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A REVIEW OF THE DESIGN OF THE SOLVENCY II RISK MARGIN

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The authors[1] are members of the Actuarial Association of Europe[2] (AAE) Solvency II Working Group who have been reviewing the risk margin in conjunction with the planned 2020 Solvency II Review by the EU Commission and EIOPA. The views expressed in this paper are those of the authors and may not align with those of the AAE or with their employers.

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2 The Actuarial Association of Europe (AAE) was established in 1978 under the name Groupe Consultatif to represent actuarial associations in Europe. Its purpose is to provide advice and opinions to the various organisations of the European Union – the Commission, the Council of Ministers, the European Parliament, EIOPA and their various committees – on actuarial issues in European legislation. The AAE currently has 36 member associations in 35 European countries, representing over 25,000 actuaries. Advice and comments provided by the AAE on behalf of the European actuarial profession are totally independent of industry interests.

SUMMARY

In this paper we review the current design of the Solvency II risk margin. The current aim of the risk margin is to provide a quantification of the hypothetical cost a third party would expect to charge (in addition to the Solvency II '*best estimate liability*') to take on a book of insurance liabilities. We make suggestions that respect this principle but address some perceived weaknesses in the existing design, including proposing a cost of capital that attenuates, i.e. declines through time from the valuation date, or equivalently including in some elements of the risk margin calculation a discount rate that is above the risk-free rate, if risk dependencies over time are material. We also explore assumptions that would be most appropriate for the reference undertaking assumed to be taking on the relevant liabilities.
The modifications we propose should help to make the end calculation more robust and stable for individual firms, whilst retaining an appropriate level of responsiveness to capital needs and an underlying structure that is actuarially sound.

Issues explored in the paper include: (a) the overall impact and sensitivity of the risk margin to changes in economic conditions, (b) the interaction between the Solvency II risk margin and the margin over current estimate in the IAIS global Insurance Capital Standard or the risk adjustment in IFRS 17, (c) the risks to include in the risk margin calculation, (d) the discount rate and cost of capital rate to use in the risk margin calculation, (e) multi-year dependencies and (f) the treatment of tax.

Note: The AAE is proposing to develop a further paper expanding on the contents of certain sections of this paper, including its Appendix C ('*An actuarially sound formula for the Risk Margin in a Solvency II Setting*')

CONTENTS

1. INTRODUCTION

1.1 On 11 February 2019, the EU Commission requested advice from EIOPA for the 2020 Solvency II Review.[3] The request included the following in relation to the Solvency II risk margin:

"EIOPA is asked to assess the appropriateness of the design of the risk margin, without challenging the approach based on the cost-of-capital. In particular, EIOPA should assess the ongoing appropriateness of:

- *the design of the risk margin, in light of the work currently undertaken by EIOPA on the transfer value of liabilities, in the context of the Commission's Call for information[4];*
- *the assumptions regarding the asset mix of the receiving undertaking, in particular with regard to the assumption of risk-free investments. This assessment should take into account the potential interactions between the recognition of market risk and the use of the volatility adjustment and the matching adjustment in the risk margin calculation;*
- *the use of a fixed cost-of-capital rate for all insurance and reinsurance undertakings;*
- *the assumptions used to derive the cost of capital rate, including the absence of leverage and the derivation of the equity risk premium"*

1.2 EIOPA has prepared draft opinions on topics in scope of the Solvency II 2020 Review. Most of EIOPA's draft Opinion, including its views on the risk margin, are included in EIOPA (2019), a consultation paper that is currently open for comments. EIOPA is currently proposing that no change is made to the Solvency II risk margin methodology.

1.3 Our desire with this paper is to present a review of the risk margin that is more comprehensive than that contained in EIOPA (2019) to further debate concerning this important element of Solvency II. We have therefore not limited ourselves just to topics considered by EIOPA within EIOPA (2019).

1.4 The rest of the paper is structured as follows. In Section 2 we set the scene by commenting on the general theory underlying a cost of capital approach. In Section 3 we summarise our understanding of the main areas of contention in the current debate, which we try to group under some summary headings. Sections 4 to 9 then analyse and offer thoughts on each group of issues in turn, whilst Section 10 considers in more detail how the risk margin might best interact with the Long

3 i.e. https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/190211-request-eiopa-technical-advice-review-solvency-2.pdf

4 i.e. https://eiopa.europa.eu/Publications/Requests%20for%20advice/Request%20for%20information%202018-04-25.pdf

Term Guarantee ('LTG') measures also included in Solvency II. At the end of each Section is a short summary of the main findings of that Section. Appendix A highlights interactions and tensions between the current design of the risk margin and the underlying market consistency principles on which the Solvency II Directive is based. Appendix B explores the risks that an insurer faces according to the current design of the SCR, which risks are currently included or excluded in the projected SCR used in the computation of the Solvency II risk margin and which of these inclusions or exclusions can be most easily justified from first principles. Appendix C elaborates how the general theory underpinning the cost of capital approach as set out in Section 2 might be expanded to cover liabilities subject to Solvency II's Matching Adjustment or Volatility Adjustment. The focus of the paper is principally on long-term business, as the risk margin is less material for short-term business.

2. A GENERAL THEORY UNDERPINNING THE COST OF CAPITAL APPROACH

2.1 Modern approaches to assessing the value and solvency of insurance undertakings are based on *market consistent valuation* of all assets and liabilities of the undertaking. The fact that no off-balance sheet values then exist is called a *total balance sheet* approach. The main theoretical reason for this choice of approach is the ongoing ability of the undertaking to act, i.e. to change its asset or liability position in the market (i.e. buy or sell assets or liabilities), *without* an instantaneous impact on its Economic Net Worth ('ENW'), here taken to be the difference between the value of all existing assets and liabilities. This reasoning reflects the ability of the undertaking to change its exposure to risk and in the extreme to assume a position minimising its risk[5].

2.2 It should be noted that while the ENW as defined above remains unchanged when the undertaking acts in the manner referred to above, the total market value of the undertaking may change. The market value of the undertaking is its ENW plus its franchise value. The latter reflects the value that investors associate with future (i.e. not yet written) business. Strategic decisions of the undertaking may impact investors' views on the undertaking's ability to write profitable business in future. In the extreme case, the undertaking may decide to fully abstain from writing new business.

2.3 The Cost of Capital approach underlying the current Solvency II risk margin calculation is one choice to implement a market consistent total balance sheet approach. It extends market valuation to positions that are exposed to additional risks, e.g. insurance or reinvestment risks, against which the undertaking needs to protect itself with a high degree of probability if it is to continue to honour promises it has made to its customers. For these positions market values do not exist. The Cost of Capital approach involves replicating the contingent cash flows with market traded instruments so that the risk of the remaining positions, i.e. the difference between all insurance positions and their replicating portfolio, becomes minimal. Holding capital reduces the risk of this remainder to a regulatorily acceptable level. Therefore, the amount of capital required is given by regulatory requirements. The cost of capital required is given by return requirements of investors. These requirements are assumed to be consistent with investors' perceived requirements as derived from information observed in capital markets.

5 A caveat is that it may be more difficult for insurers (and/or other financial institutions) to adjust their positions *in aggregate* in such a manner, i.e. systemic risk considerations may be relevant. Certain refinements to the argument then become relevant, as explained in Kemp (2009). Approaches that include market consistent valuation approaches remain desirable at an individual undertaking level because they can provide a 'fairer' way of apportioning support given to individual undertakings (e.g. via fair allocation of the costs of any applicable insurance guarantee schemes), However, they may need supplementing at an aggregate industry level to address broader financial stability issues.

2.4 The return requirements of investors relate to the market values of their investments. Only a part of it, i.e. the ENW, relates to business in force. This is discussed in more detail in Bergesio et al. (2019). This is particularly important when inferring information from market value returns observed for insurers about the return requirements that might apply to only an insurer's in-force business. The latter is decisive for the market consistent valuation of the (existing) insurance related positions.

