transform the government bonds into cash via the repo market or through an outright sale of bonds if necessary – such as in the case of centrally cleared transactions. This is also a plausible assumption for non-centrally cleared transactions, as (re)insurers may, at least in theory, have the option of posting the collateral directly in the form of high-quality government bonds. Finally, if high-quality corporate bonds are also considered as available liquid assets, no (re)insurer has a liquidity shortfall for a movement of 25 basis points.

The liquidity shortfalls observed within the sample can be driven by either a small amount of cash or a high IRS exposure. If we look at the (re)insurers with a liquidity shortfall following a 25-basis point movement with no netting and full cash, 65% of the shortfalls are driven by a low amount of cash rather than a high IRS exposure (see Figure 6, light blue boxes). If we look at a 75-basis point movement with netting and high-quality government bonds, however, the few (re)insurers in difficulty (50%, dark blue boxes in Figure 6) tend to have a large IRS portfolio (gross notional amount exceeds 50% of total investments).

Figure 6

Driving factors behind liquidity shortfalls: low level of liquid assets or high IRS exposure

(percentage of (re)insurers)



Sources: ESRB calculations and Solvency II quantitative reporting template reporting data.
Notes: (Re)insurers with high (low) cash risk are those with less (more) than 1% of cash in total investments. (Re)insurers with high (low) IRS exposure are those for which the IRS notional amount is higher (lower) than 50% of total investments. Reporting reference date: fourth quarter of 2018.

2.1.4 Policy proposals

Margining practices for (re)insurers' derivatives portfolios have a potential impact on financial stability. EMIR addressed the risks posed by derivatives trading by systematically

removing counterparty credit risk. The tools used to implement this policy carry their own risks, however, in the form of increased complexity (operational risk) and reliance on timely cash payments (liquidity risk). It is these side effects that affect (re)insurers, which are traditionally asset rich but cash poor and are usually ill-equipped to handle large and unexpected requests for cash payments at extremely short notice. If a (re)insurer fails to meet a margin call originating from either bilateral or centrally cleared derivatives, this could be interpreted by the counterparty as a default event and lead them to trigger the termination of all outstanding contracts. In isolation, this might not be a systemic concern (although it would depend on the size, interconnectedness and activities of the (re)insurer in question), but if the inability to meet margin requirements impacts multiple (re)insurers at the same time, for example because of a liquidity shock that temporarily tightens access to short-term funding, this could affect financial stability. This liquidity risk could materialise even in a scenario where (re)insurers are well capitalised.

Mitigating liquidity risk has a systemic dimension. Cash is the most fungible asset. There is not a separate liquidity market for (re)insurers: the liquidity market serves all. This means that shocks to the liquidity market affect both (re)insurers and their liquidity providers at the same time. (Re)insurers can have long-term liabilities with typically stable liquidity needs, although some insurance liabilities also create a liquidity risk, as described in Section 2.2. (Re)insurers can therefore act as shock absorbers under normal market conditions. Margin requirements introduce a change in the short-term behaviour of (re)insurers which can affect the functioning of the financial markets, for example by reducing the shock-absorption capacity of (re)insurers' portfolios in a crisis.

Margining practices for (re)insurers' derivatives portfolios may have second-round effects on financial stability via the following channels:

- **MMFs.** If (re)insurers collectively withdraw their investments from MMFs to cover margin calls, this could affect liquidity provision in those parts of the financial system that rely on funding through MMFs. Investing in MMFs allows (re)insurers to achieve a slightly higher return than with bank deposits. MMFs are also highly liquid, and settlement times are commonly T+2. While settlement times restrict the usefulness of MMFs in providing overnight liquidity in cash, (re)insurers may sell their MMF investments to restore cash liquidity during a market stress scenario. Some MMFs provide short-term liquidity to NFCs through the commercial paper market. A withdrawal of liquidity may have consequences for NFCs' ability to meet payment obligations.

- **Repo markets.** Banks' ability or willingness to provide liquidity via repos may be limited, for instance around year-end [45] or in stressed market conditions. To cover margin calls, some (re)insurers may have to rely on funding through repo markets. Under normal circumstances repo markets would be able to secure (re)insurers' liquidity needs. (Re)insurers have a natural amount of liquidity via the regular receipt of premiums. Some (re)insurers use this to provide

[45] See ECB (2017): "Volatility of repo rates and trading activity at the balance sheet reporting dates has increased gradually over the past years, peaking at the end of 2016. During 2014 and in the first part of 2015, all repo rates tended to increase at quarter-ends due to the preference for liquid assets and cash on reporting dates. However, since mid-2015, repo rates for higher credit quality collateral, such as German and French sovereign bonds, have started to fall at quarter-ends." See also ICMA (2019).

liquidity to the financial markets through reverse repos. As (re)insurers' liquidity risk management changes, they may be less willing or less able to provide short-term liquidity to the market, which could impair liquidity provision for banks.

- **Fire sales.** The need to meet variation margin calls quickly could force (re)insurers to liquidate assets. Depending on market conditions this could have a knock-on effect on other investors by moving prices, thus forming a feedback loop that reinforces the price fall.

There is a liquidity risk stemming from (re)insurers' use of derivatives, and in particular from their IRS activities. It is driven by two factors: i) high IRS exposure and ii) high cash risk (i.e. insufficient holdings of cash and liquid assets). Around 10% of EU (re)insurers use IRSs, typically large insurers and life insurers. The analysis outlined in this section concludes that some (re)insurers have not yet adapted their asset allocation to the (new) requirements – either recently introduced or currently being phased in – governing the use of derivatives and margining practices. Since the analysis carried out in this report only looked at IRSs, the reality of potential liquidity shortfalls could be worse due to margin calls on other types of derivatives.

Targeted policy interventions in the following two areas would help remedy this situation.

- **Reinforce the Pillar 2 provisions of Solvency II with stress testing and the power for supervisors to require a liquidity buffer for vulnerable (re)insurers.** Two types of policy actions could be conducted. First, (re)insurers should be asked to incorporate stress tests into their risk monitoring framework and their own risk solvency assessment, perhaps using the scenario analyses performed in this report as a starting point. This would allow them to plan their liquidity needs and assess the extent to which they are able to rely on cash they hold and on arrangements with third parties for centralised collateral management. Second, the supervisory review process should assess the effect of liquidity stresses due to margin calls on all types of derivatives that are subject to these requirements. Supervisors should compare liquidity needs with the various possible sources of liquidity, such as those provided by third parties. If supervisors conclude that a (re)insurer might face a liquidity shortfall, and this shortfall cannot be resolved via arrangements with third parties, supervisors should ultimately have the power, via a Pillar 2 tool, to require the (re)insurer to set up a cash buffer corresponding to a certain level of margin calls[46]. This is consistent with the policy options set out in the ESRB report on margins and haircuts and the need for all market participants to plan their margining needs. In the case of bilateral transactions, supervisors might also allow the (re)insurer to set up a HQLA buffer if it is confirmed that the counterparty would accept them even during periods of market stress.

- **Increase transparency of arrangements and practices in the client clearing and bilateral domain.** Limiting the discretion of client clearing service providers vis-à-vis their clients would be beneficial for (re)insurers' liquidity management. As documented in the ESRB report on margins and haircuts[47] and the market intelligence gathered for this section, client clearing

[46] In the case of IRSs, for example, supervisors could ask vulnerable (re)insurers to hold enough cash to cope with an upward parallel movement of at least 25 basis points or 50 basis points in interest rates. This is a question of calibration, and also applies to other types of derivatives.

[47] ESRB (2020).

contracts are not standardised and give clearing members a high degree of discretion vis-à-vis their clients with regard to aspects such as contract termination rights, initial margins, add-on changes and notice periods. The ESRB proposed standardising contractual terms as a policy option for making commercial terms fairer, more reasonable, non-discriminatory and transparent. Such standard contractual terms could include minimum notice periods for changes in collateral eligibility, initial margin calculation, setting of add-ons in client clearing and termination of client clearing contracts. This would help clients manage their liquidity better, including during stressed market conditions, and have certainty for accessing central clearing services. Provisions to strengthen client clearing could be incorporated into the existing legal framework. ESRB (2020) provides further details.

2.2 Impact of mass lapse events on insurers' liquidity management

Mass lapses of insurance contracts, for instance after an abrupt rise in interest rates, could result in liquidity dry-up. The risk of mass lapses is therefore a major source of liquidity risk. When evaluating this risk, it is essential to differentiate between normal and exceptional periods. It is difficult to study mass lapse risk empirically, because one is dealing with a rare event (tail risk) and the negative effects of past events were mitigated by regulatory interventions. As a result, a study based on archival data would show the sensitivity of lapse rates to economic events as quite low. Any risk assessment is therefore based in part on theoretical considerations. For example, Feodoria and Förstemann (2015)[48] argues that policyholders could carry out strategic redemptions in the event of a severe financial shock. Under exceptional economic conditions, such as an abrupt rise in interest rates or a loss of confidence in the ability of insurers to pay surrender values, policyholders might have a common incentive to redeem their funds from their life insurance contracts. This would expose life insurers to both solvency risk and liquidity risk. Related fire sales could amplify interest rate shocks by up to 15%.[49] Berdin et al. (2019) present a life insurance model in which stochastic policyholder surrender decisions are a function of interest rates calibrated to match the German life insurance market. The main result is that significant interest rate rises make insurers' free cash flows negative, meaning that insurers have to sell assets to generate additional liquidity. As interest rate changes systematically affect many life insurers, they could be collectively forced to liquidate assets, resulting in significant fire sale costs.[50]

The general approach proposed in this section is to first identify insurers with a vulnerable liquidity profile and then consider strengthening the requirements for such insurers. Liquidity risk might not be as crucial for the entire insurance sector as it is for the banking sector. The fact that premiums are paid upfront (reverse production cycle), that certain insurance products offer tax incentives that could be lost in the event of redemption, and that there may be penalties that reduce the surrender value in the event of early redemption protects insurers from liquidity risk to a certain extent. However, this does not mean that there is no risk linked to specific activities.

48 See Feodoria and Förstemann (2015).

49 See Feodoria and Förstemann (2015).

50 See Berdin et al. (2019).

Several mass lapse events have taken place at EU and non-EU insurers. In most cases their negative effects were mitigated by regulatory interventions. Berdin et al. (2019)[51] provide a brief history of what are considered to be excessive policy redemptions (i.e. more than 10% of policyholders redeeming their funds). The US insurer General American experienced a run-like situation of this kind in 1999, as did the German insurer Mannheimer Leben in 2003-04 after being transferred to a resolution scheme and closed to new business, and the Belgian insurer Ethias in 2008 (see Box 12). In the 1990s, Korean and Japanese insurers also experienced a high level of redemptions that caused the public authorities to intervene.

Over the last few years, macro-financial conditions in particular, coupled with new regulatory developments, have led to insurers investing slightly more in illiquid investments. The low-yield environment could incentivise a search for yield behaviour, as documented for example in a 2017 EIOPA report[52] and in the EIOPA Financial Stability Report published in June 2019 [53]. This has caused (re)insurers to gradually increase their investments in illiquid assets, albeit to different degrees in the different Member States. At the same time, (re)insurers investing in certain infrastructure investments, private debt, unlisted equity or long-term equity benefit from a lower capital requirement.[54] These additions of external factors affect the liquidity profile of insurers' assets and the role of insurers in funding the economy. Should a mass lapse event occur, certain illiquid assets could be difficult to transform into cash.

This section focuses on liquidity risk stemming from certain types of insurance liabilities, namely insurance-based investment products, excluding unit-linked products. Many liabilities could fall under the scope of liquidity risk as defined in Solvency II in the broad sense – the risk that insurers "are unable to realise investments and other assets in order to settle their financial obligations when they fall due". For example, liquidity risk could be analysed for non-life insurance where a catastrophic event creates a significant liquidity need.[55] This report does not consider liquidity needs stemming from non-life insurance obligations, however, but focuses on certain types of "insurance-based investment products", defined in Article 2(17) of **Directive (EU) 2016/97** (Insurance Distribution Directive) as insurance products which offer a maturity or surrender value and where that maturity or surrender value is wholly or partially exposed, directly or indirectly, to market fluctuations, and do not include non-life policies, life insurance policies which only cover death or incapacity due to injury, sickness or disability, pension products, occupational pension schemes and individual pension products. Indeed, mass lapse events on these types of products appear to be the most prominent source of systemic liquidity risk based on historical events and the weight of these obligations in (re)insurers' balance sheets.

Unit-linked and index-linked products can also be a source of liquidity risk, but are not examined further in this report. Even if insurers do not carry market risks (except where

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51 See Berdin et al. (2019).

52 These investment trends are reported by insurance companies in a survey, see EIOPA (2017a): **Investment Behavior Report**.

53 See section 5.2 "Quantitative risk assessment European insurance sector" which takes note of the increased investments in unlisted equity and mortgages and loans. **Financial Stability Report**, EIOPA (2019a).

54 In the last years there were several amendments to Delegated Regulation 2015/35: on **qualifying infrastructure projects, European Long-Term Investment Funds and equities traded on multilateral trading facilities**, on **infrastructure corporates**, on **private debt, unlisted equity and long-term equity portfolios**.

55 The Bermuda Insurance Act 1978 defines a minimum liquidity ratio for non-life insurance.

guarantees are provided), the redemption of a large amount of funds could affect the prices of assets and/or could be difficult where funds have been invested in illiquid assets such as real estate. Since they have a smaller weight on the EU insurance balance sheet than profit participation life insurance products, this report does not include any further examination of unit-linked and index-linked products, as this would require an analysis of the interconnectedness of insurers and investment funds. This could be an area for future work. Liquidity risk stemming from other balance sheet items (or from off-balance-sheet items) is briefly considered in this report. In general, the suggested approach is to identify insurers with a weak liquidity profile.

This section contributes to the current discussions on liquidity risk taking place at national, European and international level but also within the insurance industry itself. There has been an increasing focus on liquidity risk over the past few years. See for instance the Bank of England consultation paper **Liquidity risk management for insurers** (March 2019), the EIOPA consultation paper on the Opinion on the 2020 review of Solvency II (November 2019), the IAIS public consultation document on the **Holistic Framework for Systemic Risk in the Insurance Sector** (November 2018) or the Milliman white paper **Liquidity risk management: An area of increased focus for insurers** (July 2019).

This section first considers risk management and reporting provisions for liquidity risk, then develops proposals for liquidity risk indicators based on either balance sheet amounts or cash flows.

2.2.1 Risk management and reporting

2.2.1.1 Liquidity risk management

Within the Solvency II framework, there is no quantitative requirement for liquidity risk under Pillar 1 and it is only considered under Pillar 2. The quantitative requirements under Solvency II focus on the solvency of insurers. Although liquidity risk is not covered by quantitative requirements under Pillar 1 of Solvency II, such as a liquidity buffer, it is mentioned as a risk that insurers should effectively manage (see Article 44(2)(d) of Directive 2009/138/EC and Article 260(1)(d) of Commission Delegated Regulation (EU) 2015/35).

Liquidity risk is covered by different qualitative requirements under Solvency II:

- **Prudent person principle:** all assets need to be invested in such a manner as to ensure, among other aspects, the liquidity of the portfolio as a whole. This means that insurers are allowed to invest in certain illiquid investments – if justified by the liquidity profile of their liabilities – but that the degree of illiquidity needs to be controlled.
- **Risk management system:** insurers are required to have in place an effective risk management system comprising strategies, processes and reporting procedures necessary to identify, measure, monitor, manage and report the risks to which they are exposed. Liquidity risk is listed as an area that needs to be covered by the risk management system. To ensure that an insurer's liquidity is kept under control, the risk management function is required to

assess the risk from different perspectives: short-term and long-term liquidity risk, composition of the asset portfolio, measures to deal with changes in expected cash inflows and outflows, concentration risk, operational risk, reinsurance and other insurance risk mitigation techniques.

- **Own risk and solvency assessment:** all insurers are required, as part of their risk management system, to conduct their own risk and solvency assessment on a regular basis. This assessment must consider their overall solvency needs, taking into account their business strategy and the overall risk tolerance limits they have set up. Where liquidity is a risk for an insurer, liquidity thresholds would be expected as key indicators for this purpose.

- **Specific requirements for the volatility adjustment and the matching adjustment:** where insurers apply the volatility adjustment or the matching adjustment, they must set up a liquidity plan with an estimate of the incoming and outgoing cash flows relating to assets and liabilities subject to those adjustments.

At worldwide level, a strong emphasis has been placed on the management of liquidity risk. In a first attempt (2014), the IAIS released a set of policy measures for global systemically important insurers (G-SIIs) that included principle-based guidance on the minimum components for a liquidity risk management plan (LRMP)[56] . These minimum components are:

- a statement of policy containing the liquidity risk tolerance of the insurer, the starting point for which is a comprehensive understanding of the insurer's sources and needs of liquidity (i.e. a complete inventory of funding sources and needs with their characteristics);

- a description of the corporate governance for liquidity risk management (i.e. that will establish the risk tolerance, manage the level of liquidity risk given that threshold and monitor the effectiveness of that management), including contingency funding plans;

- a means of assessing the insurer's liquidity adequacy across various suitable time horizons and under current and plausible stress scenarios (i.e. requiring the G-SII to conduct a regular gap analysis of its liquidity risks and the adequacy of its available liquidity resources, under normal and stressed conditions);

- reporting by the G-SIIs on these activities (at least annually or more frequently in the event of major changes to their policy or liquidity risk profile).

The need to adequately manage liquidity risk has recently been strengthened within the IAIS holistic framework for systemic risk[57] with the intention to apply it to a wider range of insurers than G-SIIs only. Namely, the IAIS has enhanced the enterprise risk management (ERM) requirements contained in its insurance core principle (ICP) 16 and in its common framework (ComFrame) in order to target liquidity risk more explicitly. These liquidity risk management and planning requirements are expected to be applied in a proportionate manner to all international active insurance groups, as well as other relevant insurers if deemed necessary by the supervisors.

[56] See IAIS (2014).

[57] See IAIS (2019).

The IAIS published an initial consultation paper on 8 December 2017 in which it assessed that activities exposing the insurance sector to liquidity risk are a potential trigger for systemic risk. In November 2018 and as part of its consultation on the holistic framework for systemic risk in the insurance sector, the IAIS stated that it would develop a liquidity planning framework in the context of a longer-term initiative "to explore developing a quantitative metric that supervisors can use to monitor liquidity risk". To this end, the 2018 public consultation document includes, for information purposes only, an annex devoted entirely to liquidity risk management in which the components from the 2014 guidance are reconsidered. This annex is expected to be consulted at a later stage in the form of an application paper on liquidity risk management with the purpose of providing further guidance to supervisors in their application of the requirements on liquidity risk management and planning contained in ICP 16.8 and 16.9 and ComFrame. The IAIS holistic framework for systemic risk was adopted in November 2019.

The risk management provisions of Solvency II could be improved in particular via the need for stress testing with different time horizons for insurers with a vulnerable liquidity risk profile. Even if Solvency II already includes some provisions on liquidity risk, it could be improved and specify more explicitly what supervisors should expect from insurers. First, in the same way as the governing bodies of insurers need to define their solvency risk appetite, they should also define their liquidity risk appetite, taking into account their liquidity needs. For example, an insurer with a low liquidity risk appetite could define surrender penalties in its life insurance contracts. Risk tolerance limits should also be determined. Second and following the definition of this liquidity risk appetite, a liquidity risk strategy should be implemented under which sources of liquidity should cover liquidity needs in line with the insurer's risk tolerance limits. This strategy should also include contingency plans outlining what action the insurer will take in the event of a materialisation of liquidity risk. Third, insurers should conduct stress-testing exercises simulating the different urgency of their liquidity needs. These exercises should cover different time horizons in line with the vulnerabilities identified. For example, as seen in Section 2.1, the holding of derivatives may create a daily or intraday need for cash. Insurance liabilities that can be surrendered at any time may create a need to hold high-quality assets that can be transformed into cash over a period of one month. Other types of liability could create a longer-term need spanning one year, for example. These various stress tests could lead insurers to hold cash buffers or HQLA. One way to operationalise these requirements would be to first identify insurers with a vulnerable liquidity risk profile – for instance on the basis of reporting (see below) – and then request that they perform these internal stress tests with different time horizons.