2.5 Solvency II references to the valuation approach described above in cases that include:

a. When the insurance liabilities can be 'valued as a whole', i.e. it is possible to identify a market traded portfolio that essentially perfectly replicates the insurance liabilities. There are then no additional risks as per Section 2.2 that need to be considered, and the value placed on the insurance liabilities is equated with the observed market value of the replicating portfolio.
b. When the contingent insurance related cash flows do not depend on market variables. In this case, the replicating portfolio consists of default risk free bonds that match the expected cash flows best in terms of tenor and currency. Tenors for which no bonds are available can be treated by holding the next available smaller tenor (but only via the introduction of reinvestment risk). In Solvency II, the (market) value of this bond portfolio is called the '*best estimate liability*'. However, the cost of capital prescribed in Solvency II is not the cost incurred by the undertaking to produce the required returns for the providers of capital, but the cost that would be incurred by a 'reference undertaking' that assumes a minimum risk position, holds just 100% of the regulatory required capital, and does not write any new business. The reference undertaking's cost of capital is the risk margin that should be added to the best estimate liability.

2.6 From this, two first suggestions for the Solvency II framework arise:

a. The Solvency II regulation should explicitly address the general case, where cash flows depend on both financial market risks and on other risks. The theory for this is well developed. Briefly, contingent on the realisation of the other risks, the cash flows are replicated and thus obtain their contingent, market consistent value. Given the investment portfolio, the undertaking should then hold enough capital to meet these market consistent values with a suitably high probability (Solvency II targets a 99.5% likelihood over a 1-year time horizon).
b. Solvency II should consider creating transparency regarding both the company's own valuation of its insurance liabilities as a going concern including the Cost of Capital and as a gone concern explicitly calculating all costs as a gone concern, i.e. under a run-off assumption. It should be transparent about who might bear the cost of such a restructuring.

2.7 Other insights relevant to the above include:

a. Different elements of the total balance sheet can have different risk absorbing characteristics in different circumstances. This is relevant to capital tiering and, using Solvency II language, how own funds, basic own funds and eligible own funds should ideally be derived from ENW.
b. The return expected by investors in general provides compensation for:
    1. Financial market risk to which the investor is exposed indirectly via his or her investment in the undertaking
    2. Equivalent non-financial risks including insurance risks (typically assumed to be uncorrelated with market risks, i.e. to have a beta of zero)
    3. Frictional costs (excluding tax) arising from the structure of the undertaking (including ones arising from the structure of its portfolio of assets or liabilities)
    4. Tax payable by the investor because of the structure of the undertaking that the investor would not otherwise have paid had the corresponding contingent claim cash flows have been held by the investor directly. These may include tax on profits paid by the undertaking itself (rather than by the investor)[6].

2.8 Returning to the concept of the Solvency II reference undertaking, the assumption implicit in the Solvency II risk margin calculation is that investors will require a market return for any market risk their capital is exposed to. In the absence of elements like the Solvency II Matching Adjustment (MA) or Volatility Adjustment (VA), the reference undertaking is assumed to be invested so that its ENW is not exposed to market risk. In the simplest case, this means that the investments are risk-free and that cash flows relating to other positions do not depend on financial markets. Recall that the assumption that the insurer can de-risk without consequences for its ENW is a direct consequence of the adoption of a market consistent valuation approach.

2.9 If, however, a MA or VA is applied, this means that the reference undertaking needs to hold default risk exposed assets to produce the associated return implicit in these valuation methodologies. Theory implies that some corresponding adjustment to the risk margin is then needed. In Appendix C, we set out a further elaboration of how the theory underpinning the risk margin might be applied in such circumstances. This elaboration questions how relevant the liquidity characteristics of the insurance liabilities might be in determining total technical provisions (including the risk margin). The approach set out in Appendix C should also in principle be capable of being extended to identify how best to hedge cash flows forming the risk margin, but an elaboration of how this might be done is beyond the scope of this paper.

6 The impact of tax should therefore be taken into account in the risk margin calibration. However, the precise way this is done should ideally reflect e.g. the existence of any 'imputation' elements within tax regimes (i.e. offsets to taxes payable by investors that depend on how much tax has been paid by the investee corporation) and/or on whether different types of corporates are relatively more or less appealing to investors in different tax positions.

3. AREAS OF DEBATE IN RELATION TO THE CURRENT DESIGN OF THE SOLVENCY II RISK MARGIN

3.1 The current methodology used to calculate the Solvency II risk margin ('RM') is set out in the Solvency II Delegated Regulation[7] ('DR') Articles 37 – 39 and involves the following formula

$$RM = CoC\ rate \times \sum_{t=0}^{T-1} \frac{SCR(t)}{\left(1 + r(t+1)\right)^{t+1}}$$

In this formula, *SCR(t)* is the projected SCR at time *t* after the valuation date of those elements of the SCR deemed relevant in this calculation (some elements of the SCR are excluded for this purpose, see Appendix B), *r(t)* is the annualised risk-free rate between now (i.e. $t = 0$) and *t*, and *CoC rate* is the cost-of-capital rate specified in DR Article 39 (currently 6% pa). The upper limit of the summation, i.e. *T*, corresponds to the deemed lifetime of the relevant insurance obligations.

3.2 The theoretical basis underlying the current RM methodology is an 'exit valuation', i.e. it is designed to be a proxy for the amount in addition to the best estimate liability ('BEL') that a third party to whom the insurance obligations were being transferred (the 'reference undertaking' or 'RU') would seek before being willing to take over these liabilities. This is consistent with Article 77 (3) of the Solvency II Directive as currently worded, which specifies:

> *"The risk margin shall be such as to ensure that the value of the technical provisions is equivalent to the amount that insurance and reinsurance undertakings would be expected to require in order to take over and meet the insurance and reinsurance obligations."*

3.3 DR Article 36 specifies the assumed structure of the third party to adopt when determining the projected SCRs. Points flowing from this initial design choice include:

a. Implicit in this logic is the targeting of a transfer valuation or '*fair*' valuation approach for the (insurance) liabilities rather than a '*value in use*' valuation approach. In theory, at least, the Solvency II RM approach targets a specific well-defined and implementable approach to '*production*' of the insurance contracts involving a run-off of the liabilities in a reference undertaking, with the risk margin seeking to quantify the capital that this reference undertaking would ask for if it were to take over servicing the liabilities.
b. Also implicit in this logic is that firms don't expect capital that they invest in creating a business to be merely '*sunk*' capital (on which they gain no return).

7 i.e. Commission Delegated Regulation (EU) 2015/35 supplementing Directive 2009/138/EC of the European Parliament and of the Council on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II).

Instead they expect some return on this capital. At the heart, therefore, of the debate are issues such as the compensation investors might expect from the capital they have injected into an insurance business, how well the technical provisions excluding the risk margin (i.e. *BEL*) correspond to economic costs of supporting the business if capital was not an issue and the level of overall prudence the capital framework should be targeting.

3.4 An initial review of topics thought (by the authors or by other commentators) to be relevant when considering the appropriateness of the current methodology highlighted the following:

1. **Overall impact and sensitivity of the RM to changes in economic conditions.** The current formula has a significant impact on the overall Solvency II balance sheet for many EU insurers. Some commentators believe that the risk margin is pitched too high, or even if pitched reasonably is too sensitive to e.g. interest rate movements[8]. We provide further colour on these points in Section 4 although a fuller analysis of the validity of the arguments involved also spans later sections.

2. **Interaction between the RM and the Margin Over Current Estimate ('MOCE') in the IAIS's planned global Insurance Capital Standard ('ICS') for Internationally Active Insurance Groups[9] or the risk adjustment in IFRS 17.** To what extent should the Solvency II RM be guided by developments in these areas? The ICS MOCE as set out in IAIS (2018) has somewhat similar aims to the Solvency II RM but does not necessarily involve the same calculation methodology, use the same input parameters or operate in the same way in terms of e.g. capital tiering. To what extent should the Solvency II RM specifically aim to capture uncertainties in the valuation of liabilities, instead of targeting a notional transfer cost to a third party? An approach focusing principally on the potential size of adverse deviations from the central scenario perhaps aligns better with IFRS 17 concepts (including some ways in which the IFRS Risk Adjustment might be determined by individual firms). Even if the focus should be on a notional transfer cost, as prescribed by the EU Commission, are there alternative ways of interpreting this and do they lead to different answers?

3. **Risk coverage.** The current conceptual basis of the RM involves a notional transfer of the insurance obligations to a third party, with some risks being excluded from the notional transfer on the grounds that a third party could hedge or better diversify away these risks. Issues then arise with what risks should be included in the RM computation, including:
   a. How relevant is it to derive the risk margin by creating a notional reference risk portfolio that includes elements of insurance risk assumed not capable

8 A contributor to this sensitivity is that the SCR is calculated before the RM, making it impractical to hedge interest rate sensitivity in the RM without adding to the SCR. We are aiming to comment more on this point in a future paper.