2.2.1.2 Reporting of liquidity risk

Solvency II is the main source of information for assessing insurers but includes little quantitative information on liquidity risk. The narrative report that insurers have to send to their supervisors should include qualitative and quantitative information on their risk profile (see Article 309 of Commission Delegated Regulation 2015/35, in which liquidity risk is listed as one of several risk categories that need to be covered in the report). Solvency II also provides for quarterly and annual quantitative reporting. However, the templates are not designed to assess liquidity risk in particular.

The list of assets and derivatives provided in the Solvency II quantitative reporting templates can be used to partially assess liquidity stemming from liabilities. The current quantitative reporting templates already contain some information that can be used to assess the liquidity position of insurers. The following is relevant in particular.

- List of assets and list of derivatives:
    - Insurers report line-by-line information on their direct holdings. Where insurers have holdings in a collective investment undertaking, however, the information is less granular.
    - Using the direct holdings, it is possible to classify the assets into different liquidity categories in order to estimate the total liquidity of the asset portfolio. For example, different indicators can be used to calculate the amount of liquid assets against the amount of illiquid assets.
    - Analysis on specific assets can also be carried out, such as fixed income assets by buckets of maturities.
- Life technical provisions:
    - Best-estimate cash flow liabilities: insurers report their yearly expected cash flows. These data correspond to best-estimate cash flows and can be used and compared with asset cash flows (as in above). However, the added value of such information is small since it only refers to annual unstressed cash flows.
    - Best estimate of products with a surrender option: can be used to derive the share of obligations which offer the possibility for policyholders to redeem their funds.
    - Surrender value: insurers report the surrenders that occurred during the year as well as the surrender values. These latter reflect the amount, defined contractually, to be paid to the policyholders in the event of early termination of the contract. However, this information is not provided per type of contract.
    - Lapse rate and duration of contract: the lapse rate is defined as the amount of technical provisions fully or partially lapsed or surrendered during the reporting period divided by the amount of technical provisions at the beginning of the period. It can reveal whether policyholders have increasingly redeemed their funds in recent years, but its reliability as an indicator of future mass lapse events is limited. The duration of the contract can indicate whether, on average, policyholders have secured a tax advantage (often depending on the time the funds remain under the insurer's management).

Solvency II quantitative reporting could be supplemented with a small set of information allowing the assessment of liquidity risk stemming from liabilities. While current quantitative reporting does allow surrender values to be compared with assets held, it is not possible to identify the types of products to which the surrender values correspond due to a lack of granularity. In addition, an assessment of the possibility of redemptions is difficult. As an illustration, it is not possible to determine the ease with which technical provisions can be surrendered from the point of

view of the policyholder or the disincentives to surrender. Quantitative reporting could easily be supplemented with a minimum set of information to support the assessment of liquidity risk stemming from liabilities. See Box 11 on the liquidity reporting requirements imposed by the Nationale Bank van België/Banque Nationale de Belgique.

Box 11

Nationale Bank van België/Banque Nationale de Belgique liquidity reporting

The Nationale Bank van België/Banque Nationale de Belgique asks insurers to submit a liquidity report on a quarterly basis. It contains key information on insurers' liquidity risk that is not available through Solvency II quantitative reporting template data. Specifically, it supplements the pertinent and global information on liquidity needs and sources from the assets side of the balance sheet under Solvency II with two key tables relating to the liabilities side with just 16 cells in total for insurers to fill in (see Annex 2 for further details).

- Liquidity risk linked to surrenders and other cash outflows: this table sets out claim costs, the variation of technical provisions and the amount of surrender and other allowances paid.
- Amount of technical provisions split according to their liquidity risk sensitivity: this table contains the amount of life technical provisions (excluding unit-linked contracts) split according to the key liquidity characteristics of Belgian insurance products. The split is mainly determined by the presence or absence of a penalty that policyholders must pay in the event that they exercise their surrender rights. It could be a fiscal penalty[58] or a contractual fee as provided in the insurance contract, for example.

Despite the small quantity of data requested, this simple reporting feature compensates for the lack of information on the liquidity of liabilities provided in the Solvency II quantitative reporting template. Different indicators are calculated using this information, which allow the Nationale Bank van België/Banque Nationale de Belgique to better assess the liquidity risk in the Belgian insurance market. Quantitative reporting template reporting only provides a small amount of information on life technical provision, and it is not possible to identify precisely which products this is attributable to. As the liquidity characteristic of life products can range from fully illiquid to fully liquid, the information provided in the report is therefore fundamental to the proper assessment of the liquidity risk of Belgian insurers. This liquidity report is used both for horizontal and micro analyses. Combined with Solvency II quantitative reporting template data, it enables the supervisor to identify insurers that are more vulnerable to liquidity risk. For these insurers, a more detailed analysis is subsequently performed to better understand their liquidity risk profile. If necessary, it can lead to discussions between the Nationale Bank van België/Banque Nationale de Belgique and the management of the insurers to explain their liquidity risk and/or justify their responses. It may also lead to recommendations to reduce this risk through different management measures.

[58] Under certain conditions, pension/saving products offer a fiscal advantage to the policyholder. In the event of redemption before a certain age or date, this fiscal advantage can be fully or partially rescinded thus reducing the incentive to redeem this type of contract.

Insurers should report key information on liquidity risk stemming from their liabilities at least annually, including surrender values, the number of contracts with a surrender option, the expected duration of contracts and the existence of disincentives to surrender. Some of this information is already included in Solvency II reporting but could be supplemented further. In order to assess policyholders' probability of surrender, information on possible disincentives to surrender is required. Insurance contracts may include a variety of such disincentives. For example, policyholders may have to pay a penalty to exercise their surrender rights. There may also be fiscal disincentives, whereby policyholders lose a fiscal advantage or are required to pay a fiscal penalty if they surrender their contract. On the basis of disincentives, insurers could provide a split of their technical provisions corresponding to contracts with the possibility of surrender. For example, they could distinguish between obligations with or without disincentives. Having information on the extent to which the value of assets covers the surrender values would also help in assessing the likelihood of mass redemptions. The next key piece of information is the duration or expected duration of the contract. This provides a time horizon under "normal" conditions. Finally, the surrender value of the contract indicates the liquidity needs of the insurer in the event of redemption. The surrender values should be reported with sufficient granularity to be able to identify the products to which they correspond: knowing the products helps to assess the likelihood of redemptions. This set of information should be reported at least annually, so that it is possible to make an assessment of the liquidity risk profile of an insurer or group of insurers (at national or EU level, for instance). If deemed appropriate given the liquidity risk profile, the frequency of this reporting could be increased to semi-annually or quarterly.

2.2.2 Constructing liquidity indicators

In this section, the report proposes to construct liquidity indicators for the liquidity needs stemming from liabilities. As explained in the introduction, these indicators would be primarily focused on specific insurance obligations, namely life insurance obligations offering policyholders the option to surrender their policies – typically, these would be profit participation contracts (excluding unit-linked contracts). Indicators using cash-flow data can, however, easily be expanded to cover other items on or off the balance sheet. The purpose is to have a different set of indicators, each with their pros and cons, allowing an assessment of insurers' liquidity profiles.

Indicators can be constructed by comparing HQLA with an estimation of potential liquidity needs stemming from liabilities. All indicators need to compare liquidity needs with liquidity sources. In practice, this involves comparing assets that are considered of sufficient high quality to be transformed into cash when redemptions take place with an estimation of the surrender values that the insurer would have to pay to policyholders in exceptional situations.

A time horizon should be chosen for indicators to be calculated and liquidity risk to be assessed. When constructing indicators, it is important to define a time horizon over which liquidity risk is assessed, as this can affect both liquidity needs and sources. For assets, for example, a time horizon of a few days would lead to fewer assets being considered liquid than a longer time horizon. This is because the search for a counterparty willing to buy these assets might take time depending on how deep the market and how quick the settlement process is. Setting a time horizon is therefore key for the whole calculation.

The time horizon chosen in this report is 30 days. Several other options could have been considered. Both the IAIS [59] and the Bank of England[60], for example, expect insurers to consider time horizons of 30 days, 90 days and one year. 30 days appears to be the time horizon adopted in several jurisdictions for insurers to pay policyholders who have redeemed their funds. This is typically the case for profit participation contracts in Italy and France, for instance. In Germany, Section 14 of the Insurance Contract Act provides for a one-month payout period. Other time horizons could have been chosen, such as one year – the time horizon underlying the SCR calculation. The time horizon of 30 days also appears relevant from a financial stability point of view. It helps answer the question of whether insurers are able to withstand mass lapse events in a relatively short period. After this period, the relevant authorities may take action to limit the negative effects on financial stability and, ultimately, on the real economy.

The indicators defined in this report could be used as a Pillar 2 tool by supervisors, which could require vulnerable insurers to increase the amount of HQLA they hold. Where supervisors, thanks to improved liquidity reporting and, for instance, via the indicators developed below, detect an insurer with a vulnerable liquidity profile, they need tools to act. The tool proposed in this report is a Pillar 2 tool, meaning that it would be employed at the discretion of supervisors and applied case by case. To improve the liquidity position of the vulnerable insurer, supervisors need first to be able to assess the liquidity shortfall. This shortfall could be determined via the liquidity indicators proposed below. The shortfall could also be assessed via the result of the internal stress testing that the insurer may be asked to perform. Second, once the shortfall has been measured, supervisors could request that the insurer hold more HQLA. A common definition across the EU of which assets can be considered HQLA has the benefit that it would avoid diverging approaches.

2.2.2.1 Stock of high-quality liquid assets

The first step in building liquidity indicators is to define the available stock of HQLA for the next 30 days. This will make it possible to assess whether insurers hold sufficient unencumbered HQLA, i.e. assets that can be converted into cash at little or no loss of value, to meet their liquidity needs in a 30-day liquidity stress scenario.

The banking framework defines a liquidity ratio comparing stock of HQLA with net outflows, the "liquidity coverage ratio" (LCR), some parameters of which can be used in insurance liquidity ratios. Although the liquidity risk of insurers differs from that of credit institutions, considerations developed in the banking framework can be used and adapted to the insurance framework. In particular, the stock of HQLA is assessed in the banking framework against a time horizon of 30 days. This is the same time horizon as that suggested in this report, albeit for different reasons.

HQLA need to have fundamental characteristics and market-related characteristics, ensuring that they can be monetised without incurring large discounts in sale or repurchase

[59] See IAIS (2018).

[60] Prudential Regulation Authority (2019).

agreement markets in times of stress. The fundamental characteristics are i) low risk (in particular, the issuer should have a high credit standing); ii) ease and certainty of valuation; iii) low correlation with risky assets (for example, assets issued by financial institutions are more likely to be illiquid in times of liquidity stress; and iv) listing on a developed and recognised exchange, as this increases transparency. The market-related characteristics are i) active and sizeable market, meaning that there should be historical evidence of market depth as well as robust market infrastructure; ii) low volatility, meaning stable prices and being less prone to sharp price declines; and iii) flight to quality, i.e. assets which have been shown to be resilient and purchased in times of crisis.

There are two categories of assets that can be included in the stock: "Level 1" and "Level 2" assets. These two levels correspond to different qualities in terms of liquidity. As in the banking framework, Level 1 assets can be included without limit, while Level 2 assets can only comprise up to 40% of the stock of HQLA. Level 2 assets are further split into Level 2A and Level 2B. Level 2B assets cannot represent more than 15% of the stock of HQLA.

Table 3

Summary of HQLA for possible use in insurance liquidity ratios

	Item	Haircut
Level 1 assets	Cash and cash equivalents	**0%**
	Bonds and loans from:	**0%**
	- The European Central Bank	
	- EU Member States' central governments and central banks denominated and funded in the domestic currency of that central government and the central bank	
	- Multilateral development banks referred to in paragraph 2 of Article 117 of Regulation (EU) No 275/2013	
	- International organisations referred to in Article 118 of Regulation (EU) No 275/2013	
Level 2A assets	Bonds and loans rated CQS 0 or 1, excluding those from financial institutions	**15%**
Level 2B assets	Covered bonds rated CQS 0 or 1, excluding those emitted by a bank which is part of the same group	**25%**
	Qualifying reverse mortgage-backed securities (RMBS)	**50%**
	Bonds and loans rated CQS 2 or 3, excluding those from financial institutions	**50%**
	Qualifying common equity shares, excluding:	**50%**
	- Equities issued by a financial institution	
	- Equities qualifying for strategic participation	
	- Equities qualifying for the duration-based equity module	
	- Long-term equities	

Using available Solvency II statistics and several assumptions, the stock of HQLA can be estimated at EU level. Solvency II statistics are available on **EIOPA's website**, where it is possible to access the "asset exposures" template and filter the results by "life insurance undertakings".

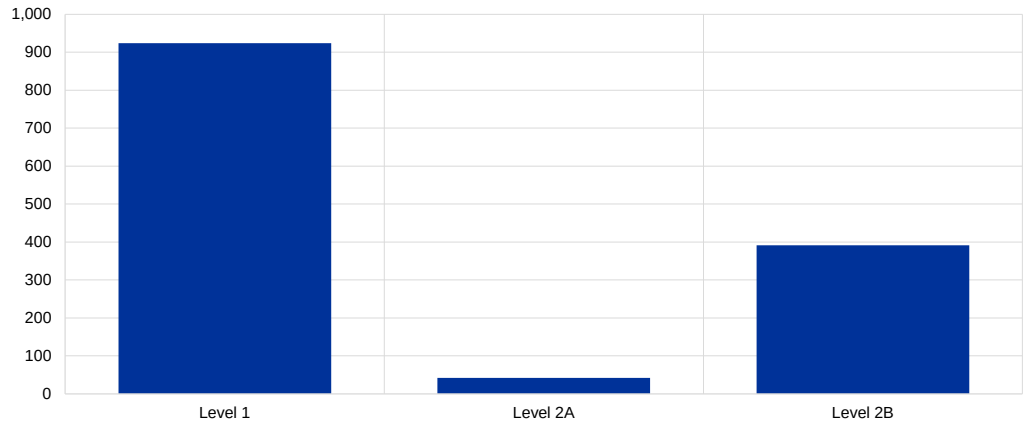
- Level 1 assets:
  - Cash equivalents can be directly accessed (CIC = 72) and total €56 billion.
  - Government bonds are filtered according to the location of investment (taken as EEA countries). Taken together, central government bonds, supra-national bonds and national central banks bonds total €868 billion.
- Level 2A assets:
  - Corporate bonds (CIC = 21) total €548 billion. Using the euro reference portfolio, CQS 0 and CQS 1 non-financial bonds represent, respectively, 2% and 7% of the corporate bond portfolio. This gives a result of €42 billion.
- Level 2B assets:
  - Covered bonds (CIC = 27) are all assumed to be rated CQS 0 or 1 and amount to €165 billion.

- Qualifying RMBS are approximated with collateralised securities exposed to real estate risk (CIC = 65) and total €4 billion.
- Using the euro reference portfolio again, CQS 2 and CQS 3 non-financial bonds represent, respectively, 11% and 15% of the corporate bond portfolio. This gives a result of €71 billion.
- Qualifying common equity shares are capped at €151 billion, which is derived thanks to CIC = 31.

A rough approximation of the amount of HQLA is €1,357 billion. Charts 16 and 17 provide further details on the composition of the stock of HQLA. Most of the HQLA held by EU life insurers are composed of government bonds.

Chart 16
High-quality liquid assets per level

(EUR billions)

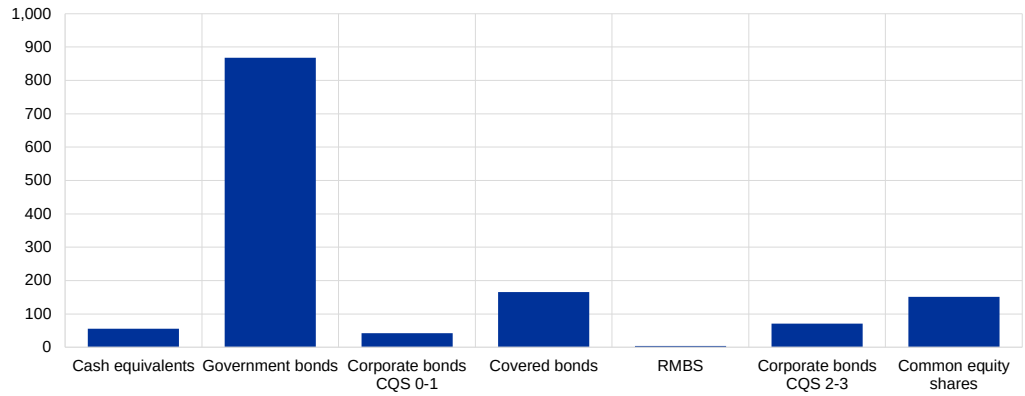


Sources: EIOPA Solvency II quantitative reporting template data and ESRB calculations.
Reporting reference date: fourth quarter of 2018.

Chart 17

High-quality liquid assets per type of assets

(EUR billions)



Sources: EIOPA Solvency II quantitative reporting template data and ESRB calculations.
Reporting reference date: fourth quarter of 2018.

2.2.2.2 A liquidity indicator based on balance sheet data

A simple liquidity risk indicator based on balance sheet data is the ratio of liquid assets to potential massive withdrawals of policyholders at short notice. Paulson et al. (2014) propose an indicator which assesses the liquidity characteristics of liabilities and assets of the US life insurance industry. Their idea is to contrast available liquid assets of life insurers with potential demands for cash due to policy surrenders or withdrawals. The potential demand for cash is an estimate based on a predefined withdrawal shock scenario. A ratio of one implies matching of asset liquidity and potential liquidity needs. The percentage of the indicator above one indicates the liquidity buffer. A firm with a sufficiently large pool of liquid assets can meet repayment claims even in times of stress. The indicator utilises balance sheet items at a specific point in time; it is therefore based on stock values. There is no consideration of a certain time period and cash flows during this period.

$$\frac{Stock\ of\ HQLA}{Surrender\ values\ of\ obligations\ at\ risk}$$

Potential liquidity needs under stress depend on the institutional rules and product features regarding surrender options, surrender values, potential surrender fees and other costs of surrendering policies. In insurance, by far the largest share of liabilities consists of policyholder claims. The relevant balance sheet item is the technical provision, which is the present value of a future cash flow stream that cannot be traded on financial markets. Even though the cash flows are mostly fixed and predictable, there are some situations where future cash flows become uncertain. An important reason for uncertain future cash flows is policy surrender. Most life insurance products allow policyholders to surrender their policies and to withdraw the accumulated value of their

policies. There are several institutional details that determine the liquidity of life insurance liabilities. These are the ease with which funds can be withdrawn, the level of surrender values relative to technical provisions, the level of surrender penalties and other costs of surrendering policies. Paulson et al. (2014) argue that a considerable amount of US life insurers' liabilities can be regarded as rather liquid.

Ease and cost of a potential cash withdrawal under an applied stress scenario need to be estimated. An essential point is the extent to which technical provisions represent a stable source of funding for the undertaking or are subject to potential cash outflows. Estimates depend on the ease and cost of policy surrenders, in particular whether policyholders have the option to lapse their contract and whether the surrender value equals the value of the respective policy as reflected in the technical provision. For this purpose, Paulson et al. (2004) define four liquidity buckets based on the ease of withdrawal: zero, low, moderate and high. Based on their expert judgement, around 54% of US life liabilities belong to the moderate (43%) to high (11%) liquidity category. They subsequently define two stress scenarios. In an extreme stress scenario, all policies that allow withdrawal are assumed to experience full withdrawal, while policies that prohibit withdrawal are assumed to experience none. In a moderate stress scenario, all policies that allow withdrawal with a penalty are assumed to experience withdrawal equal to 50% of reserves, while policies that allow withdrawal without a penalty are assumed to experience full withdrawal.

Liquidity needs could come from other balance sheet items and need to be included in a liquidity indicator. These other needs could come from liabilities and include items such as reinsurance liabilities or debts owed to credit institutions, for example. They could also come from the assets side – see Section 2 on liquidity needs due to the impact of margining.

Liquidity needs under stress for European insurers can also be estimated, but data gaps exist. For an adaptation of the ideas of Paulson et al. (2014) for European insurers, one ideally needs data on the total surrender value of all outstanding policies that are exposed to lapse risk. Comprehensive data on surrender values are not available. The best approximation using publicly available information is the best estimate of technical provisions exposed to lapse risk instead of surrender values. These can be obtained from EIOPA's first information request from a sample of European insurers.[61]

Assuming a maximum mass lapse rate of 40%, approximately €1.4 trillion of technical provisions are exposed to lapse risk. Insurers in the EEA have total liabilities of €10.3 trillion, of which €5.5 trillion are technical provisions for life policies (excluding index-linked and unit-linked contracts) (first quarter of 2019).[62] According to EIOPA's first information request, 70% of life insurance policies in the EE A have a surrender or cancellation option and are exposed to lapse risk. Using this share, €3.9 trillion of technical provisions in the EEA are in principle exposed to lapse risk. The number of policyholders who could surrender in a run-like situation is a critical assumption. Mass lapse risk is difficult to assess from historical data, as mass lapses are rare and are usually accompanied by interventions that mitigate the risk. One approach is to align the share of potential lapses with the mass lapse scenario in the standard formula of Solvency II, in which

[61] See EIOPA (2018f).

[62] **EIOPA insurance statistics**, EAA balance sheet solo quarterly.

40% of all policyholders cancel their contract in the same year.[63] The resulting estimate is potential cash withdrawals of €1.5 trillion (5.5 x 70% x 40%).

Approximately €2.0 trillion of technical provisions are exposed to lapse risk with no surrender disincentive. Among policies exposed to lapse risk, there are those that are incentive-neutral and those with surrender disincentives such as tax disadvantages or surrender penalties. For these policies, it can be difficult to estimate whether and in what situations they are exposed to lapses. However, in a crisis situation, such disincentives may not play a significant role if policyholders believe they could lose all of their funds. 36% of written premiums belong to policies with no disincentive to surrender. A conservative estimate of potential cash demands considers only policies with no disincentive to surrender. This results in potential cash withdrawals of €2.0 trillion (5.5 x 36%).

Table 4

Technical provisions exposed to lapse risk and with no surrender disincentive

	Technical provisions	Exposed to lapse risk		Mass lapse assumption	
	EUR trillions	Share	EUR trillions	Share	EUR trillions
Life insurance excluding unit-linked products	5.5	70%	3.9	40%	1.5
	Technical provisions			No surrender disincentive	
	EUR trillions			Share	EUR trillions
Life insurance excluding unit-linked products	5.5			36%	2.0

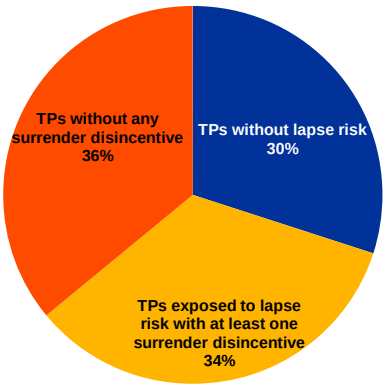
Note: EEA, Q1 2019.

[63] The reference to the 40% lapse rate according to Solvency II does not mean that lapses have to be distributed evenly over one year. It is even argued that the mass lapse module means an "instantaneous discontinuance of 40% of the insurance policies". See Burkhart (2018).

Chart 18

Breakdown of life insurance technical provisions, excluding for unit-linked products, by liquidity characteristics

(in percentages)



Sources: EIOPA (2018f) and ESRB calculations.
Reporting reference date: fourth quarter of 2018.

Combining the information on the stock of HQLA and on the liabilities "at risk", one can calculate a simple liquidity indicator. For the stock of HQLA, it is important to decide whether to use only Level 1 assets or both Level 1 and Level 2 assets. For the liabilities "at risk", the scenario should be selected that is most likely to occur, i.e. in terms of how much of the liabilities could be redeemed. This choice would probably make most sense at the level of each country and/or at the level of each product.

Assuming the same mass lapse rate as in the standard formula and comparing this with the stock of HQLA leads to an indicator of 0.9. Assumptions for the liabilities "at risk" need to be made, and the results are quite sensitive to these, with the indicator ranging from 0.5 to 0.9. The value of 0.9 indicates that, should a mass lapse event where 40% of policyholders redeem their funds materialise over a one-month period, insurers would not have sufficient HQLA. The assumption of a mass lapse event of 40% is strong, however. Another limitation of this indicator is that it does not take account of other possible inflows that might be received by insurers. The results at EEA level are presented in Table 5.

Table 5

Simple liquidity indicator based on balance -sheet data, (EEA level)

(units)

	Liquidity indicator	€2.0 trillions TPs without surrender disincentives	€1.5 trillions Mass lapse assumption
€0.9 trillions	Level 1 assets	0.5	0.6
€1.4 trillions	Level 1 and 2 assets	0.7	0.9

Source: ESRB calculations.
Reporting reference date: fourth quarter of 2018.

To go one step further, other types of balance sheet item should be taken into account. Using a similar methodology, i.e. combining balance sheet information and qualitative information, it would be possible to further develop this simple indicator to take account of factors such as other liabilities or the role of insurance guarantee schemes, or even to further develop the analysis of liabilities taking into account the number of disincentives.

2.2.2.3 A liquidity indicator based on cash-flows

This section defines a liquidity indicator that compares the stock of HQLA held by an insurer against its total net cash outflows. Whereas the previous section expressed the liquidity needs stemming from liabilities in terms of stock, this section expresses these needs in terms of flows. It starts by explaining the concept of the indicator and then lists the cash flows to be considered.

$$\frac{Stock\ of\ HQLA}{Total\ net\ cash\ outflows}$$

Concept

Using cash flows to assess liquidity offers several advantages but increases the complexity of the calculation. The first advantage is greater precision, as future cash flows can be projected per month, for example, to allow a more detailed assessment of the liquidity situation of the insurer. The second advantage is that all types of cash flows can be considered, including insurance cash flows, reinsurance cash flows or non-insurance cash flows such as those from expenses or taxation. The third advantage is that one can model both inflows (such as premiums) and outflows (such as payments). Counter to these benefits, there is the increased complexity of the calculation and possibly of the analysis of liquidity needs drivers. It is, however, reasonable to assume that this greater complexity will not be a problem for insurers. Indeed, under Solvency II, insurers already

need to project insurance cash flows at least once per year for the calculation of the best estimate of liabilities[64]. Most of the information is therefore already available to insurers.

An approach based on cash flows can be used in a stress test exercise. The cash flows can be projected under "normal circumstances" – for instance, circumstances equal to those of the best-estimate calculation – or under stressed circumstances. It is possible to define, for each type of cash flows, the extent to which they should be stressed. This approach therefore lends itself well to a stress test exercise, where the macro-financial circumstances are defined according to a scenario.

Given the time horizon of 30 days chosen in this report, all other parameters can be fixed consistently, for instance by using a scenario approach. A stressed scenario over 30 days should be specified. The various elements composing the scenario will then be reflected in the different parameters of the liquidity indicator. The scenario under consideration is typically the one that led the Belgian government to intervene in the case of Ethias. See Box 12 for further details.

This scenario entails a combined idiosyncratic and market-wide shock. In particular, it is assumed that the situation of the insurer is such that it leads rating agencies to degrade the rating of the insurer by two notches in order to reflect concerns about its aggravated solvency and liquidity situation.

Box 12

A scenario of high surrenders over a one-month period – Ethias[65]

On 20 October 2008, the Belgian authorities publicly announced measures to recapitalise the Ethias group. The global financial crisis, having gained pace at the beginning of the autumn, had considerably reduced the value of assets backing insurance obligations, eroded consumer confidence and made access to liquidity gradually more difficult. The crisis hit the Ethias group hard, reducing its capital and its solvency margin to below regulatory limits.

The Ethias group was particularly affected by the fall in the value of its shareholding in Dexia, which for historical reasons was relatively large. The loss on the Dexia shares compared with their book value in Ethias' accounts came to more than €500 million. In addition, the Ethias group suffered from the consequences of the stock market collapse (the BEL 20 index fell from over 4,000 at the beginning of 2008 to less than 2,000 at year's end). Whereas the Ethias group needed substantial returns to meet its high interest insurance obligations, it instead incurred further losses in the wake of the financial crisis. This succession of losses led rating agencies to downgrade the rating of Ethias by two notches.

These developments caused policyholders to lose confidence in Ethias' capacity to pay its surrender values. Ethias also faced a liquidity problem, in particular on a savings product which did not provide any disincentives for policyholders to redeem. Surrender rates jumped from 0.3% to between 2.44% and 4.88% in the space of a month.

[64] See for instance Article 28 of Commission Delegated Regulation (EU) 2015/35.

[65] The information provided in this box comes from the **Decision** of the European Commission on national measures adopted as a response to the financial/economic crisis in the case of Ethias, C(2009) 990 final.

This episode led the Belgian authorities to recapitalise the Ethias group in order to restore confidence. The recapitalisation took the form of a €1,500-million capital subscription by the Belgian State, the Flemish Region and the Walloon Region.

Total net outflows

The total net outflows are determined by subtracting cash inflows from cash outflows. Both cash outflows and cash inflows need to be determined consistently with the time horizon and the scenario under consideration.

In order to prevent insurers relying solely on inflows to cover their outflows, cash inflows should be capped at a certain percentage of cash outflows. Both inflows and outflows are stochastics, meaning that there is a degree of uncertainty about the realisation of these flows. Insurers should therefore not rely solely on inflows to cover their outflow needs. Cash inflows could be capped at 75% of cash outflows, for example, meaning that at least 25% of these outflows must be covered with HQLA.

Cash outflows stemming from ring-fenced obligations cannot be netted against inflows that do not stem from the same ring-fencing. This is particularly relevant in insurance as some insurance-based investment products are linked to specific funds. Liquidity risk therefore needs to be managed for each of these ring-fenced assets and liabilities.

Outflows can only be netted against inflows of the same currency; otherwise a haircut of 8% should be applied. This haircut is similar to the one applied in the banking sector. It represents the loss that could be incurred when converting the inflows into the currency of the outflows.

The paragraphs below suggest how to stress some of the most important items of the balance sheet and the cash outflows and cash inflows that should be taken into account. For further details, please refer to Annex 3.

Cash outflows

Insurance obligations offering the legal possibility to redeem should all be stressed. Even if there have been no or few redemptions in the past, all insurance obligations that offer policyholders the legal (contractual) possibility to redeem should be included in the stress scenario. Insurance contracts that do not offer the possibility to redeem are considered below.

Contracts where there is no disincentive to redeem may have a higher surrender rate than contracts where there are disincentives to redeem. A number of factors have an impact on surrender rates, and insurance contracts can include a variety of disincentives for policyholders to redeem. For instance, policyholders may have to pay a penalty to exercise their surrender rights. Fiscal disincentives are another type of disincentive, whereby policyholders may have to pay more tax on the surrender value than if they had continued their contract (i.e. they lose a fiscal advantage) or may be required to pay a fiscal penalty on the surrender value.

The difference in the surrender rates between contracts with and without disincentives should not be too important in a stress situation. Whereas under normal circumstances disincentives certainly play a role in the stickiness of insurance liabilities, under stressed circumstances – for instance a panic run – it is doubtful that they would prevent policyholders from redeeming their contracts. In other words, policyholders may be faced with the choice of losing part or all of their surrender value, in which case it is only rational to expect them to opt for the former. They may, however, wait longer than policyholders whose contracts do not offer a disincentive to redeem.

The existence of an insurance guarantee scheme covering redeemable insurance obligations could also be considered. Some national guarantee schemes also cover redeemable policies by insuring the surrender value, whether fully, partly[66] or up to a certain limit[67]. The behaviour of policyholders is expected to be different where such a guarantee scheme exists (although it could also create some moral hazard risk). The funds available within the insurance guarantee scheme could play an important role in its credibility. If the insurance guarantee scheme is able to cover only a small part of the surrender value, its disincentive effect would be expected to be rather low. The funding of such insurance guarantee schemes is therefore important.

Where contracts have no disincentive to redeem, the stress factor used to simulate surrenders should not be lower than a 5% lapse rate within a one-month period. For the calculation of the capital requirements for mass lapse risk, insurers should assume under Solvency II that 40% of their contracts will be lapsed over a one-year time horizon. Assuming surrenders occur linearly over the year – which is a unlikely – one ends up with a surrender rate of 3.33%. This can be seen as a lower bound because of the linearity assumption. Looking at the case of Ethias, up to 4.88% of contracts without disincentives were surrendered. The floor for the stressed surrender rate could therefore be set at 5%, while 40% could be seen as a cap. Assuming that one chooses to apply a 5% surrender rate, contracts offering at least one disincentive might be applied a lower stress than 5%. There is little evidence on which of the two main types of disincentive (surrender penalty or fiscal penalty) provides the best security for the insurer. Therefore, one can assume that the existence of a disincentive plays a more important role, this may not be the case. Another large assumption is that the presence of a disincentive would reduce the surrender rate: in a stress situation, and/or in a situation of loss of confidence in the capacity of the insurer to pay its obligations, a disincentive might not have a noticeable effect. Disincentives could have a more significant impact in normal times. Contracts covered by a national insurance guarantee scheme could, for example, be applied a 3% stress. 3% is also the run-off rate that needs to be applied in the banking framework for stable deposits that are fully insured by an effective deposit insurance scheme or by a public guarantee that provides equivalent protection. Where the national insurance guarantee scheme covers the surrender value only in part, the stresses defined above should be applied. In other words, this report assumes that where surrendering implies losing part of the surrender value, the policyholder would surrender the whole of their contract.

[66] In the case of insufficient funds, contractually guaranteed benefits are reduced by up to 5% in Germany.

[67] For example, up to €100,000 in France.

The downgrade of the insurer could have an effect on contractual arrangements such as the pledging of additional collateral, which should be reflected in the stress scenarios. Although Solvency II does not require collateral arrangements for reinsurance treaties, it may be the case that a specific treaty provides for such collateral. The cedant might require additional collateral due to the downgrade of the insurer, which can affect its liquidity position. Other contracts appearing as off-balance-sheet items could also be affected by the downgrade of the insurer and lead to the pledging of additional collateral.

The clearing of derivatives may create an additional liquidity need for insurers over the next 30 days, which could also be modelled in the cash flow approach. As seen in Section 2.1, margining practices may create a daily need for cash. This need could also be modelled in the cash flows, for example by assuming a certain movement in interest rates that would then affect the variation margin calls on IRSs. In such a scenario, an increase in interest rates would, on the one hand, create a variation margin call on IRSs and, on the other, lead to a fall in asset values covering the insurance obligations, thus potentially triggering a mass lapse event. The problem with such a scenario lies in the fact that the time horizons for the two events are different. Given the daily or intraday needs in the case of variation margin calls, only cash could provide sufficient cover. The modelling of these needs would then reduce the amount of HQLA (subtracting the cash required to cover the variation margin calls from HQLA). This would result in the following formula:

$$\frac{Stock\ of\ HQLA - cash\ needed\ to\ cover\ margin\ calls}{Total\ net\ cash\ outflows}$$

Cash inflows

No future premiums for insurance obligations should be recognised on the Solvency II balance sheet as at the date of the assessment, unless insurers can compel policyholders to pay them. Because of the loss of confidence in the insurer, it is likely that policyholders will not pay any additional premiums in the next 30 days. This is based on the assumption that policyholders must act to pay premiums and that inaction leads to no premiums being paid. Insurers should therefore not rely on these future premiums unless they have the capacity to compel policyholders to pay them. Obligations not yet recognised on the Solvency II balance sheet and premiums outside of contract boundaries should not be taken into account in the assessment.

Letters of credit and guarantees from other entities belonging to the same group should only contribute to inflows if the group has the operational capacity to settle these obligations within 30 days. A haircut of at least 50% should be applied. Group support can play an important role in a stressed liquidity situation. However, if one entity of a group is in distress, it is likely that policyholders and other investors will lose confidence in all entities of the group. Therefore, group support should be capped at 50%.

3 Horizontal tools addressing risks stemming from the direct and indirect provision of credit to the economy

By investing the premiums they receive, (re)insurers indirectly provide credit to the economy, which is an activity typically associated with banks. Providing credit to the economy is not the primary objective of (re)insurers, but a consequence of the fact that they invest the premiums they receive. (Re)insurers can use these premiums, for example, to originate loans (direct provision of credit) or to invest in corporate bonds emitted by NFCs (indirect provision of credit).

(Re)insurers contribute to a healthy and robust economy by providing credit either directly by originating loans or indirectly by investing in corporate bonds. Credit institutions are the main source of financing for the EU economy. A sound economy, however, does not solely rely on a particular source of funding, but also uses funding beyond banking via financial markets. (Re)insurers, as significant asset holders, have an important role to play in this diversification of funding. As seen during the 2008-09 liquidity crisis, market-based finance can support the economy when banks face difficulties. When (re)insurers can match their liability cash flows with asset cash flows, they are in an advantageous position to provide credit funding with fixed interest rates as they are differently exposed to interest rate risk. In other words, they do not undergo – or at least not to the same extent –a maturity transformation that is typically the case for banks (unlike those of banks, the liabilities of (re)insurers typically have maturities longer than those of investments). In addition, providing credit is neither the unique nor the main activity of (re)insurers, which means they have a broader diversification of risks on their balance sheets, i.e. they have a specific risk-bearing capacity. However, this does not mean that they are not exposed to credit risk due to borrowers defaulting or market risk in case they need to sell assets before their maturity, possibly at a distress value.

This section (1) provides figures on corporate bonds and loans held by (re)insurers; (2) compares the treatment of bonds and loans in the banking and the insurance regulatory frameworks; and (3) suggests the introduction of new macroprudential tools, adapted to the insurance sector, that target credit risk where Solvency II has gaps.

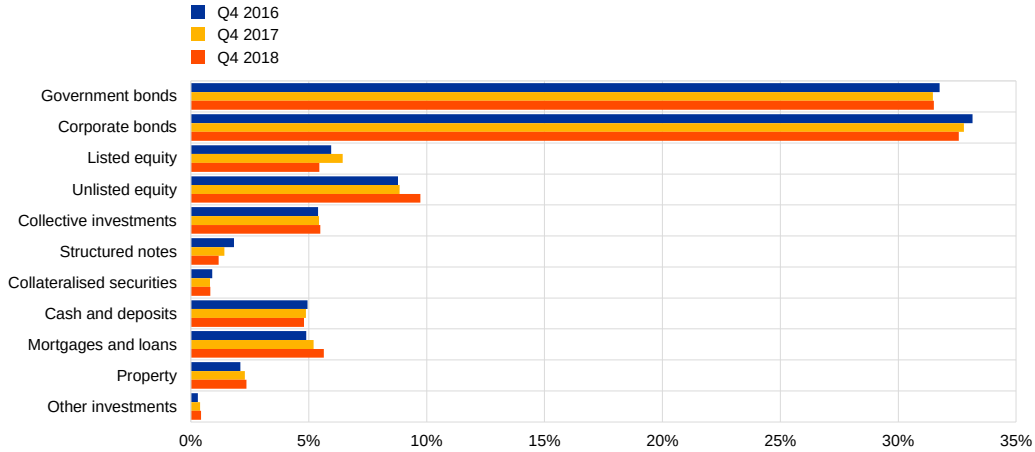
3.1 Figures on the provision of credit by the insurance sector

As at the end of 2018, the insurance sector provided roughly €3.8 trillion in credit to households and NFCs. The main asset class used by (re)insurers to provide credit to the economy is corporate bonds. (Re)insurers also hold, at EU level, €0.6 trillion in mortgages and loans, which include credit to NFCs and credit to households. The insurance sector has been increasing its investment share in this asset class over the last two years, as reflected in Chart 19 below.