9 See IAIS (2019).

of being hedged or diversified away? Some commentators argue that insurance risk typically has a (market) beta of about zero, in which case this risk might be an example of a 'non-systematic' risk and in theory able to be diversified away by a third-party investor. This concern is addressed in a market consistent setting in Bergesio et al. (2019). However, others have asked if this implies that greater focus should be placed on quantification of uncertainty in the BEL in deriving the RM.

b. Are all included risks equal? Implicit in the cost of capital approach prescribed by the EU Commission is that any risk included should be treated 'equally' to the extent that it considered relevant at all to the RM, but is this always appropriate? For example, how, ideally, should diversification be allowed for between risks? Should any such diversification allowance include allowance for new business and/or other business activities a notional reference undertaking might also be undertaking even if these activities do not contribute to the SCR relevant to the business being transferred? Is it appropriate to require separate risk margins for life and non-life business, given the legal separation imposed between these business types by the Solvency II Directive itself, even though some notional recipients might be groups who could economically benefit from such diversification?
c. Should operational risk[10] be included or partially or wholly excluded from the reference risk portfolio, e.g. on the grounds that some of the operational risks carried by the original firm might not be specifically related to the insurance cash flows that would be transferred?
d. Most firms exclude (most) market risk including interest rate risk from the reference risk portfolio used in the RM calculation. If, however, the RM should only include risks that are not capable of being hedged then to what extent can interest rate risk (particularly long-term interest rate risk after the last liquid point) be reliably considered hedgeable?
e. How should risks that arise when using LTG measures, such as Matching Adjustment asset default risk or reinvestment risk (or UFR change risk) be handled, given that these risks may not always be clearly captured within the base SCR?
f. Suppose any available hedging by the reference entity is not 'balance sheet neutral' (i.e. would have a potentially significant effective cost to implement in terms of impact on excess of assets over liabilities). How should any such capital slippage be allowed for?

4. **Discount rate(s) and cost of capital ('CoC') rate(s) used to calculate the risk margin.** The discount rate currently mandated for this purpose in the Solvency II RM is the risk-free discount rate (as supplied by EIOPA) and the CoC rate is a fixed 6% p.a. for all future time periods. What cost of capital is actually needed and on what does it depend? Or more broadly, what does it capture / represent and how might it be identified in practice? To the extent that there are available market observables, do these support using the same rate for all

10 Likewise, some expense and other risks that are company specific and not insurance portfolio specific.

types of insurance? To what extent is it sound to derive (as at present) the CoC rate based on past risk premia rather than from expected future risk premia? Are there lessons to draw from other computations in insurance where CoCs or equivalents appear, e.g. in calculations of Market Consistent Embedded Value (MCEV)? How does reinvestment risk fit into the picture? If firms are allowed to take into account an illiquidity spread when calculating their BEL (via e.g. the Matching Adjustment, if applicable) then should they also be allowed to take into account a forward illiquidity spread when calculating their RM? Should, for example, the RM computation involve:

a. A CoC rate that is time dependent or different for different types of insurance?
b. If not already included in the discount rate, a CoC rate that has regard to the current or forward-looking economic environment (e.g. for macroprudential purposes)?
c. A CoC rate that corresponds to the assumed risk premium between the return on equity that a notional recipient of the transferred liabilities might expect and the return on investments available to that recipient from the representative portfolio that most closely aligns with the risks being transferred?
d. A CoC rate that somehow, as per Bergesio et al. (2019), differentiates between (i) the base cost of capital (corresponding to the required risk adjusted return on the asset portfolio in which the risk capital is invested), (ii) the carry cost of capital (representing compensation for financial frictions inherent to the environment in which insurers operate, e.g. because capital may be trapped due to regulatory requirements) and (iii) the return on the franchise (representing economic profits that shareholders expect to earn on new business)?

5. **Multi-year dependencies.** How relevant are multi-year dependencies between risks / uncertainties faced by the insurer[11]? If they are relevant, what ought their consequences to be for the RM calculation? Should correlations between risks be different between a one-year and a multi-year picture? An example of a multi-year dependency arises with the mass lapse risk[12]. If a mass lapse occurs one year then this reduces the potential impact of mass lapses in subsequent years, as it is impossible for more than 100% of the book to lapse across the whole lifetime of the book. Another example in annuity business is the longevity stress (20% improvement) which if it were assumed to happen repeatedly might result in unrealistically long average life expectancies. At issue is that the SCR is defined in a specific way in Solvency II, with the RM deliberately derived from the SCR and not vice-versa. But in this instance, such an approach then results in no account being taken of any loss absorbing characteristics within the RM due to the RM reducing if a mass lapse scenario takes place. When the

11 It would be interesting here to identify more precisely different methodologies used in practice to project the different risk sub-modules underlying the RM calculation, but this is beyond the scope of this paper.

12 Other examples include some types of natural catastrophe risks and any other risk whose further development in the future depends on the outcome of some event in the meantime.

SCR calculated in this manner is then projected to calculate the risk margin, each projected SCR at a given point in time is based on the balance sheet then projected to be present assuming that no mass lapse has previously taken place, with the projected SCR at that time then incorporating a mass lapse at that date. So, the projected SCRs in effect assume mass lapses occur multiple times with probability > 0, and moreover each time they occur that they have not occurred beforehand. The computation therefore has inconsistencies that can lead to counterintuitive and arguably inappropriate results, see Appendix A.

6. **Treatment of tax.** How should taxes[13] be included in the RM calculation (investors generally expect to be compensated for taxes)? Should the RM be included or excluded from the computation of Solvency II-deemed taxable profits and losses and hence in any associated deferred tax asset or liability established for the purpose of determining the Solvency II balance sheet?

3.5 The list of areas noted above is quite long. Some of them may be theoretically justified and others might lack appropriate reasoning. Whatever the theoretical justifications for any selected approach, there are also some other criteria that we think it is desirable for components of practical regulatory capital computation formulae to exhibit. These include:

a. Robustness of end-result. No regulatory framework can be expected to capture all contingencies. An approach that is overly complex can give the appearance of sophistication but can lead to overconfidence in the reliability of the answers. Conversely, an approach that is overly simple may inadequately deal with valid differences between different business types.
b. Ease of interpretability of the formulae involved
c. Simplicity of computation
d. Responsiveness to required capital levels
e. Avoidance of undue sensitivity to factors that are largely or wholly irrelevant to features the computation is aiming to capture

We have borne in mind these criteria when considering alternatives, but it should be noted that there are trade-offs involved which are properly better selected by relevant policymaking bodies.

13 And, possibly, the loss absorbing capacity of deferred taxes, if the reference undertaking were to be assumed to write new business.

4. OVERALL IMPACT AND SENSITIVITY OF THE CURRENT RISK MARGIN CALCULATION

4.1 Originally, CEIOPS (2009) calibrated the 6% p.a. cost of capital rate at the lower end of a range between 6% to 8% and also argued for an alignment with an analysis done by the CRO Forum.[14]

4.2 However, with the benefit of hindsight, many in the insurance industry appear to believe that the risk margin given by the formula in 3.1 is pitched too high, or even if pitched reasonably is too sensitive to interest rate movements. As will be seen below, we are sceptical regarding many of the arguments that have previously been put forward by the industry but set them out anyway to provide additional context.

4.3 According to Insurance Europe (2017) in their response to a previous EIOPA review of Solvency II, EIOPA figures indicated that the total risk margin for the entire European insurance industry was €210bn in Q3 2016 of which €150bn stemmed from life and composite insurance undertakings (representing more than 45% of the overall EU life insurance industry SCR). They noted that for certain long-term products the risk margin can be particularly large, including pensions paid out in lifelong annuities, whole life insurance and funeral insurance products (which are popular in the Netherlands). Insurance Europe also noted that EIOPA's Q3 2016 data for life insurance business indicated that the risk margin was higher than 50% of SCR in four EEA jurisdictions (Czech Republic, Germany, Netherlands, Norway) and between 40-50% in ten EEA jurisdictions (Estonia, Greece, Ireland, Liechtenstein, Lithuania, Luxembourg, Poland, Slovakia, Spain and UK). However, as noted below, we think that comparing the risk margin with the SCR without further qualification is of dubious relevance since the two are by construction not comparable. Perhaps the most important driver of differences in the ratio between jurisdictions involves differences in average durations of the liabilities. Such a comparison is therefore potentially like comparing an annual rent with a monthly rent without specifically pointing out that the two relate to different time periods.