Chart 19

Investments held by (re)insurers

(percentage of total investment portfolio, excluding unit-linked investments)



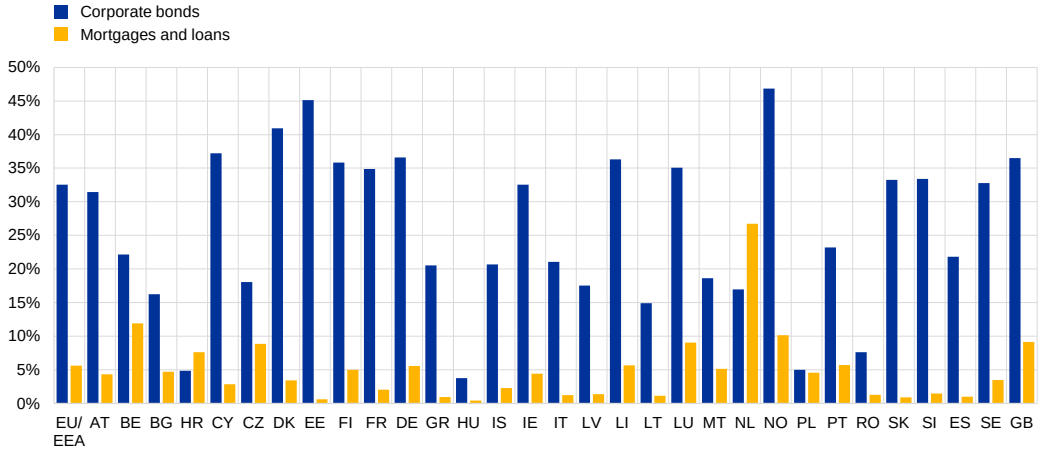
Source: EIOPA Solvency II quantitative reporting template data.
Notes: Look-through approach applied. Reporting reference date: fourth quarter of 2018.

In most EU countries, (re)insurers provide credit indirectly as a consequence of their investments in corporate bonds; credit to households is small with a few exceptions. By investing the premiums they receive in corporate bonds, (re)insurers finance NFCs by providing them with credit. In most EEA countries, credit is supplied via corporate bonds, meaning it is mainly directed towards NFCs and not towards households. The highest share of corporate bonds held by EEA countries is found in Norway, Denmark and Estonia, where it accounts for more than 40% of the total investment portfolio (see Chart 20).

Chart 20

Corporate bonds and loans held by (re)insurers per country

(percentage of total investment portfolio, excluding unit-linked investments)



Source: EIOPA Solvency II quantitative reporting template data.
Notes: Look-through approach not applied. Reporting reference date: fourth quarter of 2018.

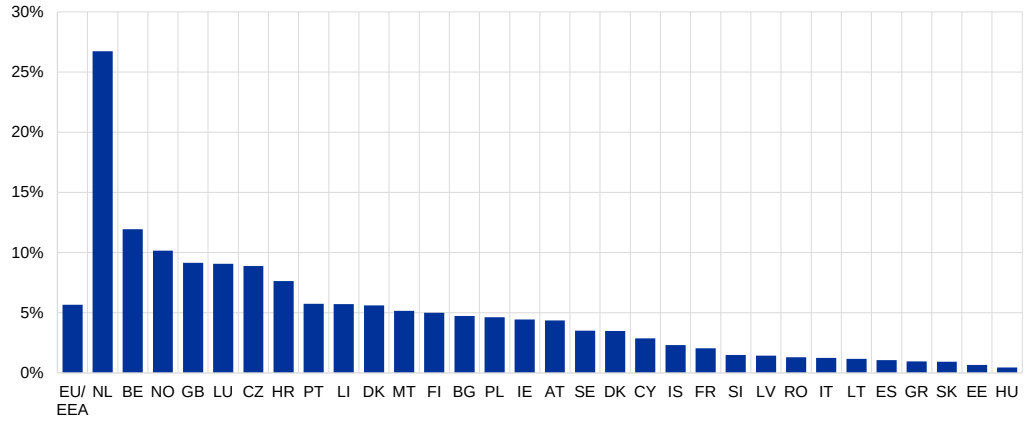
Mortgage loans and other loans account for a small share of EEA (re)insurers' investment portfolios; however, in some countries it is not negligible. Such exposures represent less than 10% of (re)insurers' portfolios in all but three countries and equate to roughly 5% on average (see Chart 21). However, Belgium, the Czech Republic, Luxembourg, the Netherlands, Norway and the United Kingdom appear to provide a significant amount of mortgage loans and other loans. It should be noted that the category "other loans" covers a broad range of assets.[68] In particular, mortgage loans and other loans play a significant role in Dutch (re)insurers' portfolios, with more than 25% of total investments linked to them.

[68] In the Czech Republic, for example, the "other loans" category consists predominantly of repo transactions.

Chart 21

(Re)insurers' investments in loans

(percentage of total investment portfolio excluding unit-linked investments)



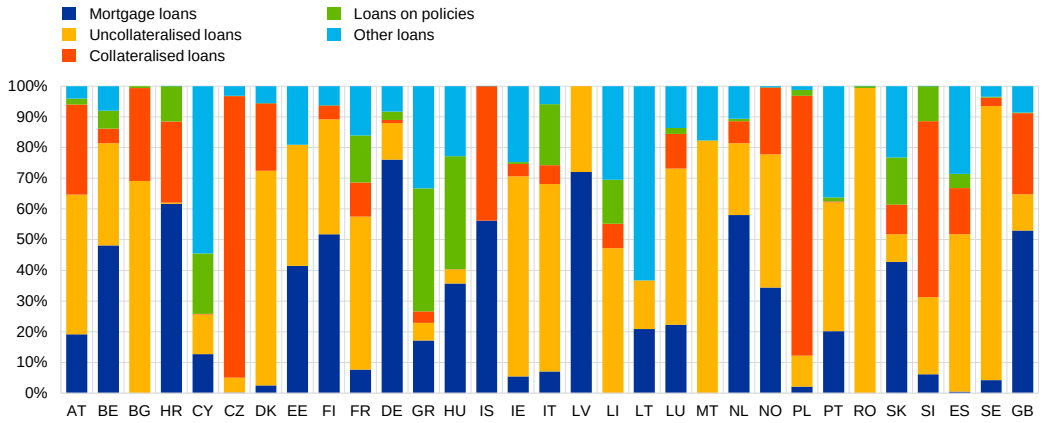
Source: EIOPA Solvency II quantitative reporting template data.
Notes: Asset-by-asset template, sample based on quarterly solo data. Look-through approach applied. Reporting reference date: fourth quarter of 2018.

The types of loans held by (re)insurers are heterogeneous across countries (see Chart 22). Taking account of direct exposures only (i.e. without considering loans held through investment funds), residential mortgage loans make up the majority of (re)insurers' total loan portfolios in countries such as Germany, Latvia, the United Kingdom and the Netherlands, while uncollateralised loans constitute the majority of (re)insurers' loans in countries such as Ireland, Italy, Sweden and Bulgaria. Both collateralised loans and other loans are less significant. Nevertheless, the former represent the majority of (re)insurers' loan portfolios in Poland and the Czech Republic, while the latter account for the majority in Cyprus and Lithuania. Loans on policies tend to play a more residual role.

Chart 22

Types of loan per country

(percentage of total loan portfolio)



Source: EIOPA Solvency II quantitative reporting template data.
Notes: Amounts as a percentage of direct exposure to "mortgages and loans" (CIC category 8). This mortgage loans category includes residential and commercial mortgage loans. Reporting reference date: fourth quarter of 2018.

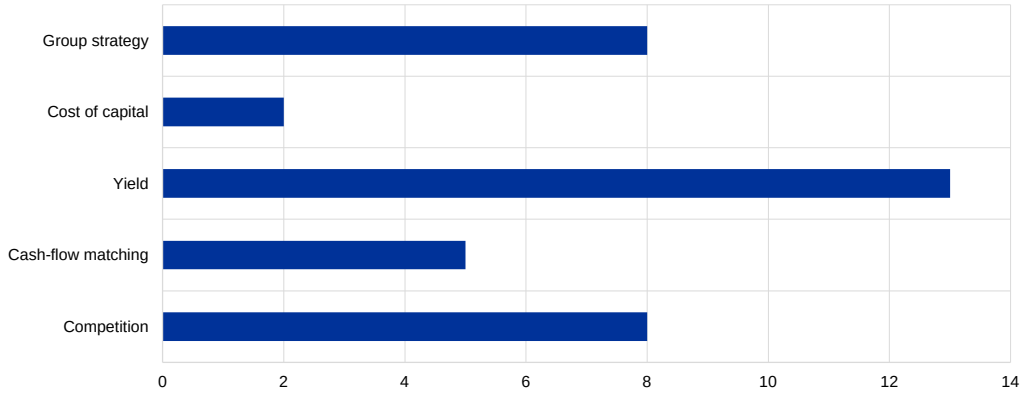
The remainder of this section distinguishes residential mortgage loans from other loans and corporate bonds. The analysis presented in this report distinguishes between credit provided to households and credit provided to NFCs. For credit provided to households, the report focuses on residential mortgage loans. A survey among ESRB members provided further information on this asset class.

The search for yield is the main driver of (re)insurers' exposure to residential mortgage loans (see Chart 23). Indeed, their risk/return profile has been attracting (re)insurers in a large number of countries. Competition with banks or other mortgage providers as well as the strategy of the wider group an (re)insurer belongs to also explain why (re)insurers hold residential mortgage loans. In some cases, the market may already be saturated by banks and, for that reason, (re)insurers may have little engagement with this specific asset class. The need to optimise risk within a conglomerate can sometimes lead to the transfer of mortgage loans from banks to (re)insurers within the same group. Moreover, (re)insurers can also follow wider investment strategies approved at group level and invest in residential mortgage loans as a result. Cash flow matching is an important determinant in (re)insurers' exposures. Given their typically long-term liabilities, (re)insurers have an incentive to opt for loans with longer maturities, of which residential mortgage loans are an example. In such a case, the cash flow of their assets would better match that of their liabilities. This matching is recognised in Solvency II and reduces the SCR held for interest rate risk.

Chart 23

Drivers of (re)insurers' exposures to residential mortgage loans

(number of countries where each driver is deemed relevant)



Source: ESRB survey on insurance and residential mortgage loans.
Notes: Countries can contribute to several categories. For example, the same country could be counted for the category "Yield" and the category "Cash-flow matching".

3.2 Insurance and banking requirements: a comparison

As regards differences in risk-bearing capacities, the treatment of corporate bonds and loans in the insurance and banking frameworks can be compared to identify possible loopholes and the potential for regulatory arbitrage. The specificities of both types of financial institutions should be reflected in their respective regulatory frameworks, and any comparison should consider the differences in business models. In particular, it is difficult to compare directly the level of capital requirements of a given exposure, because it might interact with other elements of the framework. In the insurance framework, for example, diversification benefits and the loss-absorbing capacity of technical provisions need to be taken into account. Conversely, the business of banks is to originate loans meaning one might expect that they have a comparative advantage in terms of underwriting standards and risk management that should be reflected in the regulatory framework. (Re)insurers may be in a position where investing in corporate bonds with a long duration or providing a residential mortgage loan would reduce their asset-liability mismatch: they follow a liability-driven investment approach and therefore should be able to avoid risks related to maturity transformation. However, beyond these different risk-bearing capacities, both types of financial institutions are exposed to the same borrower risk: where a borrower is unable to reimburse its credit, both types of financial institutions suffer a loss. This credit risk should be reflected in both regulatory frameworks in a consistent way. It should not necessarily lead to the exact same capital requirements, but at least the parameters used to calculate capital requirements should be similar so that the same aspects of credit risk are taken into account. For example, if one regulation provides that capital requirements vary according to credit quality while the other does not, it would be expected that exposures with high credit quality are moved to the most risk-sensitive regulatory framework. The other framework would be left with the riskier exposures. One difficulty in comparing the requirements of both frameworks is that bonds and loans can be valued

differently. Under Solvency II, all assets should be valued at market value. In the banking framework, loans are typically valued at exposure value, corresponding to their accounting value remaining after specific credit risk adjustments.

3.2.1 Residential mortgage loans

Under Solvency II, residential mortgage loans may be treated differently from other types of bonds and loans. The SCR standard formula stipulates that all types of bonds and loans would fall under the spread risk sub-module, ensuring the similar treatment of these assets (see Box 13). However, where residential mortgage loans meet certain criteria (specified in Article 191 of Commission Delegated Regulation (EU) 2015/35), they fall under the counterparty default risk module. This module provides for a calculation of the SCR using different assumptions than the ones of the spread risk sub-module. Indeed, the counterparty default risk module does not capture the risk of selling the loans before maturity: it only captures the pure credit risk. The spread risk sub-module captures both the fundamental credit risk and the risk that (re)insurers would incur a loss if they were to sell their bonds and loans at a distressed price. Typically, the counterparty default risk module provides for a smaller SCR than the spread risk sub-module.

Box 13
SCR standard formula structure

This box will explain the modular structure of the SCR standard formula, the diversification benefits and the loss-absorbing capacities.

Solvency II provides a standard formula with which (re)insurers can calculate their SCR. The SCR covers the main quantifiable risk for existing business and, where appropriate, new business expected to be written in the following 12 months. The SCR is calibrated using the Value at Risk of the (re)insurer's own funds, subject to a confidence level of 99.5% over a one-year period.

The standard formula follows a modular structure. It is composed of several modules that represent the main risks (re)insurers are exposed to: market risk, counterparty default risk, life underwriting risk, non-life underwriting risk, health underwriting risk and operational risk. Each of these modules is then split into several sub-modules targeting particular aspects of the risk.

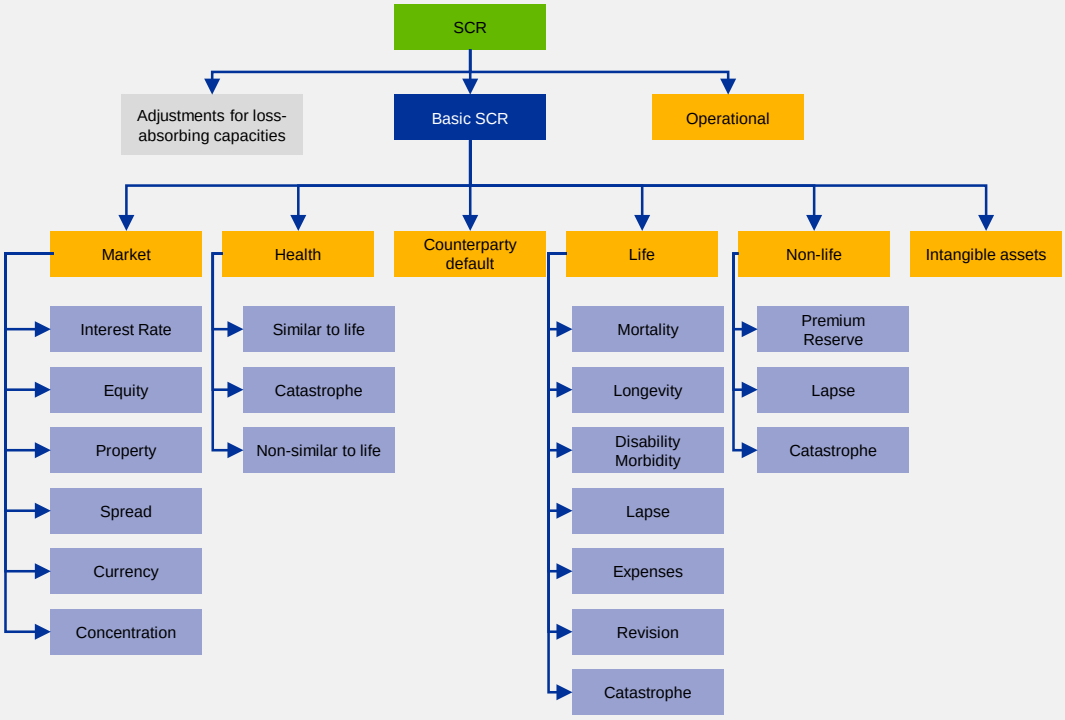
Insurers are required to calculate their capital requirements sub-module by sub-module. Diversification effects are then taken into account when aggregating these intermediate results, via correlation matrices.

The standard formula also recognises the specific loss-absorbing capacities of (re)insurers' technical provisions and deferred taxes via downward adjustments. These adjustments reflect the possibility for (re)insurers to reduce their profit participation payouts to policy holders in the event of a shock and to lower their future tax payments.

All types of corporate bonds and loans fall under the interest rate sub-module and either under the spread risk sub-module or the counterparty default risk module if they meet the criteria specified in Article 191 of Commission Delegated Regulation (EU) 2015/35.

Figure A

Structure of the standard formula



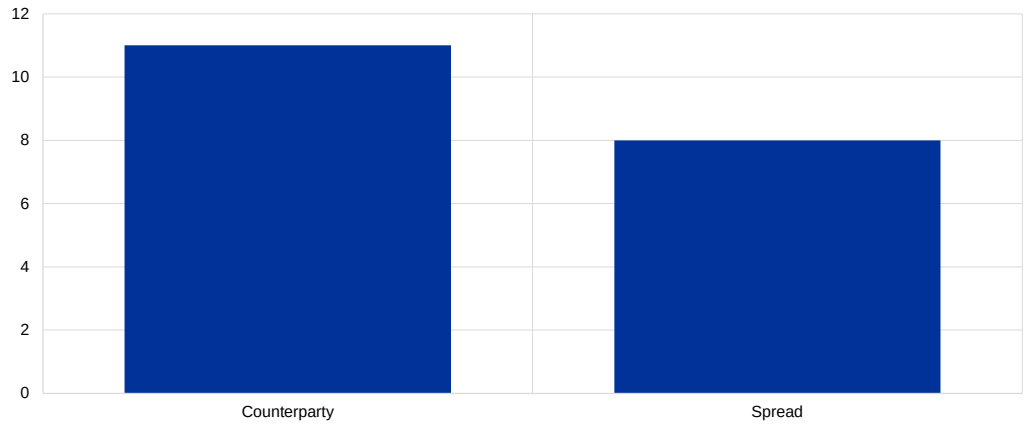
Source: Commission Delegated Regulation (EU) 2015/35.

In a majority of Member States, residential mortgage loans are treated under the counterparty default risk module. A survey among ESRB members provided information on where, typically, residential mortgage loans are treated under Solvency II. In certain countries, treatment under Solvency II depends on the contractual conditions of the residential mortgage loans and it was not possible to indicate a typical treatment. In 19 Member States, it was possible to indicate the typical treatment of residential mortgage loans (see Chart 24). (Re)insurers can hold residential mortgage loans via different means: they can originate the loans, they can buy a portfolio of loans from another financial institution (typically a bank), they can invest in a fund which holds a portfolio of residential mortgage loans,; or they can gain exposure through securitisations or covered bonds where the pool of assets is mainly constituted of residential mortgage loans.

Chart 24

Residential mortgage loan treatment under Solvency II

(number of countries)



Source: ESRB survey on insurance and residential mortgage loans.
Notes: Residential mortgage loans are typically treated under the counterparty default risk module in Belgium, Germany, Finland, France, Iceland, Liechtenstein, Luxembourg, Norway, Netherlands, Sweden and Slovenia. They are typically treated under the spread risk sub-module in Austria, Cyprus, Estonia, Spain, Croatia, Latvia, Poland and the United Kingdom.