4.4 Insurance Europe (2017) also referred to a survey of UK life insurers carried out by the Association of British Insurers which indicated that the size of the risk margin could be very sensitive to interest rates. The survey indicated that a 200bps fall in risk-free rates could result in the size of the risk margin doubling.

4.5 Willis Towers Watson (2017) ('WTW') shared similar concerns to those of Insurance Europe in their response to the review referred to above. According to their line of reasoning (which arguably diverges from how Solvency II itself appears to understand the risk margin), the risk margin can be viewed as introducing a buffer into technical provisions (akin in many ways to an additional capital requirement) and additionally:

14 See https://eiopa.europa.eu/CEIOPS-Archive/Documents/Advices/CEIOPS-L2-Final-Advice-on-TP-Risk-Margin.pdf pages 39ff.

a. The theoretical basis for this buffer was as a proxy for a current exit value. However, for a single insurance book in isolation, WTW thought that there was no corresponding market available for calibration, so any calibration would be inherently unreliable. Arguably, some of the statistics on individual transaction prices captured by EIOPA in EIOPA (2019) have addressed this challenge.
b. The use of a % p.a. charge on non-hedgeable risk capital was viewed by WTW as only one of several ways of formulating a risk margin. WTW indicated in their response that they were not aware of evidence that EIOPA or its predecessor CEIOPS had independently assessed this approach against the alternatives. WTW recommended that such an assessment be carried out.
c. WTW seemed to think that the use of a 6% p.a. cost of capital rate had been based solely on a Swiss Solvency Test ('SST') calibration without independent assessment of its merits. Moreover, WTW seemed convinced that the [Weighted Average] Cost of Capital approach it adopted led to a double counting of market and credit risk because in their opinion market and credit risk had already been allowed for in the BEL by using a risk-free rate. As noted below, we disagree with their view regarding double counting.

4.6 WTW's response also noted the apparent sensitivity of the risk margin to interest rate movements and that the larger the risk margin was (relative to the rest of the technical provisions), the greater the incentive became to transfer the liability to outside the EU, e.g. via reinsurance arrangements.

4.7 Of course, there are also some potential counterarguments:

a. Insurance Europe, being an industry body, might focus on arguments that favour lowering the RM when expressing views on this topic, particularly given the sizes of the figures involved. A high RM might merely be a true reflection of the expense of exiting from the type of business in question. The RM is typically highest for long-term contracts which cannot be unravelled unilaterally by the insurance company in the interim. These sorts of contracts inherently create greater risk exposures than short-term contracts, e.g. to expense overruns, to tricky to forecast changes in longer term investment and economic conditions etc. Long-term-ness in such relationships has a perceived value to customers, so potentially a perceived cost to insurers in adverse circumstances. As part of the 2020 Review the EU Commission is seeking input from EIOPA on actual transfer values that have occurred. This sounds desirable. However, it should be noted that such transfer values are likely to be influenced by prevailing regulatory capital regimes, so there could be a degree of circularity in such an analysis.
b. WTW's argument that market risk is being double counted is not obvious, since in most cases market risk is excluded from the projected SCR used in the computation of the risk margin, see Appendix B. This highlights that consideration of the nature of the hypothetical reference undertaking taking on the liabilities is likely to be important.

c. The high sensitivity to interest rates both Insurance Europe and WTW note might initially appear surprising to some commentators. However, in the risk margin formula in Section 3.1, the cashflows are proportional to SCR_n, which in turn is sensitive to the interest rates in the relative future of n. This is true even if the underlying cashflows do not depend on interest rates. Therefore, the risk margin is more sensitive to interest rates than the cash flow structure might otherwise suggest. We are planning to assess this further in a future paper.

d. For unit-linked business, funds would typically be assumed to grow at the risk-free discount rate and then projected SCRs would be discounted at the same rate, so the interest rate sensitivity of the RM should be muted. However, the same netting does not apply if the cash flows underlying the policy are e.g. substantially fixed in nominal terms. In short, the exposures of many EU life insurers to long term guarantees within insurance contracts they have written seem to further raise the interest sensitivity over and above the effects described under (c). These guarantees typically become more expensive to honour as (long-term) interest rates fall. Solvency II already includes specific elements that bear in mind the impact of such guarantees, i.e. its LTG elements. The implication is that the ideal design of the RM for such business should link to how the LTG measures are structured. We explore this further in Section 10.

e. It is unclear to us, how WTW might justify the assumption that transferring the liability outside the EU could be regarded as fully risk mitigating, if the technical provisions on the receiving balance sheet are insufficient from a Solvency II perspective.

4.8 IN SUMMARY

a. The size of the risk margin is an important issue (as is its volatility), but merely because it is in aggregate a large number does not necessarily make it wrong. Instead, a decision on whether it is set too high or too low should ideally take account of relevant actuarial principles, which we explore further below. Approaches used by other regulators may also be informative, see e.g. Section 5.8(a).

b. Given the current structure of the Solvency II risk margin, the assumed nature of the reference undertaking that takes over the liabilities becomes important.

c. The apparently high sensitivity of the risk margin to interest rates seems in part to be a manifestation of issues that led to the creation of Solvency II's Long Term Guarantees measures, so ideally should be considered in conjunction with these measures.

5. INTERACTION WITH ICS MARGIN OVER CURRENT ESTIMATE ('MOCE') AND RELATED CONCEPTS

5.1 The IAIS is engaged in developing a risk-based global insurance capital standard (ICS). The latest version (ICS Version 2.0) was consulted upon in 2018, see IAIS (2018), with comments due back by 30 October 2018. At the time of writing, a level 1 text by the IAIS had been released, see IAIS (2019), but fuller details in a Level 2 text were still awaited. Comments in this Section relate to material set out in that consultation document, so do not necessarily reflect current views within IAIS on how ICS should be structured. The IAIS has been '*field testing*' its proposals by asking affected insurers to estimate the impact of adopting specific alternatives and to report back the results to the IAIS. This process allows the IAIS to assess the likely impact that a range of alternative proposals might have if they were implemented. It also provides a means of dialogue with the industry over how the standard might eventually be structured.

5.2 The ICS will apply to internationally active insurance groups ('IAIGs') and at a group rather than a solo entity level. The implementation is planned to involve two phases, see IAIS (2019). The first involves a five-year '*monitoring period*' during which the ICS would be used for confidential reporting to the group-wide supervisor and discussion in supervisory colleges. Only after this date would the ICS become a group-wide prescribed capital requirement.

5.3 There is no specific need for individual jurisdictions to adopt regulatory capital requirements in line with ICS, particularly not within the initial five-year monitoring period when the ICS results will not be public. However, some level of harmonisation is likely to be a desirable goal, given the global nature of many insurance markets. ICS thinking is also more recent than that underlying Solvency II so may have incorporated additional insights that were not well recognised when Solvency II was originally developed. However, this advantage is mitigated by the concepts underlying ICS seeming to be more blurred and less consistent than those underlying Solvency II.