For residential mortgage loans with a low loan-to-value (LTV) ratio, the microprudential capital requirements can differ significantly between banks and (re)insurers, and there is no EU-wide macroprudential toolkit for insurance. In terms of underwriting standards and risk management, the insurance and the banking regulatory frameworks share similarities when it comes to assessing and managing the credit risk of the borrower. In particular, Directive 2014/17/EU on mortgage credit lays down requirements that (re)insurers and banks must comply with when they grant mortgage loans to consumers. As for residential mortgage loans held by (re)insurers, the microprudential capital requirements under Solvency II can either be calculated under the spread risk sub-module or under the counterparty default risk module (see above and Box 13). In the latter, the LGD can be nil where the amount of the loan is smaller than 80% of the risk-adjusted value of the collateral[69]. In this case, there is no capital requirement for credit risk in the insurance sector, whereas the risk weights for banks lie between 8% and 25%. Chart 25 provides a comparison of risk weights carried out for the Dutch market by De Nederlandsche Bank in which the capital requirements observed for (re)insurers (both under the standard formula and under internal models) have been converted into equivalent risk weights, assuming certain diversification effects and loss-absorbing capacities. These equivalent risk weights have been calculated for different LTV values for (re)insurers, pension funds and banks under several regulatory regimes (current and upcoming capital requirements regulations, standardised approach and internal ratings-based approach). A capital requirement which is nil would indicate that, in the event of defaults, (re)insurers are able to realise the value of the risk-adjusted collateral. This assumption should be confronted with the fact that, for credit institutions, the capital requirements

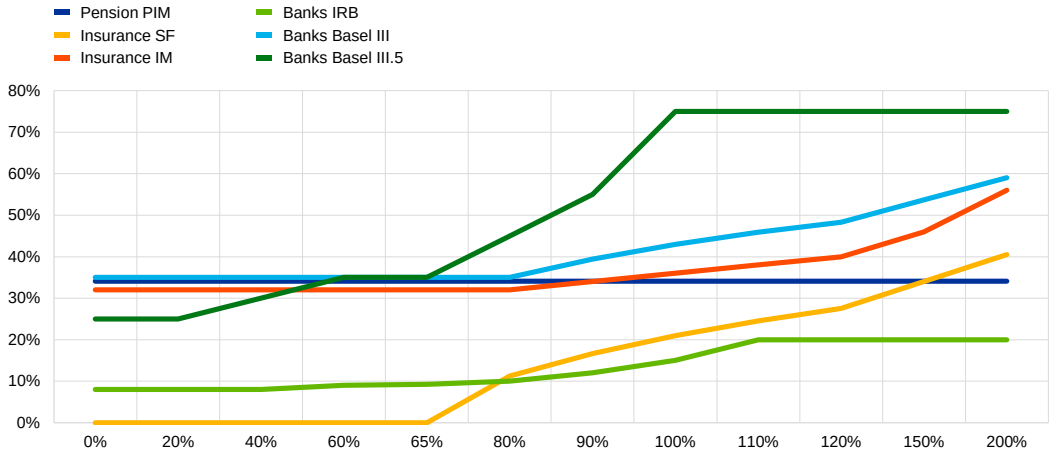
[69] Commission Delegated Regulation (EU) 2015/35 defines the risk-adjusted value of the collateral in Article 198. It broadly corresponds to the market value of the property, to which a haircut of 25% is applied.

are not nil, which could be interpreted as meaning that they cannot realise the value of the collateral. By extension, it is therefore doubtful that (re)insurers would be able to do so. In addition, the capital requirements calculated by (re)insurers who use an internal model are not nil. These inconsistencies show that there may be an issue with the calibration of capital requirements for residential mortgage loans in the standard formula of the insurance framework. In terms of macroprudential tools, there are none in the insurance framework at EU level as opposed to the banking framework. Please also refer to Annex 4 for more details on the comparison of the banking and insurance frameworks.

Chart 25

Comparison of risk weights across sectors

(percentage risk weights (y-axis) according to LTV ratio (x axis))



*Source: De Nederlandsche Bank (2016), "**Loan markets in motion**", November.*
Notes: The risk weight percentages vary according to the LTV ratio, which is also expressed as a percentage. Assumptions need to be made for diversification benefits and loss-absorbing capacities to calculate equivalent risk weights for the insurance and pension sectors. The chart provides a comparison of the risk weights obtained for pension funds (Pension PIM), for (re)insurers under the standard formula (Insurance SF), for (re)insurers using an internal model (Insurance IM), for credit institutions using the internal ratings-based approach (Banks IRB) and for credit institutions under the standardised approach (Banks Basel III and Banks Basel III.5).

(Re)insurers are exposed to the same borrower risk as banks. If the borrower of the residential mortgage loan (partly) defaults, both banks and (re)insurers would face a loss. This gross loss would be the same due to the fact that it stems from the borrower, i.e. the LGD would be the same. However, the net loss, taking account of the specificity of each balance sheet, could differ due to diversification benefits and specific loss-absorbing capacities.

The banking framework provides an LGD floor for residential mortgage loans; a similar approach could be considered in the insurance framework. Since the borrower risk is the same, the same residential mortgage loan provided either by a bank or by an (re)insurer carries the same LGD and probability of default risks. As seen above, there are cases where the Solvency II standard formula provides for a zero LGD, thereby assuming that (re)insurers are able to realise the risk-adjusted value of the collateral, while the banking framework assumes that banks cannot.

In the banking framework, the LGD floor provided in Article 164 of the Capital Requirements Regulation (CRR) prevents the LGD from falling too low.[70] Introducing a similar floor in Solvency II would correct this inconsistency and the potential regulatory arbitrage. The newly introduced LGD floor would have to be calibrated to meet the requirements of the SCR, i.e. be sufficient to cover unexpected losses with a confidence level of 99.5%. The calibration would not necessarily lead to the same values as the valuation framework is different. The values used by (re)insurers calculating their SCR with an internal model could be also used to test the outcome of the calibration.

3.2.2 Loans to NFCs and corporate bonds

One important difference in the treatment of bonds and loans is the absence, in the insurance framework, of a capital-based tool targeting credit risk stemming from (sub-) sectors. The (microprudential) capital requirements of both banking and insurance frameworks rely on the credit rating of the borrowing corporation. The banking framework also explicitly takes into account the relationship between the value of the collateral and the value of the loan. Under the insurance framework, the value of the collateral is implicitly calculated via changes in the market values of bonds and loans. The risk management provisions and underwriting standards are also comparable, despite some differences due to the varying business models of banks and (re)insurers. One noticeable difference is that banking regulations provide for hard quantitative concentration limits on large exposures, whereas in the insurance regulatory framework, (re)insurers need to hold capital for concentration risk. The main difference comes from the fact that the (new) banking framework now provides competent authorities with the power to set up a systemic risk buffer for sectoral and sub-sectoral exposures. The market risk concentration sub-module of the insurance framework does not capture sectoral and sub-sectoral exposures. Although this risk does not lead to capital requirements, it should be taken into account via the Pillar 2 provisions of Solvency II (risk management provisions and prudent person principle). There may be cases where a sector contributes to systemic risk and where a capital-based tool would usefully complement the insurance framework. Please also refer to Annex 5 for a more detailed comparison.

3.3 Macroprudential tools targeting the direct and indirect provision of credit

Macroprudential tools targeting systemic risk stemming from the provision of credit can be split between (1) those that directly increase (re)insurers' capacity to absorb shocks, (2) those that act upon lending conditions, and (3) those that incentivise market discipline. The first type of tool is the capital-based tool, which, by increasing the solvency requirements of (re)insurers, enables them to absorb unexpected losses of a systemic nature. The second type of tool, usually referred to as a borrower-based measure, has a direct impact on borrowers' resilience.

[70] Article 164 provides that "The exposure weighted average LGD for all retail exposures secured by residential property (…) shall not be lower than 10%".

The third type of tool aims at incentivising market discipline via the public disclosure of specific information.

The macroprudential tools suggested in this report would be at the discretion of the competent authorities and would be activated in order to mitigate relevant systemic risks and increase the capacity of (re)insurers to absorb unexpected losses. All macroprudential tools suggested would only be activated by the competent authorities in specific circumstances: the authorities would have to demonstrate that the intensity of the systemic risk to be addressed is increasing and may pose a danger to financial stability. For example, the activation of a macroprudential tool may be informed by past loss experience or forward-looking developments in the real estate markets, but may also be substantiated solely on the basis of financial stability concerns.[71] The scope and calibration of the tools proposed would also be at the discretion of the competent authority so that they can be adapted to the institutions particularly exposed to the systemic risk and to the intensity of this systemic risk. The authority may, for instance, define exposure thresholds under which it would not be considered proportionate to apply the measure. The authority responsible for activating the measures may set out different requirements for the various geographical areas in its jurisdiction, which in particular enhances its ability to target potential real estate price bubbles in specific geographical locations.

EIOPA should play a key role in terms of activation, calibration and reciprocity of the tools. For example, EIOPA and/or the European Commission could be empowered to draft technical standards and/or guidelines setting out the process to be followed as well as the principles for the calibration of the tools. Where the tools are activated by a national authority and where (re)insurers located in a different Member State would also be exposed to that specific systemic risk, a system of reciprocation for the activation of the macroprudential tools involving EIOPA would complete the macroprudential toolkit. Such a process for the activation and reciprocation of national macroprudential tools already exists in the banking framework and could be adapted to the insurance sector[72]. Finally, the introduction of such a discretionary tool in the Solvency II framework may necessitate further modifications of EU law setting the allocation of powers between EU and national authorities.

Please also refer to Annex 6 for a review of the macroprudential tools available in the banking framework and whether it would make sense to apply similar tools to (re)insurers.

3.3.1 Instruments increasing (re)insurers' resilience

Capital-based tools applying to (re)insurers should target specific exposures. Whereas in the banking framework capital-based tools can either target specific exposures or apply to the total risk

[71] See ESRB (2014).

[72] While preparing a macroprudential measure under Article 458 CRR, the national (banking) authority has to demonstrate that the intensity of the systemic risk to be addressed is increasing and may pose a danger to financial stability in the concerned Member State. It also has to demonstrate that other macroprudential measures established in the regulatory framework cannot address these risks as proportionately, effectively and efficiently as the national flexibility measures in Article 458. The report prepared by the national authority is then subject to the opinion of both the European Banking Authority (EBA) and the ESRB, supporting the European Commission decision, which subsequently recommends whether the European Council should issue a rejection act of the proposed measure.

exposure of the institution, in the insurance framework only tools targeting specific exposures would realistically address systemic risk arising from the provision of credit – through lending to households and NFCs or through investing in corporate bonds. Indeed, the primary business of banks is to provide credit. As such, tools targeting credit risk can apply to the whole balance sheet of banks in certain circumstances. The balance sheet of (re)insurers is only partly exposed to the same credit risk, hence tools targeting these specific exposures are more appropriate. These capital-based tools would therefore follow an activity/exposure-based approach. They are a subset of the tools envisaged in ESRB (2018), referred to as "capital increases". ESRB (2018) provides that such capital increases could be useful in any (unforeseen) situation where the entire (or a significant part of the) insurance sector is affected simultaneously and the Solvency II capital requirements would not sufficiently capture the systemic riskiness or particularities of the situation. In addition to such capital increases, authorities could consider temporarily restricting the distribution of dividends (i.e. rule-based dividend restrictions). This could, for example, help avoid simultaneous de-risking of similar exposures. The capital increases or dividend restrictions would only prevail for as long as necessary.

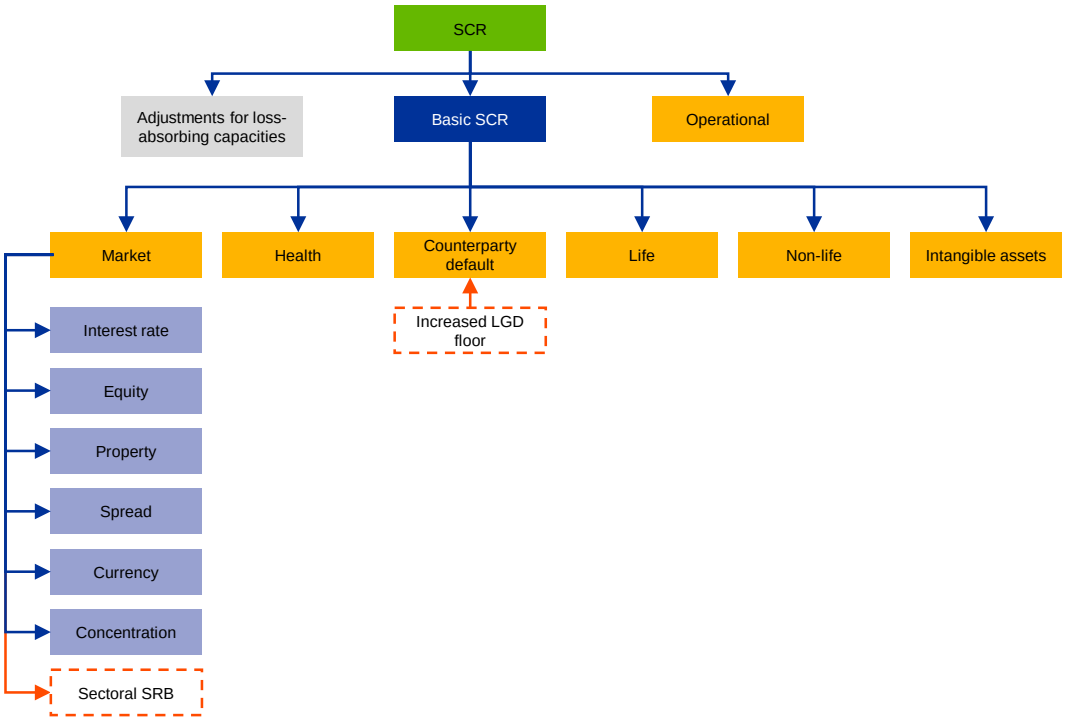
Capital-based tools should at least target the following three segments: residential real estate, commercial real estate and exposures to legal entities such as NFCs. Capital-based tools should help prevent and mitigate (systemic) risks that are not covered by Solvency II, or are not covered sufficiently. The flexibility of the tools is key to ensuring their effectiveness: capital-based tools should apply to all similar exposures or to a subset of exposures. Within the banking regime, four segments are pre-identified: residential real estate, commercial real estate, exposures to legal entities such as NFCs (excluding real estate) and exposures to households (excluding real estate). Given the exposure of the insurance sector, the first three segments could be relevant. As (re)insurers provide little credit to households with the exception of residential mortgage loans, the fourth segment identified in the banking regime is not relevant for the insurance sector.

Capital-based tools for the insurance sector should follow the SCR standard formula structure for simplicity of activation, calibration and recognition of insurance specificities. Following the SCR standard formula structure (see also Box 13) offers three benefits. First, authorities need flexible and simple tools to adapt to the different sources of systemic risk. Defining tools that reflect the standard SCR formula structure can ensure this. For example, residential mortgage loans can either be treated under the counterparty default risk module or the spread risk sub-module. Instead of having a unique capital-based tool applying to (re)insurers, which would increase resilience against systemic risk stemming from residential real estate, this report suggests the use of two capital-based tools: one defined at the level of the counterparty default risk module and another at the level of the spread risk sub-module. The second benefit is that this will also ensure consistency in the calibration, as the (sub-)modules of the standard formula define the gross losses before modelling the specificities of the insurance balance sheet. It is easier to model the gross losses that would result from the materialisation of risk than the net losses. Third, by applying capital-based tools at the level of the (sub-)modules, one ensures that the risk-bearing capacity of each (re)insurer is reflected in the ultimate capital requirements. Indeed, the diversification benefits between the (sub-)module under which the tool is defined and other (sub-)modules of the standard formula (such as between the market risk module and the underwriting risk modules), would be as currently provided by the standard formula: the diversification benefits between the different activities of (re)insurers would therefore be recognised. In addition, the loss-absorbing capacity of

technical provisions and deferred taxes would also be accounted for in the calculation. It would also be possible to define such tools as a Pillar 2 measure, i.e. outside of the standard formula, similar to capital add-ons[73]. In such a case, however, it is more difficult to take account of the insurance specificities, in particular the diversification benefits and loss-absorbing capacities. Finally, competent authorities should also have the power to use such tools on (re)insurers calculating their SCR with an internal model. In this case, supervisors would need to assess specifically the risks covered by the internal model – it is possible that some internal models already calculate capital requirements against sectoral concentration.

Two capital-based tools are proposed: the tightening of the SCR on residential mortgage loans via an increase in the LGD floor, and a sectoral systemic risk buffer. The first tool would exclusively target residential real estate vulnerabilities that can be transmitted to (re)insurers via residential mortgage loans treated under the counterparty default risk module. The second tool would be more flexible and target any kind of exposure, including residential real estate exposure not covered by the first tool, commercial real estate exposure and exposure to NFCs. See Figure 7 for an illustration of where the capital-based tools would enter the standard formula.

Figure 7
SCR standard formula structure and capital-based tools



Source: ESRB.
Notes: The two boxes in dashed red illustrate where, in the standard formula structure, the capital-based tools would be activated. The sectoral SRB is a new discretionary module. The increased LGD floor is a discretionary decision that increases the SCR for counterparty default risk.

[73] See EIOPA (2019b).

Tightening of capital requirements on residential mortgage loans via an LGD floor

Given the minimal borrower risk, the introduction of an LGD floor for residential mortgage loans in Solvency II could be considered. As explained above, (re)insurers holding residential mortgage loans on their balance sheets are exposed to the same risk of borrower default as banks – the difference lies in the resilience of the institutions after the default occurs. The introduction of an LGD floor for residential mortgage loans would correct the inconsistency observed for loans with an LTV ratio smaller than 80% of the risk-adjusted value of the collateral. In addition to avoiding the possibility of regulatory arbitrage, the introduction of an LGD floor would have another macroprudential benefit.

Where there are systemic vulnerabilities in the residential real estate sector, competent authorities should be able to increase the LGD floor for residential mortgage loans. The capital requirements under Solvency II are calibrated to cover for unexpected losses with a 99.5% confidence level. The calibration of the SCR parameters is usually done through the cycle and does not capture the possibility of risks temporarily increasing. If authorities detect that risks are building up in the residential real estate sector (see for instance ESRB, 2019b), they should have the power to increase the resilience of financial institutions exposed to this sector. The banking framework includes several tools that allow authorities to increase capital requirements for (residential) mortgage loans. Article 124 CRR, for example, applies to institutions that use the standardised approach to compute minimum capital requirements for loans guaranteed by immovable property and establishes the conditions under which the minimum risk weights for residential and commercial property may be applied. It also stipulates that such minimum risk weights can be increased or the conditions for applying such weights restricted. Article 164 CRR applies to institutions opting for the internal ratings-based approach when calculating capital requirements for exposures secured by residential or commercial immovable property, and defines the minimum average LGD values that should be applied. The same article also stipulates that the supervisory authority must periodically assess whether the minimum LGD is still appropriate; if not, the authority can increase the minimum LGD. Article 458 CRR includes a specific reference to “risk weights for targeting asset bubbles in the residential and commercial property sector” and provides for an add-on to implicit risk weights and the imposition of a minimum implicit risk weight, both when the institution is using the standardised and the internal ratings-based approach. The competent authorities for the supervision of the insurance sector should also have a tool to increase the resilience of (re)insurers. Increasing the LGD used to calculate capital requirements under the counterparty default risk module would be a simple yet effective tool. Despite leading to an increase in the SCR held for the counterparty default risk, this tool would also recognise the specific diversification benefits and loss-absorbing capacities of (re)insurers.