5.4 The ICS Consultation document, see IAIS (2018), did not identify a single agreed risk margin equivalent. Instead, IAIS (2018) offered two possibilities:

a. A Cost of Capital Margin Over Current Estimate ('C-MOCE'). Its structure has similarities to the Solvency II RM, involving a formula along the lines of the following:

$$C-MOCE = Cost\ of\ Capital \times \sum_{t \geq 0} \frac{capital\ requirement(t)}{(1+discount\ rate)^t}$$

In the 2018 Field Testing, two approaches to determine the cost of capital parameter were tested:

i. A fixed cost of capital set at 5% per annum; and
ii. An adjusted cost of capital linked to the level of the risk-free interest rate: cost of capital = 3% + 10-year[15] risk-free rate, subject to an absolute cap of 10% and an absolute floor of 3%. This approach appears to have the aim of reflecting differences in the cost of capital in different economic environments at a given point in time and over time. However, it seems fairly ignorant of investors' considerations regarding return and duration of their investment.

b. A Prudence Margin Over Current Estimate ('P-MOCE'). In the 2018 Field Testing the P-MOCE was structured with the aim that the capital requirement and the P-MOCE margins together provide an adequate level of protection, with differing approaches adopted for life versus non-life insurance:
   - For life obligations, the P-MOCE construction measures the uncertainty of cash flows associated with life insurance obligations using the confidence interval approach and a normal approximation. The P-MOCE is calculated as a percentage[16] of the standard deviation for the current estimate (the ICS equivalent of the Solvency II BEL)
   - For non-life obligations, the approach is based on avoiding the recognition of future profits. Given the different nature of claims and premium liabilities the P-MOCE considers these separately (and both are floored at zero). For claims liabilities, where profits take the form of investment income on reserves, the P-MOCE takes the form of a discounting approach. The effect of discounting rises with the length of the cash flows, which is a proxy for estimation uncertainty. For premium liabilities, the P-MOCE is the difference between liabilities as implied by a combined ratio of 100% and liabilities calculated using current estimate assumptions.

5.5 The proposed C-MOCE and P-MOCE also have different interactions with the remainder of the balance sheet. The P-MOCE is assumed to be fully deducted from the capital requirement, on the basis that the P-MOCE is an own-fulfilment view, with the P-MOCE and capital requirements jointly providing an overall level of policyholder protection. A joint calibration of the P-MOCE and ICS capital requirement would then be required in order to achieve an ICS overall target level of policyholder protection[17]. In contrast, with the C-MOCE there is no deduction from the capital requirement as the IAIS view the function being performed by the C-MOCE as different and not overlapping with the capital requirement

15 It is not clear to us what the rationale is for using a 10-year risk-free rate except that this is a similar duration to common benchmark government bonds.

16 The percentage chosen for the P-MOCE life was calibrated to be broadly consistent with the overall level of margins observed in financial statements of Volunteer Groups under local jurisdictional requirements where this was possible. Such a calibration approach may therefore be relatively circular and self-fulfilling.

17 This target is 99.5% VaR over a one-year time horizon, i.e. currently the same as targeted by Solvency II.

5.6 The field testing of two alternative approaches is a recognition by IAIS as noted in the consultation document that practitioners *"recognise different objectives for a margin, such as to ensure that promises made by an insurer to its policyholders will be kept, or to provide for the cost or price for bearing risk (including but not restricted to an exit value approach)".* As noted previously, the Solvency II Directive has a more precise articulation of the purpose of the Solvency II RM and there appears to be little appetite from the EU Commission in its call for advice to change the overall aim of the RM, which is that it should conceptually target an exit valuation approach. This approach is more compatible with the C-MOCE concept than with the P-MOCE concept.

5.7 The wording of the Level 1 Document issued by IAIS on 14 November 2019, see IAIS (2019), suggests that the IAIS has decided to use a P-MOCE rather than a C-MOCE style of computation. However, fuller details will only become available when the corresponding Level 2 document is issued in early 2020. The P-MOCE concept appears to us to be inconsistent with the principles underlying Solvency II, the request of the EU Commission, and perhaps more focused on non-life obligations. These are typically of shorter duration than for life obligations and more protection orientated. Under Solvency II, these features would typically be associated with RMs that were smaller as percentages of SCRs. For example, for very short-tail business (with less than one-year obligation terms), the RM becomes approximately 6% of the (non-hedged element of) the SCR. The issue for such business then becomes more whether the SCR itself is calibrated appropriately, rather than how the then small addition constituting the RM is calculated. There are, of course, some non-life obligations that have much longer durations, e.g. when claims give rise to periodic payment orders spanning the remaining life of the individual. However, these share many features of long-term life insurance and so presumably are best treated in a comparable manner.

5.8 However, some elements of the current C-MOCE design do appear to be potentially relevant to the current debate on the Solvency II RM even if it is not clear at this stage whether or exactly how they might be included in the Level 2 details of the ICS Version 2.0:

a. The first C-MOCE CoC rate in the 2018 Field Test has a CoC rate (5%) lower than the Solvency II RM CoC rate (6%). In section 7 we also argue on other grounds that a 6% CoC rate might look high in some assessments.
b. The second C-MOCE CoC rate in the 2018 Field Test has a more complex CoC rate that varies in different economic environments (specifically different longer-term interest rate levels). In Section 7 we consider further the merits of a CoC rate that varies according to prevailing economic conditions, including ones associated with different interest rate levels.
c. The C-MOCE applies a discounting factor over a slightly different time period to the Solvency II RM[18]. At times of low interest rates, the difference is likely to be minimal but, depending on how the equivalent of the SCR is defined in the ICS,

18 In the C-MOCE the denominator involves a factor of $(1+r(t))^t$ whereas in the Solvency II RM the denominator involves a factor of $(1+r(t+1))^{t+1}$

it may be worth seeking to harmonise the proposed ICS with Solvency II principles in this area.

5.9 The authors of this paper also debated whether concepts such as the risk adjustment appearing in the Building Block approach in IFRS 17 were relevant. The IFRS 17 risk adjustment arguably fulfils a function akin to the ICS MOCE. The IFRS 17 risk adjustment (which should only include non-financial risks) should have the following characteristics:

- Risks with low frequency and high severity should result in a higher risk adjustment;
- For similar risks, contracts with longer durations should result in a higher risk adjustment;
- Risks with a wide probability distribution should result in a higher risk adjustment;
- The less that is known about the current estimate and the trend, the higher the risk adjustment should be; and
- To the extent that emerging experience reduces uncertainty, the risk adjustment should decrease.

5.10 However, the relevant material in IFRS 17 on the risk adjustment is primarily principles-based. These principles are thought by the authors of this paper to be unlikely in isolation to provide enough comparability across firms to offer good insights into how the Solvency II RM should be designed. Also, the IFRS 17 risk adjustment excludes financial risks, some of which it would seem appropriate to assume would be retained by the reference undertaking (see Appendix B). Several different methods appear to be acceptable for the IFRS risk adjustment (at the discretion of the firm in question), including a Value-at-Risk approach, a Conditional Tail Expectation (or tail value at risk) approach and a CoC-based approach. The first two are more like the P-MOCE and the third is more like the C-MOCE.

5.11 IN SUMMARY

a. Some harmonisation between the C-MOCE in the proposed ICS and the RM in Solvency II may be desirable for consistency and also for pragmatic purposes. Put another way, many of the comments made in this paper ought to be relevant to the design of the ICS C-MOCE. Less clear would be how this might work if (as now seems likely to be the case) the IAIS drops the C-MOCE concept and focuses exclusively on the P-MOCE concept, as the latter is based on different principles.

b. Concepts articulated in IFRS 17 might provide inspiration, but in practice the principles defining IFRS 17 may provide too much room for materially different approaches to allow their use in a robust way to determine regulatory own funds.

6. RISK COVERAGE

6.1 The design of the Solvency II RM rests on the concept of there being a reference undertaking that is willing to take over the firm's insurance liabilities, in order to establish a hypothetical exit valuation for the business. The consequence is that the assumed structure of this reference undertaking becomes important to the end-result. DR Article 38(1) sets out the assumptions currently mandated for the reference undertaking.

6.2 Some of these assumptions appear to have been chosen in order to make the calculations simpler, more robust and less open to ambiguity, but may not fully reflect the nature that a real-life reference undertaking might be expected to exhibit in practice. As we have noted in Section 3.5, there are trade-offs involved in the design of regulatory capital computations. Computations that are simpler and easier to calculate have many attractions provided they are responsive enough to the capital needed for the risks being run. However, if they tend to overstate the appropriate capital needs then this should ideally be reflected in the calibrations used to set other parts of the capital requirements, provided that this avoids material understatement of the capital needs.

6.3 In Appendix B.2 we have considered in turn each element of DR Article 38(1) as currently worded. In general, a monochromatic assumption about what a reference undertaking should look like is likely to overstate somewhat actual exit prices (particularly the assumption that the reference entity is an empty shell immediately before the transfer and will write no new business after transfer). This is because the buyers likely to be most willing to bid competitively for a book of insurance obligations are likely to be the ones for whom the transferring obligations are a good fit in relation to their existing and expected future business[19].

6.4 However, we also accept that it is in practice impossible to design a RM that takes accurate account of this buyer optionality. The most that is likely to be practical is to adjust calibrations in some suitable broad-brush manner. We welcome the EU Commission's apparent desire in its call for advice to take note of actual transaction prices, which EIOPA has tried to do in EIOPA (2019). It may provide further insight on the impact that buyer optionality might have on the design of the RM.

6.5 Two areas highlighted in Appendix B as particularly meriting further review relate to operational risk and interest rate risk. These are considered further below and in Section 10.

19 Fit here might e.g. include enhanced diversification benefits and/or cost synergies, but also holding and servicing much higher capital levels.

OPERATIONAL RISK

6.6 DR Article 38(1)(i)(iv) specifies that the reference undertaking's projected SCR for RM purposes should include operational risk. Some operational risks will clearly accrue to the reference undertaking when it takes over the transferred obligations. However, most operational risks are specific to the firm in question (e.g. arising from weaknesses or compromises within its own control processes etc.).

6.7 More specifically, we might expect investors in consolidators (and other interested buyers of insurance books) to be particularly focused on the mitigation and effective management of operational risk. A high proportion of the risks they can control are likely to be operational risks (particularly if it is assumed that they will receive no new business, as per DR Article 38(1)(e)). They might also seek a diversified book of operational risk, but the standard formula currently assumes limited or nil scope for diversification between operational and other risks. Only firms that believe they have robust operational risk processes are likely to bid competitively for books being transferred. Only firms able to demonstrate that they have such processes in place are likely to find investors willing to support their consolidation activities.

6.8 The computation of the SCR for operational risk is relatively 'volume driven' (unless a firm uses an internal model that includes operational risk to compute its SCR). By this we mean that the computation is derived by applying fixed factors to measures of business volume (premiums, sums assured, expenses, …). This means that the computation is relatively insensitive to the detailed operational risk characteristics of the firm in question and potentially therefore understates the extent of diversification and the extra focus on operational risk that might be expected to be relevant to a successful bidder.

6.9 Conversely, take-over processes will themselves involve operational risk, so perhaps a short-term increase in operational risk is to be expected, even if over the longer-term the nature of such transactions might be expected to lead to declining levels of operational risk

6.10 If it is felt that, overall, operational risk might be overstated then one possible way of catering for this would be to scale down the SCR for operational risk included in the projected SCRs used to calculate the RM relative to the contribution from operational risk in the (base) SCR. Some jurisdictions, e.g. China, have regulatory capital frameworks that we understand include some sensitivity to the quality of the risk management of the insurer as assessed by the supervisor. In the EU, insurers are required to take operational risk into account in their ORSA.

6.11 Such an approach would be akin to assuming that insurers who deliberately assume operational risks from other insurers are likely to manage those risks better than insurers for whom other risks are more central to their business models. It might be possible to identify a suitable scaling factor based on data collected by the Commission's Call for information referred to in the Call for Advice, or from ORSAs or internal model outputs of firms that seem to be active in purchasing other insurers' insurance obligations.

INTEREST RATE RISK

6.12 DR Article 38(1)(i)(ii) specifies that the reference undertaking's projected SCR for RM purposes should exclude interest rate. In effect, the assumption being made is that all interest rate risk can be hedged.

6.13 However, this assumption seems debatable for cash flows for which no risk-free fixed income instruments exist or where the instruments are not traded in a sufficiently deep, transparent and liquid market – as is assumed to be the case after the last liquid point. Especially, investors will clearly see the risk their investment in the reference undertaking is exposed to and will ask a return for this risk regardless of whether it is reflected in the SCR or not. This highlights a significant interaction between the RM and Solvency II's LTG measures. For example:

a. There is currently no SCR component specifically relating to the risk of movement in the UFR even though a firm's Solvency II balance sheet surplus can be expected to change if the UFR changes. Hypothetically, the insurer can immunise against this risk by matching cash flows with sufficiently long-dated fixed interest instruments. However, the region of the yield curve sensitive to the UFR is past the last liquid point and so by definition is hard or impossible to access.
b. Firms using the Matching Adjustment need to hold certain credit sensitive fixed income instruments, like corporate bonds. We might expect the same bonds to be transferred to the reference undertaking, which means that the reference undertaking will be exposed to some default risk during the whole lifetime of the related liabilities. The reference undertaking may also be exposed to price risk if a credit migration leads to the necessity to replace a bond.

6.14 We explore the interaction between the RM and LTG measures further in Section 10.

6.15 IN SUMMARY

a. The existing RM design does not take full account of buyer optionality that is likely to drive down observed prices for insurance books paid by successful bidders. We accept that quantifying the probable impact of buyer optionality is hard and welcome the EU Commission's apparent desire in its call for advice to take note of actual transaction prices since this may assist. We note that EIOPA has tried to consider this issue in EIOPA (2019).

b. Some modification of the operational risk contribution to projected SCRs may be justified bearing in mind the typical (operational) risk profile of a buyer but conversely a transfer of business might be expected to involve additional operational risks. Again, analysis of actual transaction prices might assist in identifying whether such effects are noteworthy enough to justify an adjustment to the projected SCR for operational risk to use in the RM calculation.

c. The inclusion or exclusion of some risks interacts with Long Term Guarantee measures (see Section 10).

7. COC RATES AND DISCOUNT RATES USED IN RM COMPUTATION

7.1 For short-term business, the main driver of the RM computation (apart from the assumed nature of the third party taking over the liabilities) is the CoC rate. For longer-term business, the way in which future projected SCRs are discounted and whether the CoC rate used might attenuate, i.e. decline over time from the valuation date, also become important. In this Section we therefore:

i. First discuss the overall level of the CoC rate (and whether it might vary according to economic conditions)[20] and

ii. Then move on to considering how best to apply discounting and/or to introduce a predictable time-varying nature to the CoC[21].

LEVEL OF COC RATE

7.2 The current design of the RM in effect focuses on the likely weighted average cost of capital (WACC) of the reference entity[22]. In a competitive market across all business sectors, the WACC might typically be calculated as the product of an expected risk premium applicable to all risk assets (so not sector specific) times a beta that investors ascribe to the sector or individual investment concerned.

7.3 In terms of capital requirements, we might also expect the WACC targeted by the RM to reflect the extent of leverage implicit in the balance sheet[23]. The higher the leverage, the greater might be the targeted WACC, to provide the same level of regulatory robustness in the balance sheet in terms of likelihood of policyholders being paid what they have been promised.

7.4 However, it is not easy to identify a robust estimate of the equity risk premium (ERP) that might be used in this context. Norges Investment Bank (2016) explores the distribution of the realised (i.e. past observed) ERPs and what might be suitable forward-looking (expected) ERPs to adopt. They think that the relatively large realised ERP (they quote about 7% pa in the US and 5.5% pa in other major developed markets) is difficult to explain in the context of standard neoclassical macroeconomic

20 The current CoC rate (6% pa) used in the RM calculation has only recently been reviewed by EIOPA (and the EU Commission), see EIOPA (2018), but arguably in a manner that could be viewed as merely deferring to the current Solvency II review more substantive debate on this topic. Consequently, we have included comments on both the level of the CoC rate and on how it is then applied in the RM calculation within this section of the paper.

21 As explained in Appendix A, a similar end-result can be obtained either by incorporating a CoC that attenuates, i.e. declines through time from the valuation date or by discounting at higher rates.

22 Ideally, the analysis would also explore the impact of introduction of Solvency II in 2016 on the level of policyholders' and shareholders' protection, but this is beyond the scope of this paper.

23 Calibration of an undertaking-specific unlevered beta could be carried out by first deleveraging with the average tax rate, debt and equity from the sector and then leveraging again with undertaking-specific variables. When doing so a formula such as $\beta_{unleveraged} = \beta_{unleveraged}$ / [1 + ((1 - $Tax\ Rate$) x $Debt/Equity$)] might be used.

models, an empirical observation known in the literature as the 'equity premium puzzle'. Some of this they consider to be due to repricing, e.g. they conclude that the average (forward-looking) world ERP based on data from 1970 to 2015 is 6.4% but adjusting the average for repricing[24] over the period lowers the average to 3.9%. They think that estimates from cross-sectional and time-series models also suggest an expected world (forward-looking) ERP of 3 to 4 %.