Sectoral systemic risk buffer (SRB)

Introducing an SRB in the insurance regulatory framework would allow increases in systemic risks of specific exposures or (sub-)sectors to be targeted. Solvency II and the SCR standard formula provide for capital requirements whenever an (re)insurer has an excess exposure towards corporates belonging to the same group (via the concept of “single name exposure”). The capital requirement for this risk is calculated via the market concentration risk sub-module, which assumes that the geographical and the sector concentration of the assets held by (re)insurers are

not material (see Recital 62 of Commission Delegated Regulation 2015/35). This module defines thresholds, above which the excess exposure triggers a capital requirement. However, the calibration of these thresholds does not take account of the situation in which a single name exposure creates or contributes to systemic risk. A tool allowing additional capital to be imposed in cases where a specific exposure or sector creates systemic risk would therefore complete the Solvency II standard formula. This tool would also complement the symmetric volatility adjustment that this report proposes to introduce. The symmetric volatility adjustment cannot build resilience against specific exposures since its calculation does not take into account the sectoral dimension. In addition, the symmetric volatility adjustment targets procyclical behaviour against cyclical risk, whereas the SRB could also target structural risks. See ESRB (2014) for a discussion on structural risks stemming from sectors and SRBs in the banking framework. In the following, an illustration of how authorities could define such a capital tool is provided.

An insurance-specific SRB could be added under the market risk module of the SCR standard formula so that insurance-specific risk-bearing capacities are reflected in the calculation. Adding an SRB to the SCR calculated for the market risk module would offer several benefits. First, it would explicitly show that the SRB is a complement to the market risk concentration sub-module, which avoids double-counting. Second, the same correlation parameters as those used for the market risk concentration sub-module could be used, i.e. no diversification benefits, to ensure consistency within the market risk module. Third, the diversification benefits between the market risk module and other modules of the standard formula, such as the underwriting risk modules, would stay the same: the diversification benefits between the different activities of (re)insurers would be recognised. Fourth, the loss-absorbing capacity of technical provisions and deferred taxes would also be accounted for in the SRB calculation.

The calibration of the SRB could be based on the same principles as those of the market risk concentration sub-module. There are three steps to follow. First, authorities would identify and define a sector that poses a systemic risk to the insurance sector. This could be done by using NACE codes, which are already reported under Solvency II. The “Mining and quarrying” sector (NACE code B), for example, could be envisaged to raise a systemic risk in view of its impact on climate change, while the “Transport and storage” sector (NACE code H) could be viewed as particularly vulnerable in the context of a trade war. The sector “Telecommunications” (NACE code J61) could represent a systemic risk if it were particularly indebted. Second, authorities would define a relative excess exposure threshold, below which the SRB would not be activated. It could be calculated as a percentage of all exposures, for example 3%. It could also be calculated by comparing the specific exposure with the excess capital available to (re)insurers: for example, if a (re)insurer has excess capital above its SCR of €100 million and holds €35 million in assets from a specific sector raising systemic risk concerns, authorities could define a threshold of 25% and capture the specific exposure of this (re)insurer – in this case €10 million[74]. Third, authorities would define a risk factor, which could be based on the average CQS of the (sub-)sectoral exposure or on a credit assessment of the sector. For example, if the authorities conclude that a specific sector has a credit risk similar to bonds with a CQS of 3 (BBB), they could use the dedicated risk factor defined in the market risk concentration sub-module (Article 186 of Commission Delegated

[74] Calculated as: 35 –100 x 25% = €10 million.

Regulation (EU) 2015/35). In this case, the above-mentioned €10 million would be assigned a risk factor of 21%, leading to an SRB of €2.1 million. This €2.1 million would be added to the SCR held for market risk, which would then enter into the calculation of the basic SCR and final SCR.

3.3.2 Instruments targeting borrowers

In addition to capital-based macroprudential measures, there are other measures serving a macroprudential purpose that are not harmonised by EU law and that are at the discretion of the Member States' national authorities. Examples of such measures, which have been defined and calibrated at Member State level, are caps to LTV, loan-to-income (LTI), debt-to-income (DTI) and debt-service-to-income (DSTI) ratios as well as maturity limits. These tools and measures vary from one Member State to another, not only in terms of the actual caps and ratio values, but also in terms of the definitions and calculations of those ratios.

These measures are distinct from other macroprudential tools as they "are directed towards the contract between the bank and the borrower" (ESRB, 2014). They are therefore referred to as borrower-based measures.

Borrower-based measures have been implemented by several Member States, in particular to address excessive household credit growth or high indebtedness.[75] Generally, the implementation of borrower-based measures is heterogeneous across Europe, which reflects the specific structural factors of countries' credit markets or their position in the financial cycle depending on the definitions of collateral, monthly income and so on. In some Member States, borrower-based measures are implemented via binding regulations and in others through recommendations. Therefore, one of the disadvantages of these measures is complicated cross-country analysis and valuation.

Instruments that target borrowers work directly on the terms and conditions of the loans by making the volume of credit granted dependent on:

- the value of the underlying real estate (LTV limit); or
- the debt servicing capacity of the borrower (LTI, DSTI and maturity limits).

These instruments restrict the amount that can be borrowed relative to the value of the collateral or income of the borrower and thereby curb credit growth in the real estate sector. See Annex 7 for an overview of the types of borrower-based measures.

The main objective of borrower-based measures is to increase the resilience of both borrowers and financial institutions originating loans. They reduce the funding available to riskier borrowers by imposing a limit on the loan – through the value of underlying collateral (LTV) or disposable income of the borrower (LTI, DSTI).

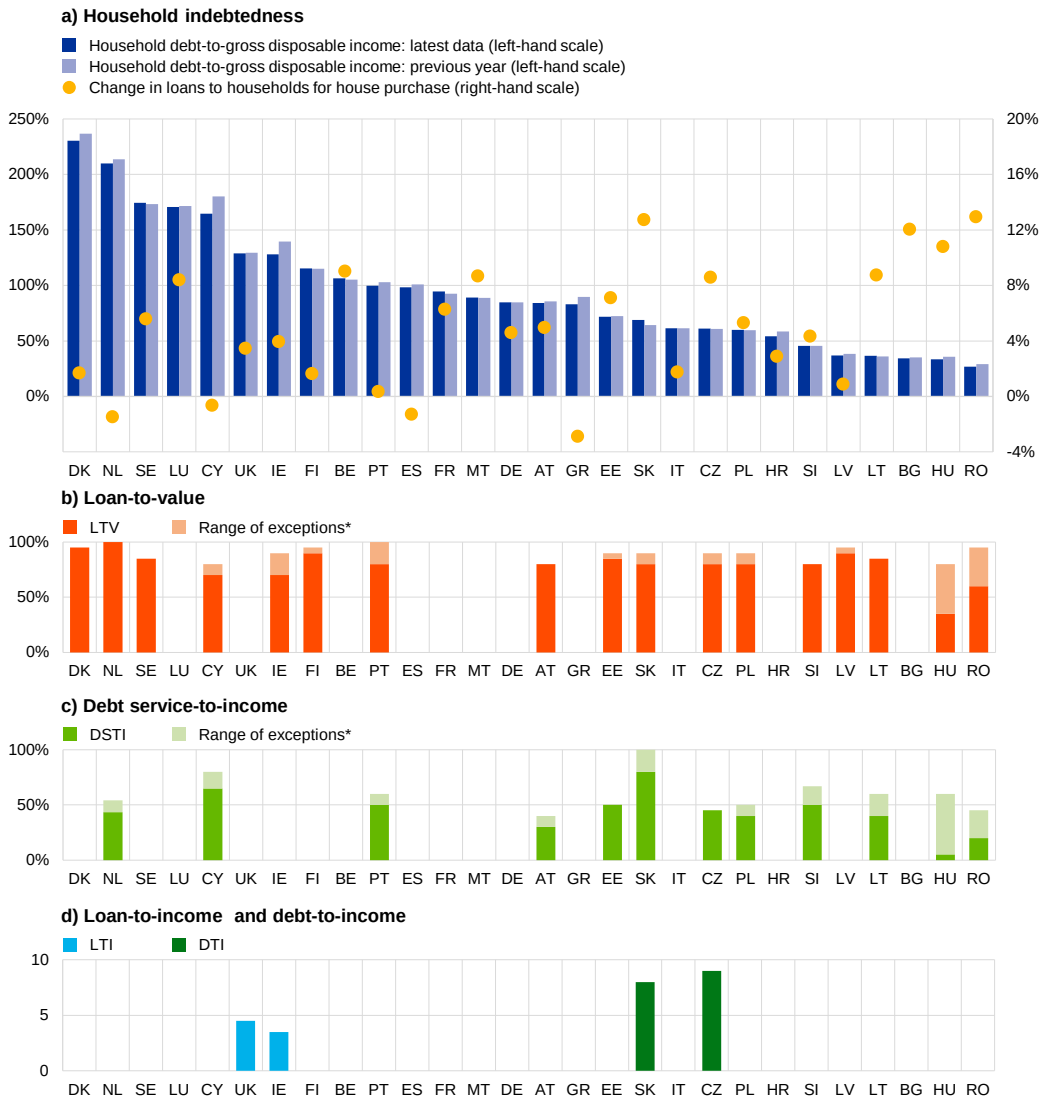
[75] ESRB (2016) also refers to the possibility of targeting NFCs via borrower-based measures in order to complement the macroprudential toolkit and be able to target all borrowers.

Such measures are also countercyclical. During the expansionary phase of the cycle, borrower-based instruments can curb excessive credit growth and leverage, thus smoothing the credit cycle. Moreover, simultaneous caps to LTV and DSTI ratios complement each other and limit the feedback loop between house prices and credit.

Chart 26

Implementation of borrower-based measures across EU Member States, including the variation in the measures' application and values

(percentages and percentage changes; multiples for LTI and DTI ratios)



Source: ESRB Annual Report 2018.

Notes: The chart shows the household debt-to-gross-disposable-income ratio, the annual nominal growth in loans to households for house purchase and the applicable macroprudential measures (LTV, DSTI, LTI and DTI limits) in EU countries. The data for indebtedness refer to the third quarter of 2018 (latest data, dark blue bars) and the third quarter of 2017 (previous year, light blue bars). For some countries, the latest data on household indebtedness refer to the fourth quarter of 2017 (Bulgaria, Cyprus, Estonia, Hungary, Lithuania, Luxembourg, Latvia, Slovakia) or the fourth quarter of 2016 (Croatia). Data for Malta were provided

*by the Maltese authorities during the consultation for the ESRB publication **A Review of Macroprudential Policy in the EU in 2018**; the last data point refers to the third quarter of 2018. For more detailed information on household indebtedness, see the March 2019 ESRB risk dashboard. For LTV, DSTI, LTI and DTI limits, the darker bars represent the currently applicable measures and the lighter shades indicate the range of possible exceptions from the cap. The differentiation of DSTI and LTV limits is heterogeneous and subject to various rules across countries.*
** For detailed descriptions of the application of LTV, DSTI, LTI and DTI measures in Member States, as well as links to the official country announcements, see the "**Overview of national macroprudential measures**" on the ESRB's website. The latest observations are for 30 December 2018 for LTV, DSTI and LTI/DTI limits; 30 September 2018 for indebtedness; and 31 December 2018 for loans to households for house purchase.*

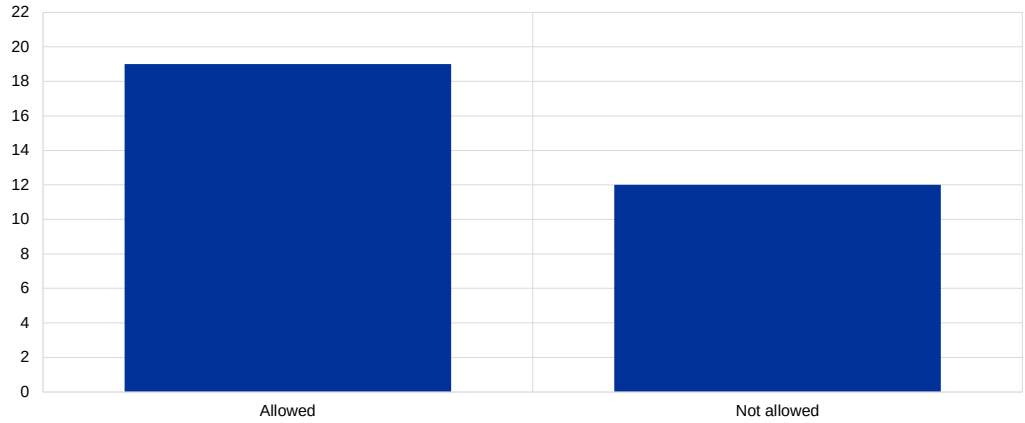
Borrower-based tools may allow potential procyclical effects to be avoided for new lending. In January 2019, the ESRB published a policy report focusing on macroprudential approaches to prevent the emergence of system-wide non-performing loans (ESRB, 2019a). It was a policy response to the mandate given by the EU Council. In the report, consideration is given to the use of borrower-based macroprudential measures. It was highlighted that borrower-based macroprudential measures are particularly useful in addressing strategic complementarities that can have adverse consequences besides increasing the resilience of both borrowers and banks.

Since borrower-based tools target borrowers directly via the terms and conditions of the loans, they should apply to all institutions originating loans, including (re)insurers. The tool should be activated for all financial institutions carrying out the same activity. If the tool were only an entity-based tool, it would run the risk of creating loopholes. The absence of such tools could result in inefficient macroprudential policy, where borrowers not complying with defined caps and ratios would take out a loan from a provider other than a bank, such as a (re)insurer.

In most jurisdictions, (re)insurers are allowed to originate residential mortgage loans. There is, however, a significant number of countries where (re)insurers have no such permission (see Chart 27). (Re)insurers in these countries can still gain exposure to mortgage loans through the purchase of portfolios containing such loans or through investments in funds holding mortgages on their balance sheets. In such cases, borrower-based measures would not apply.

Chart 27
Legal permission for (re)insurers to originate residential mortgage loans

(number of countries)



Source: ESRB survey on insurance and mortgage loans.

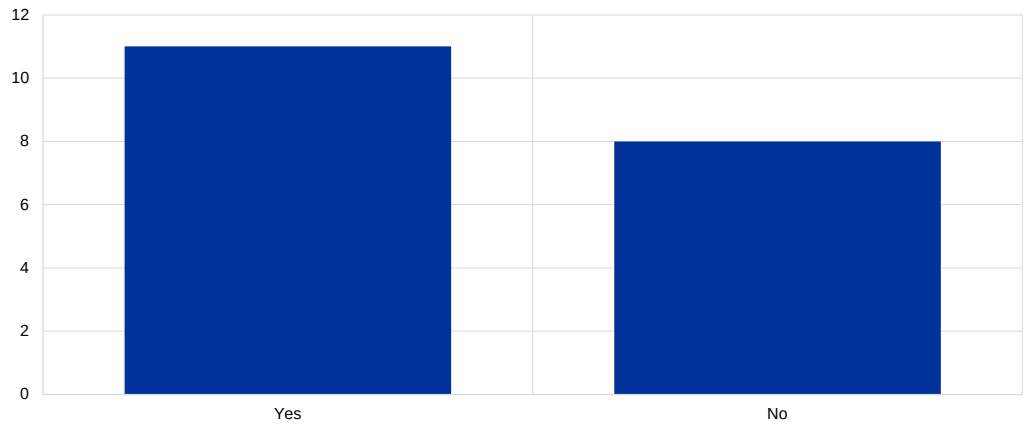
Notes: (Re)insurers are allowed to originate residential mortgage loans in Austria, Belgium, Cyprus, Germany, Denmark, Estonia, France, Greece, Croatia, Iceland, Liechtenstein, Latvia, Norway, Netherlands, Poland, Romania, Sweden, Slovenia and the United Kingdom. They are not allowed to originate residential mortgage loans in Bulgaria, the Czech Republic, Spain, Finland, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, Portugal and Slovakia.

The borrower-based measures available at country level cannot always be applied to (re)insurers. In 11 Member States, the legal scope of the borrower-based measures includes (re)insurers originating loans. This is not the case in eight Member States, however, which can reduce the effectiveness of macroprudential policy. See Chart 28.

Chart 28

Legal scope of borrower-based measures includes insurance

(number of countries)



Source: ESRB survey on insurance and mortgage loans.
Notes: Only countries where (re)insurers are allowed to originate residential mortgage loans are considered in this chart. There are legal provisions for the implementation of borrower-based measures applying to (re)insurers in Austria, Belgium, Cyprus, Germany, Denmark, Iceland, Latvia, Norway, Netherlands, Sweden and Slovenia. Such legal provisions do not exist in Estonia, France, Greece, Croatia, Liechtenstein, Poland, Romania and the United Kingdom.

3.3.3 Public disclosure power

Besides capital-based and borrower-based tools, other types of tools could be used to mitigate systemic risk stemming from the provision of credit. Competent authorities should be given a complete macroprudential toolkit to effectively prevent and mitigate systemic risk, which goes beyond capital-based and borrower-based instruments. As is the case for capital-based and borrower-based tools, where the banking framework provides for a tool that does not cover the insurance sector, there could be a migration of risks from one sector to another – or even from one entity to another within the same financial conglomerate.

Public disclosure provisions may include the power for authorities to require (re)insurers to disclose at a more granular level, at a higher frequency and using specific formats. The purpose of using such a tool is to reinforce market discipline in view of excessive risk taking, of exposure to systemic risk or because of involvement in certain activities. For example, the Solvency

and Financial Condition Report could be completed in a consistent way across Europe to incorporate information on certain exposures, as defined by competent authorities.

Conclusions

This report sets out solvency, liquidity and horizontal tools based on macroprudential considerations for the review of Solvency II. This review, which is envisaged to be completed by the end of 2020, provides an opportunity to better reflect macroprudential considerations in legislation. To this end, this report sets out three types of tool that are designed to address procyclical behaviour and to ensure the consistent treatment of activities typically performed by banks. They are: (i) solvency tools addressing cyclical risks via symmetric adjustments to the solvency requirements of (re)insurers; (ii) liquidity tools addressing risks arising on the assets and liabilities side of the balance sheet; and (iii) horizontal tools addressing risks stemming from the provision of credit to the economy.

The tools proposed in this report would strengthen the macroprudential dimension of the regulatory framework for insurance. The tools are a subset of the broader set of tools identified in ESRB (2018). Reflecting the ESRB's cross-sectoral expertise, this subset focuses on those types of risk that are not necessarily specific to the insurance sector, but that reflect the risk profile and the business model of (re)insurers. Some of the more insurance-specific tools identified in ESRB (2018) are considered in EIOPA's consultation paper on the Solvency II review.

Solvency tools addressing cyclical risks via symmetric adjustments

The volatility adjustment should be reviewed and made symmetric, so that it can also build up resilience when the prices of fixed income assets are rising. The current methodology for the volatility adjustment results in an adjustment that is almost always positive. This means that (re)insurers are not required to build up loss absorption capacity for a time when risk premia reverse. A symmetric volatility adjustment corrects this deficiency and may also counter procyclical investment behaviour in all phases of the financial cycle. Such adjustments should be applied automatically to all (re)insurers. The calibration of the parameters of the adjustment should be assessed using (re)insurers' data at currency, country and entity-specific levels. As an alternative to the symmetric volatility adjustment, this report also describes a symmetric adjustment to the SCR for spread risk. However, the latter has the disadvantage that it does not build up resilience on government bonds. If legislators were to opt for this alternative, they would need to make sure that there is no double-counting with the volatility adjustment by removing the corporate assets from the volatility adjustment.

The symmetric volatility adjustment should form an additional own funds item to enhance its effectiveness and transparency and ensure an unbiased calculation of technical provisions. The volatility adjustment is currently applied to the risk-free interest rate term structure used to discount technical provisions. This raises three concerns: (i) it contributes to under/overshooting effects where the size and duration of liabilities are different from those of fixed income assets; (ii) it is complex and not transparent, as the adjustment targets assets but applies to liabilities; and (iii) it affects the value of options and guarantees embedded in insurance contracts, and hence also of technical provisions.

The (symmetric) volatility adjustment should not affect the calculation of the SCR for (re)insurers that use an internal model. For such (re)insurers, the current volatility adjustment reduces their technical provisions and can also reduce their SCR. This gives rise to double-counting, which could lead to an under-capitalisation.

(Re)insurers using an internal model should be required to adapt the symmetric adjustment for equity risk to their models. The symmetric adjustment for equity risk should be improved in two ways. First, the symmetric adjustment for equity risk only applies to (re)insurers calculating their SCR with the standard formula, while roughly 40% of EEA (re)insurers' investments are held by firms calculating their SCR with an internal model. Such (re)insurers should also be required to adapt the symmetric adjustment to their models, which are subject to supervisory approval. Second, the cap on the value of the adjustment of 10 percentage points should be increased to improve its effectiveness. More generally, to increase resilience during times of excessive market price gains, the ESRB also sees merit in applying the symmetric adjustment to other non-fixed income assets, albeit the fact that this has not been analysed in detail in this report. This report also investigates a symmetric adjustment for interest rate risk but does not conclude in favour of such an adjustment because the current design of the SCR for interest rate risk should first be corrected of its flaws and take better account of low and negative interest rates, and because evidence of procyclical investment behaviour due to changes in interest rates is mixed.

Liquidity tools addressing liquidity risk arising on the assets and liabilities side

Enhanced Solvency II reporting would allow authorities to measure liquidity risk stemming from certain activities. On the assets side, most of the information needed to assess liquidity risk stemming from margins calls is already available. On the liabilities side, insurers underwriting insurance-based investment products offering the option to policyholders to surrender their contracts should be required to report and disclose the information that authorities need to measure and assess liquidity risk. Such reporting could be provided on an annual, semi-annual or quarterly basis, depending on the vulnerability of the liquidity risk profile.

The provisions on managing liquidity risk should be reinforced, in particular by requiring vulnerable (re)insurers to carry out internal stress testing. (Re)insurers should be required to assess their liquidity risk in more detail if they carry out certain activities that make them vulnerable to liquidity risk. In addition to defining their liquidity risk appetite and strategy, this assessment should take the form of internal stress testing with different time horizons to capture short-term liquidity needs (as in the case of margin calls) or medium and long-term liquidity needs (as in the case of mass lapse events).

The financial stability implications of liquidity risk should also be assessed via supervisory stress tests. To capture the effect that liquidity shortfalls experienced by individual (re)insurers would have on the financial system, supervisory stress tests incorporating liquidity risk should be carried out.

Supervisors should have the power, through new Pillar 2 provisions, to require (re)insurers with a vulnerable liquidity profile to hold a liquidity buffer. The supervisory toolkit provides supervisors that detect a liquidity vulnerability at particular (re)insurers with few ways to take action.

Solvency II should be complemented by Pillar 2 provisions that give supervisors the power to require such (re)insurers to hold liquidity buffers. To this end, there should be a common understanding of what constitutes high-quality liquid assets (HQLA). This report suggests drawing on the banking framework definition of HQLA, which, once adapted to the insurance framework, would also allow cross-sectoral analyses of liquidity risk. Finally, these new Pillar 2 provisions should provide an understanding of which HQLA can be used for different liquidity needs. For example, in the case of variation margin calls, there could be instances where cash would be the main acceptable source of liquidity. As illustrated in this report, some (re)insurers may have difficulty providing cash in the event of variation margin calls on IRSs. The new Pillar 2 provisions would be consistent with policy options set out in ESRB (2020), which considers whether financial institutions that use derivatives should be required to hold a cash buffer to meet variation margin calls.

Horizontal tools addressing risks stemming from the direct and indirect provision of credit to the economy

Capital-based tools targeting (sub-)sectoral exposures would complement the treatment of credit risk under Solvency II and correct inconsistencies between the insurance and banking frameworks. Solvency II has two main flaws in the way it treats credit risk stemming from bonds and loans. The first is that the capital requirement for certain categories of residential mortgage loans is zero. In particular, residential mortgage loans treated under the counterparty default risk module and where the risk-adjusted value of the collateral covers more than 80% of the loan do not generate any capital requirements in the insurance sector. In contrast, the minimum capital requirement for the same loan made by a bank might be between 8% and 25% of risk-weighted assets. This may lead to the transfer of such loans from the balance sheets of banks to the balance sheets of (re)insurers. The second flaw is that there is no capital requirement for the concentration of exposures in specific sectors or sub-sectors. This means that authorities have few possibilities to increase the capacity of (re)insurers to absorb unexpected losses if they detect (the build-up of) a systemic risk stemming from a specific (sub-)sector.

For residential mortgage loans, this report suggests setting an LGD floor that could be modified by authorities for financial stability reasons. Setting an LGD floor would first correct the inconsistency in the microprudential capital requirements between the insurance and banking frameworks. The value of this floor should be calibrated so that it meets the requirements of the SCR standard formula. In addition, the competent authorities should be given the power to increase this floor in order to mitigate systemic risks stemming from the residential real estate sector.

For other loans and for corporate bonds, authorities should have the power to impose a (sub-)sectoral systemic risk buffer. This buffer would be included within the market risk module of the standard formula, ensuring that the risk-bearing capacity of (re)insurers is taken into account by applying diversification benefits and loss-absorbing capacities. It would allow authorities to mitigate systemic risk stemming from residential or commercial real estate and from exposures to certain legal entities belonging to the same (sub-)sector. The calibration of such a tool could be based on the calibration of the market risk concentration sub-module, which targets excessive concentration in the same group.

(Re)insurers should be included in the scope of national borrower-based measures. Where (re)insurers are authorised to originate loans to households, such as residential mortgage loans, they should be subject to national borrower-based measures to ensure consistency in the treatment of the credit risk of the borrower.

Solvency II should require (re)insurers engaging materially in the provision of residential mortgage loans to report the characteristics of such loans, and authorities should be given the power to impose the public disclosure of certain exposures. At present, few data are reported in the Solvency II quantitative reporting templates on residential mortgage loans held by (re)insurers. Additional reporting, either qualitative (via the Solvency and Financial Condition Report, for example) or quantitative (if deemed appropriate by authorities), would allow supervisors to monitor and assess the quality of the residential mortgage loan portfolio held by (re)insurers where they engage materially in this activity. In addition, the power for authorities to impose the public disclosure of certain exposures would reinforce the market discipline required in view of excessive risk taking, exposure to systemic risk or because of involvement in certain activities. For example, the Solvency and Financial Condition Report could be completed in a consistent way across Europe to incorporate information on certain exposures.

Annexes

Annex 1: Symmetric adjustments to the SCR for spread risk – corridor approach

An alternative approach, in addition to that suggested in the main text, is to consider a "corridor" symmetric adjustment that is activated if the spread level exceeds a certain threshold. Otherwise, the symmetric adjustment remains zero. This approach has the following economic interpretation. The credit spread can be split into a rational and an irrational component. The rational spread component is the difference between the current spread level and the specified threshold. The threshold specifies a given distance of the spread level from its average. Once this distance becomes too large, i.e. the threshold is breached, the part of the credit spread exceeding the threshold is considered the irrational credit spread component. The essential idea of this approach is that the symmetric adjustment coincides exactly with the irrational credit spread component.

The symmetric adjustment is calculated as follows:

$$\mathrm{SA_t} = \begin{cases} \max(s_t - (\bar{s} + k\sigma),\ 0)\,, & if \quad s_t > \bar{s} \\ -\max((\bar{s} - k\sigma) - s_t, 0) & else\,, \end{cases} \tag{1}$$

$\bar{s}$ denotes the constant average-spread, σ denotes the constant standard deviation of the spread level and k denotes the calibration parameter.

Unlike the symmetric adjustment proposed in the main text, the corridor symmetric adjustment may result in certain cliff effects, since the adjustment is only activated if the specified thresholds are breached. This also raises issues related to the most appropriate speed of (de)activation. From the equation above one can observe that, in "normal times", with credit spread movements close to the average, no symmetric adjustment applies. In times of a "crisis" with exploding credit spreads (the upper line in the equation above), the irrational spread is positive and thus the stress factor for spread risk decreases. In times of too low credit spreads, a negative irrational spread leads to an increase in the stress factor for spread risk.

The corridor symmetric adjustment is illustrated in the charts below. The calculation was performed with the same dataset as in the main text. The calibration parameter *k* was set to one. The same finding can be observed as in the main text that in periods of substantially widening credit spreads, such as during financial crises, the symmetric adjustment has the highest values and would reduce the spread risk charge by up to 1%. Some minor cliff effects can be observed in the charts. In addition, it can be seen that the symmetric adjustment would mainly be zero during periods of lower credit spreads, since such periods have not been observed in the data. This differs from the proposal made in the main text.

Chart A.1

Symmetric adjustments

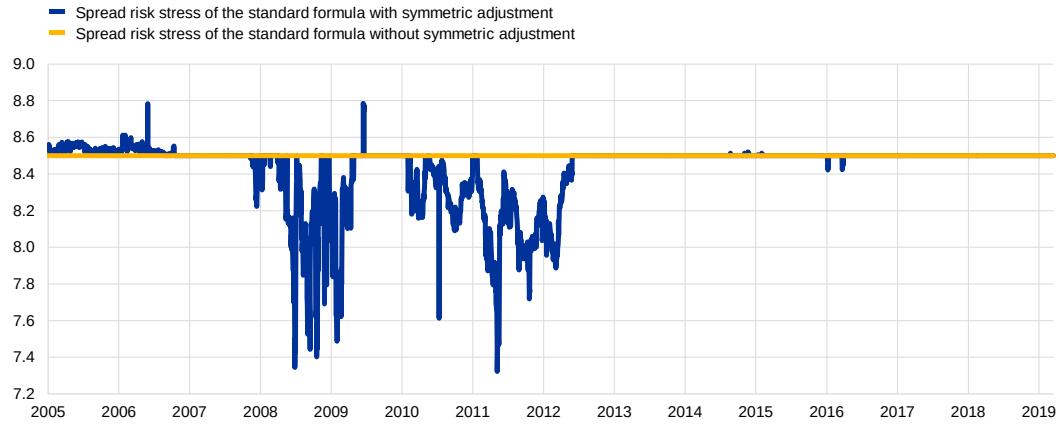
(in basis points)

Source: ESRB calculations.
Note: the chart shows the "corridor" symmetric adjustment with k=1.

Chart A.2

Spread risk stress

(in percentages)



Source: ESRB calculations.
Notes: The blue line displays the corresponding spread risk stress with the symmetric adjustment according to equation (1). The yellow line displays the constant standard formula stress factor for a ten-year, AA-rated corporate bond, which is 8.5% according to Article 176(3) of Commission Delegated Regulation 2015/35.

Annex 2: Templates liquidity reporting in Belgium

Table A.1

Cash outflows in life insurance (excluding health and unit-linked contracts)

(in EUR)

Claims incurred (net)	
Changes in technical provisions (net)	
Benefits paid (net)	
Benefits paid - surrenders	
Benefits paid - other	

Table A.2

Surrenders in life insurance (excluding health and unit-linked contracts)

Products		Surrender value
Life technical provisions – individual contracts	Traditional life products and savings products with a fiscal incentive on premiums	
	- With fiscal penalty in the event of surrender	
	- Without fiscal penalty in the event of surrender	
	Traditional life products and savings products without a fiscal incentive on premiums	
	- Adjustment to market value (AMV) applicable	
	- No AMV applicable, with a contractual penalty in case of surrender	
	- No AMV applicable, without a contractual penalty in the event of surrender, but with a loss of exemption from withholding tax	
	- No penalty applicable	
	Life insurance in case of death	
	Other contracts	
Life technical provisions – group contracts	Contracts without a premium	
	Active contracts (= premiums to be paid)	
	Other contracts	

Annex 3: Cash flow assumptions for the liquidity indicator

This annex sets out how the liquidity indicator could take account of additional cash flows.

Cash outflows

Other insurance obligations

The cash outflows of insurance obligations that are not redeemable should be those of the best estimate. If a time horizon of one year is chosen, one can assume that stressed cash outflows for insurance obligations are not redeemable. Over a 30-day time horizon, the outflows (expense outflows, outflows due to disability, morbidity or mortality risk factors, annuity servicing outflows, etc.) can be assumed to remain those of the best estimate.

Reinsurance obligations, reinsurance payables and deposits from reinsurers

Where the insurer has accepted reinsurance, the cedant may require additional collateral due to the downgrade of the insurer, which can affect the latter's liquidity position. Although Solvency II does not require collateral arrangements for reinsurance treaties, it may be the case that a specific treaty provides for such collateral. Pooling arrangements could also require additional collateral due to the downgrade of the insurer. These additional collateral requirements should be taken into account in the cash outflows.

All reinsurance payables that fall due in the next 30 days should be included in the cash outflows. Although reinsurance is less frequent and material in life business than in non-life business, many insurers still conclude reinsurance treaties. The amounts payable over the next 30 days as stipulated in the reinsurance treaty should be included in the cash outflows.

The insurer should assess whether deposits from reinsurers would be affected by the downgrade and the specific liquidity situation, and should not assume that additional deposits will be made by reinsurers. Reinsurance treaties may include arrangements for the reinsurer to deposit assets, usually cash, so that the insurer can pay future claims. These arrangements may be affected by the downgrade of the insurer, any negative consequences of which should be taken into account. Over the 30-day stress period, the insurer should not assume that additional deposits will be made by reinsurers. If these deposits are callable by the reinsurer, the insurer should assume that they will be called in full within the next 30 days.

Contingent liabilities and provisions other than technical provisions

Where it is probable that outflows would occur due to contingent liabilities or due to provisions other than technical provisions in the next 30 days, insurers should assume that these outflows will take place. "Probable" should be understood as having a probability greater than 50%.

Debts owed to credit institutions and other financial liabilities (including subordinated liabilities)

Insurers should fully take account of all payments related to debts owed to credit institutions and to other financial liabilities due within the next 30 days. Where these debts are callable, the insurer should assume 100% outflows. In particular, where the lender is a financial institution or a legal entity, insurers should assume that options will be called.

Off-balance sheet items

Insurers should assess whether they would need to pledge additional collateral due to the assumed downgrade. Assuming that insurers will be downgraded by two notches, the counterparty may require additional collateral against loans or bonds, for example. Insurers should assume this is the case and that they will need to pledge further HQLA.

A stress assumption can be applied to guarantees, including letters of credit, in particular if these are intragroup guarantees. It may well be the case, as for Ethias, that a loss of confidence will affect not just one but several entities of the same group. If guarantees have been provided, the insurer would need to meet its obligations – in particular in the case of guarantees provided outside of the group the insurer belongs to.

Insurance, intermediaries and other payables (trade, not insurance)

Insurers should fully take account of all payments related to payables due within the next 30 days.

Pension benefit obligations

All pension obligations to be paid in the next 30 days should be included in the insurer's calculation.

Cash inflows

Reinsurance recoverables

Unless the reinsurance treaty requires the reinsurer to provide cash within 30 days for recoverables, insurers should not assume any inflows from their reinsurance recoverables. If a reinsurance treaty is in place, the payment of insurance obligations may lead to an increase in reinsurance recoverables on the balance sheet. However, it may take more than 30 days for the reinsurer to settle the recoverables. It is therefore assumed that the reinsurance recoverables cannot increase the inflows, unless a specific provision in the reinsurance treaty specifies the quick settlement of recoverables.

Deposits to cedants

There should be no inflows corresponding to deposits to cedants. This report assumes that deposits will be used by cedants and therefore no reimbursement to insurers will take place.

Insurance and intermediaries receivables, reinsurance receiveables and other receiveables

Payments due in the next 30 days can be assumed to be received, unless they have been due for three months or more, in which case no inflows should be taken into account. As with the Solvency II standard formula, it is assumed that receivables that have been due for three months or more are likely not to be paid. Payments for other receivables due in the next 30 days can contribute to inflows.

Loans on policies, loans and mortgages to individuals, other loans and mortgages

Only payments due in the next 30 days can be assumed to be received.

Off-balance-sheet items

Letters of credit and guarantees from other entities belonging to the same group should only contribute to inflows if the group has the operational capacity to settle these obligations within 30 days. A haircut of 50% should be applied. Group support can play an important role in a stressed liquidity situation. However, if one entity of a group is in distress, it is likely that policyholders and other investors will lose confidence in all entities of the group. Therefore, group support should be capped at 50%.

A comprehensive stress test exercise should also provide assumptions for other items on or off the balance sheet. For example, letters of credit and guarantees provided by an entity that does not belong to the same group as the insurer may be accounted for or not, depending on the global stress scenario. Other items such as amounts due in respect of own funds items, unpaid and uncalled ordinary share capital, initial funds or preference shares callable on demand, legally binding commitments to subscribe and pay for subordinated liabilities on demand, supplementary member calls or call options on bonds and on structured products may be modelled.

Annex 4: Detailed comparison of residential mortgage loans according to framework

	Banking framework	Insurance framework
Valuation	Mortgage lending value means "the value of immovable property as determined by a prudent assessment of the future marketability of the property taking into account long-term sustainable aspects of the property, the normal and local market conditions, the current use and alternative appropriate uses of the property". (Article 4(74) CRR) "Unless noted otherwise, the exposure value of on-balance-sheet exposures shall be the accounting value measured without taking into account any credit risk adjustments made." (Article 166(1) CRR)	Residential mortgage loans must be valued at market value where available, or at fair value (IFRS13) where there is not market value available. IFRS13 defines fair value as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.
Underwriting standards and risk management	LTV ratio LTI ratio DTI ratio DSTI ratio	LTV ratio (implicitly covered when determining the LGD) LTI ratio
Microprudential capital requirements	Risk-weighted exposure amounts. The application of risk weights shall be based on the exposure class to which the exposure is assigned and its credit quality. Risk weights for mortgages under the standardized approach: - 35% for mortgages fully and completely secured by mortgages on residential property. - Unless otherwise determined under Article 124(2), the part of the loan to which the 35% risk weight is assigned should not exceed 80% of the market value of the property in question.	Residential mortgage loans that meet the requirements in Articles 191(2) to (13) are considered as Type 2 exposures which fall within the scope of the counterparty default risk module. The LGD is defined as: $LGD = max(Loan - 80\% \cdot Mortgage; 0)$ Where "*Mortgage*" denotes the risk-adjusted value of the mortgage.