7.5 According to Damodaran (2019), the average market beta of Western European insurance firms as at early January 2019 was roughly the same as (or perhaps somewhat below) the beta for the total (Western European) equity market, see Table 1

TABLE 1: MARKET BETAS IN EARLY JANUARY 2019, SOURCE DAMODARAN (2019)

Market betas	General insurance	Life insurance	Property / casualty insurance	Total market	Total market excluding financials
(Basic) beta	0.92	0.99	0.74	1.04	1.06
'Unlevered' beta	0.64	0.50	0.61	0.58	0.77
'Unlevered' beta corrected for cash	0.87	0.67	0.65	0.67	0.82

However, there appears to have been noticeable fluctuations in these figures through time (including for total market betas!). The picture is also complicated by the impact of leverage. Damodaran's analysis suggests insurers may have smaller amounts of structural leverage than some other firms, but conversely their underlying business cash flows might be viewed as riskier if their overall equity risk premia after allowing for leverage are not much different to other corporates. There are possibly some differences between life and non-life insurers, e.g. life insurance might provide a more effective way for investors to capture 'illiquidity' premiums in credit-sensitive instruments. However, many groups span both life and non-life and it is difficult to identify any clear economic differentiation between the two in terms of the betas or WACCs that investors might expect from them.

7.6 Three potentially important additional factors, explored to some extent in Bergesio et al. (2019), are:

a. The impact of tax
b. The impact of any differences in solvency coverage ratios exhibited by a typical insurer (or equivalent for another type of corporation) and the ratio assumed to apply to the reference entity applicable in the RM calculation; and
c. The contribution to the equity risk premium that investors ascribe to 'franchise value' (new business opportunities etc.), i.e. the extent to which they may demand additional compensation to cater for uncertainty in likely future developments in this value.

24 Norges Investment Bank (2016) interpret 'repricing' to mean semi-permanent changes to the dividend-price ratio.

7.7 Investors will generally be interested in after-tax returns. This includes impacts both from any taxes that they themselves pay on income or capital gains and from taxes on profits suffered by the corporate entity itself. Exactly how investors (and insurers) are taxed and the rates at which they are taxed varies by jurisdiction but, nevertheless, the focus should ideally take tax into account in some appropriate manner. In normal circumstances, we may expect any component of the balance sheet represented by the risk margin eventually to fall into profit, if the best estimate liability is actually a best estimate (i.e. a probability weighted average). WACC figures as above typically focus on the position of a 'tax-exempt' (or 'gross') investor, i.e. an investor that does not itself pay tax. However, the insurer itself is still likely to pay tax on these profits. Of course, it is also possible that in some jurisdictions profit retentions used to fund the establishment of the risk margin (or subsequent changes to it) will be tax deductible or may at least defer realisation of tax payments. We do not profess to be experts in tax but would expect some addition to the WACC to be likely to be justifiable to derive a suitable (pre-tax) CoC rate to use in the RM calculation. As tax arrangements are generally reserved to member states under current EU treaties, we have not explored this topic further in this paper.

7.8 Investors will also typically expect a WACC-style return on all the capital they invest in a business. Typically, insurers have solvency coverage ratios above 100%. We might therefore argue that if say a WACC of 4% was applicable to a typical insurer that had a solvency coverage ratio of, say, 125% then we ought to apply a WACC of 5% (=4% x 1.25%) to a firm in the position of the assumed reference entity which starts with a coverage ratio of just 100%. However, this ignores the different likelihoods of honouring promises to policyholders likely to apply to firms with different solvency coverage ratios. Any applicable multiplier introduced on these grounds should ideally reflect the 'absolute' level of security that is being targeted by the regulatory framework rather than the (often higher) level actually followed by the industry. Otherwise the industry might argue that holding capital above the SCR would in effect be penalised within the RM calculation, which does not seem to be a desirable incentive for the RM calculation to promote. Whilst decisions on the security level being targeted by a regulatory framework properly belong to policymakers, it seems likely to us that any adjustments arising from this factor might largely cancel out.

7.9 The interaction with return on franchise value is relevant because the reference entity underlying the RM is assumed not to write new business and hence to have no obvious 'franchise value' either at outset or subsequently. This should make its cash flows more predictable (i.e. more 'value'-like than 'growth-like' to use investor-speak). This should deplete the risk premium investors might seek from such a vehicle, as explained in e.g. Bergesio et al. (2019), and hence the CoC rate and overall RM. This point also links to comments in Section 6 and Appendix B on buyer optionality. We argue there that a typical buyer of a book of insurance liabilities is likely to seek more synergies (i.e. in effect seek a greater franchise value) than is available to the reference entity as currently envisaged. This has implications for the ideal design of the RM which might likewise on average mitigate overall RM levels.

7.10 Overall, the above analysis is fairly inconclusive at any reasonable confidence level about whether the current CoC rate is too high, too low or about right, although we do note that it is higher than the corresponding rate proposed for the ICS:

a. Ideally, the focus should be on what is expected to happen in the future rather than on what has happened in the past, since it is the first that drives market prices not the second. However, any such focus would need to rely heavily on expert judgement. It is hard to find independent parties whose judgement can be considered likely to be reliable in this area.
b. Based purely on WACC-style arguments that ignore tax and typical surplus levels across the industry[25], an (average) 6% p.a. CoC rate might be too high since it focuses on past excess returns that some arguably independent commentators are less convinced will recur in the future. As noted earlier, ICS Version 2.0 included a fixed 5% CoC as one of its proposals.
c. Some modest additional reduction to the CoC rate for RM purposes might also be justifiable from observed market betas.
d. Although there are differences in the structural leverage present in insurers' balance sheets versus those of other corporates, it is not clear whether these differences justify further adjustments to the CoC rate, as they may already be reflected in (b).
e. Conversely, a WACC-style argument in isolation appears to give insufficient weight to uplifts that may be desirable to cater for taxes on profits likely to be incurred by insurers
f. Some adjustment may be appropriate to reflect typical solvency coverage ratios above 100% seen in the insurance industry, but the extent of any such adjustment would need to bear in mind the targeted level of security being sought from the regulatory framework and may therefore net to about zero.
g. The reference entity underlying the RM calculation will likely be more 'value'-like (versus 'growth'-like) than the generality of firms, and some lowering of the CoC rate might be justified in relation to this factor.
h. It is tricky to identify from these sources alone any strong justification for adopting different CoCs for different types of insurers.

25 As noted in Bergesio et al. (2019) and in Section 3.4(4)f above, a pure WACC argument along these lines may be questionable because of the existence of different elements to the WACC that may not all be associated with the sort of CoC rate applicable for the RM calculation.

7.11 Other potentially relevant lines of argument include the following, several of which the AAE commented on in its own response to a previous EIOPA consultation on the CoC rate[26]:

a. In that earlier consultation, EIOPA proposed justifying retention of a CoC rate of 6% pa or even increasing it on the grounds that an appropriate beta to apply in the derivation of the CoC rate for insurers should be 1.20 based on the characteristics of quoted insurers' equity returns. Such an assertion doesn't seem to be supported by the data in Table 1.

b. The reference undertaking is assumed to have no market risk. However, market risk is a substantial part of the risks being run by many insurers. We might therefore argue that the CoC rate should be lower than that derived purely by reference to the equity volatility of open-to-new business insurers. Conversely, a high proportion of market risks is likely to be hedgable[27]. The Capital Asset Pricing Model (and the Modigliani-Miller theorem) suggests that there should be little reward to investors merely from taking indirect exposure to such 'systematic' (i.e. market-wide) risks via investment in the equity of an insurance company.

c. EIOPA appeared in their review to have assumed that relevant insurers fund their regulatory capital largely or wholly using equity capital. This is believed to have been based on material collected as part of the EIOPA QIS 4 exercise and so is likely to be out-of-date. Insurers for whom the risk margin is a material size now seem, on average, to fund a material fraction of their regulatory capital using debt capital or from the value of their in-force business. Both are likely to be significantly less 'expensive' to service (in terms of the risk premium that needs to be offered to investors) than equity capital.

d. Anecdotally, it is believed that large insurance groups' subordinated liabilities can represent more than 20% of their total eligible own funds. The use of debt funding will tend to lower the cost of financing. Disregarding this can be expected to lead to an overestimation of the true weighted average cost of capital, although see (a). A study about the weight of equity or debt likely to be used when taking over and meeting the underlying insurance and reinsurance obligations (and that also included consideration of value-of-in-force) could usefully complete the analysis. However, depending on how 'leverage' is defined and calculated, Table 1 suggests that it may again be tricky to differentiate insurers from other corporates on these grounds alone (and particularly difficult to distinguish between life insurers, the type of insurer that typically has the largest risk margins, and other corporates).

e. In principle, the risk margin should not just provide an equity premium but also provide coverage for the credit risk component of borrowing. However, in practice much of the 'fixed-income-like' borrowing that supports insurers' balance sheets comes from policyholder liabilities and the regulatory presumption may be that own credit risk should not be taken into account when these are being considered.