Annex 5: Detailed comparison of other bonds and loans according to framework

	Banking framework	Insurance framework
Valuation	CRR Article 111 – Exposure value The exposure value of an asset item shall be its accounting value remaining after specific credit risk adjustments, additional value adjustments and other own funds reductions related to the asset item have been applied.	Fair value measurement
Underwriting standards and risk management	CRD IV – Article 79 Credit and counterparty risk Competent authorities shall ensure that: - credit-granting is based on sound and well-defined criteria and that the process for approving, amending, renewing and re-financing credits is clearly established; - institutions have internal methodologies that enable them to assess the credit risk of exposures to individual obligors, securities or securitisation positions and credit risk at the portfolio level. In particular, internal methodologies shall not rely solely or mechanistically on external credit ratings. - the ongoing administration and monitoring of the various credit risk-bearing portfolios and exposures of institutions, including for identifying and managing problem credits and for making adequate value adjustments and provisions, is operated through effective systems; - diversification of credit portfolios is adequate given an institution's target markets and overall credit strategy.	Art 261 of Commission Delegated Regulation 2015/35: specific provisions when (re)insurers provide loans. - Credit-granting should rely on well-defined criteria. - Internal methodologies should enable (re)insurers to assess the credit risk of the exposure. - Effective systems should be in place to administer and monitor the loans (in particular problematic loans which could result in value adjustments). - There should be adequate diversification.
Microprudential capital requirements	Exposures are split according to "exposure class" (Annex 1); equity exposures, derivatives and off-balance-sheet items are subject to specific criteria. As such, bonds and loans are subject to the same treatment. The capital requirement associated with each exposure will depend on the risk-weighted exposure amount. CRR Article 113 - To calculate risk-weighted exposure amounts, risk weights shall be applied to all exposures, unless deducted from own funds (…). - The application of risk weights shall be based on the exposure class to which the exposure is assigned and (…) its credit quality. - Credit quality may be determined by reference to the credit assessments of External Credit Assessment Institutions (ECAIs) or the credit assessments of Export Credit Agencies (…); - Where an exposure is subject to credit protection the risk weight applicable to that item may be amended (…) - Risk-weighted exposure amounts for securitised exposures shall be calculated in accordance with	Bonds and loans are treated in the same way via the spread risk sub-module (Article 176 of Commission Delegated Regulation 2015/35) - The capital requirements depend on the CQS and on the modified duration. These two parameters define a stress which, when applied to loans, changes their value. The change in their value corresponds to the capital requirements. - The CQS has to be provided by a nominated ECAI. If that is not the case, one should determine whether collateral was posted. - With collateral, one needs to calculate a "risk-adjusted value", which is included in the calculation. - Without collateral, the treatment is intermediate to that of CQS 3 and 4, unless the (re)insurer carries out an internal assessment, which can lead, under certain conditions, to applying CQS 2 or 3. These conditions apply to 1) risk management, 2) the financial situation of the company (total debt, EBITDA), and 3)

	Chapter 5. - Exposures for which no calculation is provided in Section 2 shall be assigned a risk weight of 100%. CRR Article 136 - Mapping of ECAIs' credit assessments: mandate for the development of draft implementing technical standards attributed to the EBA, EIOPA and ESMA, through the Joint Committee ["to specify for all ECAIs, with which of the credit quality steps (…) the relevant credit assessments of the ECAI correspond ('mapping'). Those determinations shall be objective and consistent."]	the yield of the loan. The assessment can also be outsourced to banks/insurers using an internal model Infrastructure - Loans to "qualifying infrastructure assets" (infrastructure projects) and "infrastructure corporates" can benefit from a lower capital requirement if they meet certain conditions. - The parameters for the calculation of the capital requirements do not change (CQS and modified duration).

Annex 6: Overview of macroprudential tools in the banking framework

Overview of macroprudential tools in the banking framework (CRD-CRR)

Description of banking tool	Relevance for insurance sector
Capital conservation buffer (CCB) The CCB was introduced as part of the Basel III agreement and subsequently incorporated into the EU banking regulatory framework. At present, after a phasing-in period, the CCB is a flat CET1 buffer requirement that corresponds to 2.5% of the institution's total risk exposure amount. It applies to all authorised credit institutions and investment firms and is also time-invariant. However, higher rates can be applied if an authority makes use of the national measures in Article 458 CRR, which are detailed below. The CCB requirement was introduced with the aim of increasing an institution's ability to withstand losses without breaching the mandatory capital requirements, which is a common feature of all macroprudential capital buffers. Hence, if an institution needs to absorb an unexpected amount of losses it can use part or the totality of the buffer, as it does not constitute a Pillar 1 mandatory requisite.	**Not relevant** Under Solvency II, there are already two layers of capital that can play a similar role: SCR and the minimum capital requirement (MCR). The SCR and the MCR represent different intervention points for the supervisory authority. A (re)insurer breaching its SCR could still maintain its licence and continue underwriting contracts. The SCR absorbs unexpected losses not covered by the technical provisions (which cover expected payments). Consequently, it does not appear to be necessary to introduce a CCB in the insurance framework.
National flexibility measure (Article 458 CRR): increase in the capital conservation buffer The CCB may be increased above the level established in the CRD, i.e. a CET1 ratio of 2.5% of total risk exposure. When preparing a macroprudential measure under Article 458, the national authority must demonstrate that the intensity of the systemic risk to be addressed is increasing and may pose a danger to financial stability in the concerned Member State. It must also show that other macroprudential measures established in the regulatory framework cannot address these risks as proportionately, effectively and efficiently as the national flexibility measures in Article 458 CRR. The report prepared by the national authority is then subject to the opinion of both the EBA and the ESRB, supporting the European Commission decision, which subsequently recommends whether the European Council should issue a rejection act of the proposed measure.	**May be relevant but not necessarily linked to credit risk** In the insurance sector, it could be beneficial for supervisors to be able to set a capital add-on to the SCR for macroprudential reasons. Such an add-on would increase (re)insurers' ability to withstand losses without breaching the mandatory capital requirements. In certain cases, where supervisors assess that there is an increased systemic risk, or where they believe that the SCR does not sufficiently capture the systemic riskiness or particularities of the situation, they could set up a capital add-on to absorb the potential materialisation of systemic risk. See also the report on macroprudential provisions, measures and instruments for insurance (ESRB, 2018) for further details. However, this macroprudential tool is not linked to a bank-like activity; this report therefore does not further elaborate on how it could be included in the insurance framework.
Buffers for systemically important institutions (G-SIIs/O-SIIs) In order to compensate for the higher risk that systemically important institutions pose to the financial system, the macroprudential authority can impose higher capital requirements on global systemically important institutions (G-SIIs) and other systemically important institutions (O-SIIs). Also, given their importance to the financial system, globally or at country level, these institutions have benefited from implicit subsidies that translated, inter alia, into lower financing costs. The systemic importance of an institution is assessed on the basis of its size, importance for the economy, complexity or degree of interconnection with other financial sector institutions and, in the event of insolvency, the potential contagion of these institutions to the rest of the non-financial and financial sectors. The G-SIIs/O-SIIs capital buffer must be build-up of CET1 and be applied on The G-SII/O-SII capital buffer must be built up from CET1 and be applied on	**Relevant but not linked to credit risk** In insurance, such a concept could be transposed into Solvency II for insurance groups that are deemed systematically important at global, EU or national level. In this case, the concept should be in line with the respective IAIS and EIOPA developments. As for banking groups, the purpose of such a buffer would be to ensure a higher loss absorbency capacity for insurance groups deemed systemically important. The same criteria as in the banking framework could be considered: size of the group, importance for the economy, complexity, degree of interconnection with other financial institutions

a consolidated basis. It should be revised annually or if a significant restructuring process occurs, such as a merger or acquisition. The G-SII buffer is set between 0% and 3.5% of the total risk exposure amount, and the list of G-SIIs is disseminated by the Financial Stability Board each year. The O-SIIs are identified at the level of the Member State, and the buffer is set between 0% and 3% of the institution's total risk exposure amount or at a higher level, given the authorisation of the European Commission. At present, an additional requirement applies solely to institutions identified as G-SIIs. Following the introduction of a minimum leverage ratio of 3% and to keep in line with Basel developments, the revised legislative package provides for an accompanying CET1 buffer, which corresponds to 50% of the G-SII risk-based buffer requirement. The requirements are parallel, meaning both can be fulfilled with the same quantum of capital, but the G-SII buffer can only be constituted by CET1 and the leverage buffer can be partly constituted by instruments that qualify as additional Tier 1 equity.	or potential contagion to the rest of the non-financial and financial sectors in the event of failure. See also the report on macroprudential provisions, measures and instruments for insurance (ESRB, 2018) for further details. However, this macroprudential tool is not linked to a bank-like activity; this report therefore does not further elaborate on how it could be included in the insurance framework.
Countercyclical capital buffer (CCyB) The CCyB, the main purpose of which is to mitigate cyclical systemic risk, is also part of the reforms included in Basel III and has subsequently been incorporated into the EU banking regulatory framework. Given that systemic risk tends to accumulate during the upward part of the financial cycle and materialise in its downward phase, the accumulation of capital during the former would increase resilience and the release of the buffer during the latter would allow banks to absorb losses without sharply deleveraging and reducing credit flows, thus decreasing negative consequences for the real economy. Hence, the CCyB requirement is meant to be time-variant in order to counter some of the pro-cyclicality in the financial system. Additionally, as a positive side effect, the introduction of a positive CCyB requirement or its increase during expansions may curb credit growth, thus leaning against the wind. The calibration of the requirement by the macroprudential authority is a function of both quantitative indicators and expert judgement. Quantitative indicators have been selected based on their predictive capacity in terms of the accumulation of cyclical systemic risk prior to the occurrence of systemic banking crises. The Basel gap is the international reference indicator, which has been defined as the deviation between the observed credit-to-GDP ratio and its long-term average. The ESRB handbook on operationalising macroprudential policy in the banking sector further develops this issue in the context of the EU, analysing other early warning indicators and establishing a common operational framework. The CCyB is a CET1 buffer requirement for domestic exposures; as such, there will be an institution-specific CCyB requirement, which is dependent of the balance sheet composition. The requirement for national exposures is set between 0% and 2.5%, but can be set higher when system-wide risks associated with excessive credit growth or other cyclical systemic risks are judged to be high. Mandatory reciprocity (up to 2.5%) ensures that the CCyB applies to all exposures in a certain jurisdiction, irrespective of the country of origin of the creditor. This contributes to a level playing field between domestic and foreign banks.	**Not relevant** Introducing an equivalent to the CCyB in the insurance framework would be difficult given its purpose and the way it is applied on balance sheets. (Re)insurers can invest in a procyclical manner (see Section 1), however their balance sheets do not have the elasticity of credit institutions' balance sheets. In other words, even in the upward phase of the financial cycle, (re)insurers are not able to originate more loans than the written premiums they receive. Furthermore, the CCyB applies to banks' entire balance sheets, whereas for (re)insurers countercyclical tools should target the exposure to specific asset classes. For example, the symmetric adjustment for equity risk is limited to equities and the volatility adjustment is limited to fixed income portfolios. An approach linked to specific asset classes (exposure-based) and targeting the potential procyclicality of (re)insurers as asset managers appears to make more sense than a CCyB.
National flexibility measure (Article 458 CRR): increase of own funds requirements Own funds requirements may be increased above the minimum levels laid down in Article 92 CRR. With the implementation of CRR II, this encompasses both the different risk-based capital requirements and the leverage-based requirements. For example, the CET1 capital ratio, which is the CET1 capital of the institution expressed as a percentage of the total risk exposure amount, could be increased to a higher level than 4.5%.	**May be relevant but there are sector specificities in the way own funds are defined** In insurance, Solvency II defines eligibility limits to the three tiers of own funds. The limits are (i) half of the SCR needs to be covered by Tier 1 items, (ii) Tier 3 items cannot represent more than 15% of the SCR, (iii) and the sum of Tier 2 and Tier 3 items cannot exceed 50% of the SCR. Moreover, Tier 1 items should account for at least 80% of the MCR, and Tier 2 items should account for at most 20% of the MCR. Within Tier 1, several items constitute what is

	referred to as “restricted Tier 1”, i.e. certain items cannot represent more than 20% of the total amount of Tier 1 items.
Systemic risk buffer (SRB) The SRB is specific to the European banking regulatory framework. It is a CET1 buffer that can be used to mitigate systemic risks not targeted either by the G-SII/O-SII buffer or the CCyB. In the revised macroprudential framework, the flexibility inherent in this instrument has been enhanced and the buffer may now be applied to all or a subset of institutions, to all exposures or domestic exposures only, or to a predefined set or subset of domestic exposures or sub-sectors. As such, systemic risks stemming from a particular sub-sector may be mitigated through targeted measures.	**Relevant** Introducing an SRB in the insurance regulatory framework would allow increases in systemic risks of specific exposures or (sub-)sectors to be targeted. Solvency II and the SCR standard formula provide for capital requirements whenever an (re)insurer has an excess exposure towards corporates belonging to the same group (via the concept of “single name exposure”). The capital requirement for this risk is calculated via the market concentration risk sub-module, which assumes that the geographical and the sector concentration of the assets held by (re)insurers are not material (see Recital 62 of Commission Delegated Regulation 2015/35). This module defines thresholds, above which the excess exposure triggers a capital requirement. However, the calibration of these thresholds does not take account of the situation in which a single name exposure creates or contributes to systemic risk. A tool allowing additional capital to be raised in cases where a specific exposure or sector creates systemic risk would therefore complete the Solvency II standard formula.
The combined buffer requirement In addition to the MCRs, commonly named Pillar 1 requirements, each institution has to comply with the combined buffer requirement, which has been defined has the sum of (i) the CCB, (ii) the higher of the applicable G-SII/O-SII buffer rate, (iii) the institution-specific CCyB, and (iv) the systemic risk buffer converted into a rate applicable to the total risk exposure amount. All macroprudential buffers shall be constituted by CET1 capital. If an institution no longer fulfils the combined buffer requirement, it shall propose a capital conservation plan to the competent authority that is expected to ultimately restore the appropriate capital levels. This plan must include restrictions on payments that reduce the institution’s own funds, including dividends, remuneration of contingent debt instruments and share repurchases.	**Not relevant** Article 138 of Solvency II sets out the process to be followed in the event of non-compliance with the SCR, including the requirements for (re)insurers to submit a realistic recovery plan to the supervisory authority.
Tightening of capital requirements for mortgage loans (Articles 124 and 164 CRR) Supervisory authorities can increase the capital requirements for mortgage loans computed via the standardised approach. Article 124 CRR applies to institutions that use the standardised approach to compute MCRs for loans guaranteed by immovable property. It establishes the conditions under which the minimum risk weights for residential and commercial property may be applied. It also stipulates that such minimum risk weights can be increased or the conditions for applying such weights restricted. The use of this instrument by the supervisory authority may be informed by past loss experience or forward-looking developments in the real estate market, but may also be substantiated solely on the basis of financial stability concerns. In the same manner, supervisory authorities can increase the LGD value used to compute the capital requirements for mortgage loans via the internal ratings-based approach. Article 164 CRR applies to institutions opting for the internal ratings-based approach when calculating capital requirements for exposures secured by residential or commercial immovable property, and defines the minimum average LGD values that should be applied. The same article also stipulates that the supervisory authority shall periodically assess whether the minimum LGD is still appropriate; if not, the authority can	**Relevant** Insurers are exposed to the same borrower risk as banks. If the borrower of the mortgage loan is (partly) defaults, both banks and (re)insurers would face a loss. This gross loss would be the same due to the fact that it stems from the borrower, i.e. the LGD would be the same. However, the net loss, taking account of the specificity of each balance sheet, could differ due to diversification benefits and specific loss-absorbing capacities. There should be a tool allowing for the tightening of capital requirements for mortgage loans in the insurance sector.

increase the minimum LGD given forward-looking property market developments or on the basis of financial stability considerations. The measures specified in Articles 124 and 164 apply to exposures guaranteed by property located in a defined Member State and to all institutions authorised in the jurisdiction. In addition, their reciprocation by other countries' authorities is mandatory, which enhances their efficiency. Furthermore, the new banking regulatory framework clarifies that the authority responsible for activating these measures may set out different requirements for the various geographical areas in a jurisdiction, which in particular enhances its ability to target real estate price bubbles in specific locations. The tightening of capital requirements for mortgage loans will increase capital requirements by increasing institutions' total risk exposure amounts. As such, these requirements will have an impact on all prudential requisites, including the remit of the resolution framework, and constitute a mandatory Pillar 1 requirement. Moreover, capital adequacy ratios will initially decrease, which may have a negative impact on the way the institutions are perceived by the market, emphasising the need for the effective communication of the measure. Finally, a measure with these characteristics also makes comparison between institutions from different countries difficult.	
National flexibility measure (Article 458 CRR): tightening the limits on large single-exposure Measures concerning large exposure requirements may include tightening the limits on single-exposure concentrations or the less stringent limits that trigger intensive supervision and monitoring. Alternatively, existing exemptions for certain sets of exposures may be removed.	**May be relevant** However, the prudent person principle and the SCR for market risk concentration already increase the resilience of (re)insurers. It may be relevant in the event of systemic risk concerns not captured by the prudent person principle or SCR.
National flexibility measure (Article 458 CRR): public disclosure at a more granular level The purpose of using such a tool is to reinforce market discipline in view of excessive risk taking, of exposure to systemic risk or because of involvement in certain activities.	**May be relevant**
National flexibility measure (Article 458 CRR): reducing contagion effects via intra-financial sector exposures The CRR stipulates that significant investments in a financial sector entity should be deducted from own funds – for example, Article 43 provides a limit of 10%, above which the holdings should be deducted from CET1. Article 458 provides that authorities may tighten these limits in certain situations.	**Relevant**
National flexibility measure (Article 458 CRR): liquidity tools Measures targeting liquidity-related systemic risks allow authorities to adapt liquidity requirements to the particular situation of certain banks. The banking framework provides for qualitative and quantitative liquidity requirements – for example, the LCR or the net stable funding ratio.	**May be relevant for certain activities and/or exposures** See section on liquidity tools.

Annex 7: Overview of types of borrower-based measures

Loan-to-value (LTV) limit

The LTV ratio is the ratio between the value of a loan and the value of the underlying collateral (real estate). National authorities could place a limit on this ratio at the time of loan origination. Introducing an LTV limit could affect the credit cycle by restricting the borrower's share of debt financing using real estate as collateral. It also reduces a bank's potential loss in the event of borrower default, i.e. the bank's LGD will be lower. Different LTV limits may be applied to different types of real estate exposure and/or borrower by the same Member State. For example, the LTV limit for first-time home buyers may differ from borrowers purchasing the property as a buy-to-let or second home. In some jurisdictions, LTV limits may differ by region or city. Typically, the LTV limit is applied to residential real estate; however, it could be applied to commercial real estate exposures as well. In certain cases, this measure may be supplemented by other borrower-based measures, such as LTI or DTI limits, to address procyclicality.

Loan-to-income (LTI) limit

The LTI ratio is the ratio between the value of the borrower's loan or set of loans and the borrower's disposable income (typically annual income). In order to restrict the amount of real estate loans available to borrowers, an LTI limit may be introduced with the aim of increasing the resilience of both borrowers and banks by lowering the probability of borrower default. If the LTI ratio is calculated by taking into account not only real estate loans (mortgages) but also other (unsecured) consumer loans, an LTI limit may restrict borrowers' overall indebtedness. LTI and DSTI limits reduce the probability that the borrower will default. The LTI limit is a more intrusive measure than capital-based tools as it directly restricts available lending.

Debt-service-to-income (DSTI) limit

The DSTI ratio or payment-to-income ratio is the ratio between the amount of current payments in relation to debt servicing and the monthly (or annual) income of the borrower. Placing a limit on this ratio is designed to cap the proportion of the borrower's income dedicated to debt servicing, usually calculated as a percentage of the borrower's net monthly (or annual) income. As with the LTI limit above, the main objective of this measure is to affect the credit cycle by restricting the real estate loans available to borrowers and increase the resilience of banks and borrowers. It is intended to act as an automatic stabiliser in the sense that it becomes more binding during a credit boom, when real estate prices grow quicker than borrowers' income.

Debt-to-income (DTI) limit

Certain Member States have implemented DTI limits. The DTI ratio is calculated as the ratio between mortgage debt (or total debt) and, in most cases, annual income (either net or gross). As with the LTI limit, a DTI limit is intended to limit the loans available to borrowers and therefore improve the resilience of borrowers and subsequently of banks.

Loan maturity limit

In certain jurisdictions, limits are placed on the maximum duration of loans. They typically limit the length of the credit agreement and are set at the time of loan origination. Maturity limits are normally applied to mortgage loans and other consumer loans. Loan maturity limits may vary across categories of borrowers in the same jurisdiction.

Loan amortisation measures

In order to manage credit growth and leverage, certain Member States have introduced loan amortisation measures, primarily focusing on residential real estate loans. Amortisation requirements are typically tied to other borrower-based measures such as LTV or DTI/LTI limits.

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