26 See EIOPA (2017).

27 Except perhaps very long-term interest rate risk, see Section 10.

7.12 These additional lines of argument seem to us to be inconclusive as well, as they appear to depend heavily on presumed differences between insurers and other corporates that are difficult to be sure exist from data available to us and difficult to be sure are relevant based on underlying economic theory. The original calibration of the risk margin as proposed in CEIOPS (2009) referred to data from the CRO Forum which appeared to show materially higher CoCs for the European life and non-life markets than for the corresponding global markets. This data may have influenced the CoC rate eventually included in the Solvency II Directive. However, the data was itself based on historical averages, and so it may have been uplifted by the same equity risk premium 'puzzle' referred to in Section 7.4 which arguably should be deducted in order to identify a suitable forward-looking CoC rate.

SENSITIVITY OF THE COC RATE TO ECONOMIC CONDITIONS

7.13 Norges Investment Bank (2016) does not specifically explore whether the ERP might vary according to prevailing economic conditions, particularly interest rate levels. Views on this are likely to depend on perceived reasons for and impacts of prevailing interest rate levels. For example, current interest rate levels are low by recent historic standards. Two alternative stylised explanations are, see e.g. ESRB (2016):

a. Central banks have temporarily pushed down such rates via e.g. quantitative easing following the 2007-09 global financial crisis but eventually levels are likely to return to 'normality'. Commentators focused on such effects might then view low (long-term) interest rates as not having much effect on longer-term ERPs;
b. Current low interest rates are a more structural feature of world economies e.g. they were falling already even before the crisis and this fall reflects longer-term demographic trends which have bid up the price of long-term assets. Commentators focused on such effects might then view low (long-term) interest rates as an indicator that longer-term ERPs might also be depressed.

7.14 It is not clear to us which of these views should take precedence. The ICS C-MOCE 2018 Field Testing includes two options, which stylistically can be viewed as testing these two alternatives. The likelihood is that there is some truth to both points of view. We would note, however, that their second option, described in 5.4(a) ii, proposes a level of dependency on interest rates that seems to us implausibly strong, given ERPs prevailing at times in the recent past when interest rates were much higher than at present. Estimates in Damodaran (2019a) seem much less sensitive to interest rate movements than would be implied by this proposed C-MOCE variant. It seems to us more plausible that investors were then mentally applying high risk premia on longer term cash flows, rather than high CoC rates. Including spreads over risk free rates in the RM computation reduces the RM (see below) whilst increasing the CoC rate increases the RM. Typically, absolute return targets of companies do adjust over time to changes in interest rates, but typically only slowly.

7.15 The inclusion of a specific sensitivity to economic conditions also introduces possible pro-cyclical or anti-cyclical effects giving rise to macroprudential issues. Given the likely interest rate focus of such issues, we discuss this topic further in Section 10 given that there are also macroprudential aspects to Solvency II's LTG measures. Some further discussion on the merits of having the CoC rate automatically vary when risk-free rates vary is included in Pelkiewicz et al. (2019).

DISCOUNT RATE AND/OR INCLUSION OF A PREDICTABLE TIME-VARYING ELEMENT TO THE COC RATE

7.16 The current design of the RM can be viewed as a simplification of a more general design in which the discount rate is not aligned to the risk-free rate and/or the CoC rate is time-varying, i.e. takes the form RM^* or RM^{**} as below:

$$RM^* = \sum_{t=0}^{T-1} fixed\ CoC\ rate \times \frac{SCR(t)}{\left(1 + r^*(t+1)\right)^{t+1}}$$

$$RM^{**} = \sum_{t=0}^{T-1} varying\ CoC\ rate(t) \times \frac{SCR(t)}{\left(1 + r(t+1)\right)^{t+1}}$$

7.17 An important point to highlight is that the mathematical form of RM^* and RM^{**} is such that the same answer can be obtained using either a constant CoC rate or a time varying rate as long as the discount rate is adjusted accordingly, e.g. by choosing r^* so that:

$$r^*(t+1) = \left(1 + r(t+1)\right)\left(\frac{fixed\ CoC\ rate}{variable\ CoC\ rate(t)}\right)^{1/(t+1)} - 1$$

7.18 A CoC rate declining through time can therefore be viewed as having the same end impact on the RM as including a spread element in the discount yield curve used in the RM calculation.

7.19 In Section 8 and Appendix A we explain why for some types of insurance risk a declining CoC and/or use of a discount rate that includes a spread over risk-free rates appears justified, based on how risks might be expected to emerge or crystallise through time.

7.20 Norges Investment Bank (2016) referred to above does not differentiate by term, so if an average CoC rate of, say, 4% p.a. was considered justifiable based on evidence presented there or elsewhere, this could be rationalised to be consistent with a CoC rate that starts at say 6% p.a. but declines to below 4% p.a. at longer durations.

7.21 IN SUMMARY

a. The current CoC rate of 6% pa may be somewhat high when applied to multi-year projected SCRs, if the aim is to base the CoC rate on a suitable forward-looking estimate of the equity risk premium. For example, Norges Investment Bank (2016) appears to support a long-term average closer to 4% pa. Whilst insurers clearly have features not shared by other corporates it is not so obvious that these should lead to different applicable equity risk premia and hence CoC rates, if capital markets are competitive.

b. To some extent offsetting such a reduction (versus the current rate) is the likely tax treatment of insurers, as insurers typically pay some tax on profits. However, tax arrangements are generally reserved to individual member states and vary between them, so we have not explored this topic further in this paper. There are also some other possible additions or deductions based on arguments relating to average solvency coverage ratios and/or franchise value. We are address some of these issues in a second paper.

c. Several economic arguments can be put forward for why the most appropriate CoC rate might attenuate through time from the valuation date (or equivalently for why the discount rate used to put a present value in the risk margin on projected future SCRs might include a spread above the risk-free rate), if there are material multi-year dependencies of the right kind, see Section 8 and Appendix A.

d. A further overlay could be included, on macroprudential grounds, that alters as economic conditions change. However, robustly identifying whether such an overlay is needed (and if so, how it might best be structured) may be challenging.

e. Taking all of the above into account, we find it difficult to conclude that the current CoC rate of 6% it too high, too low or about right on any reasonable level of confidence.

8. MULTI-YEAR DEPENDENCIES

8.1 There are two main ways in which multi-year features of insurance contracts might influence the design of the risk margin:

a. The emergence of uncertainty in the insurance liabilities may exhibit some time-dependency and may be correlated through time. This point is explained further in Appendix A. There are several types of risks insurers face where there is some practical upper limit to what loss might arise. For these risks, if the overall term of the liabilities is T and nearly all the risk has emerged between $t = 0$ and $t = t_1$ then only a limited amount of the risk is capable of emerging between $t = t_1$ and $t = T$, even in cases where $t_1 \ll T$.
b. The way in which the hypothetical reference undertaking taking over the risks might price these risks may also exhibit multi-year dependencies.

The impacts of these dependencies are explored further below. We might refer to them as the 'what's gone is gone effect', since it is the types of risk for which this might be most true where the impacts are potentially most material.

8.2 As explained in Appendix A, if uncertainty typically emerges according to a pattern as per 8.1(a) (and for some risks this does seem to be the case) then the current RM design can be expected to overstate the required RM. This is because the projected future SCRs at a given time point as used in the RM calculation typically assume 'average' emergence of risks by then. The issue is that with the above pattern of risk emergence, the more the risks have materialised by a given point in time, the lower should be the SCR at that point in time (as the exposure to risk at the portfolio level has already decreased), but many of the current implementations of the Solvency II RM ignore this possibility.

8.3 This issue can be addressed by 'correctly' assessing the economic loss used to calculate the SCR in the first place, but this means that the impact of the realisation of the risk in year 1 on the risk margin at the end of year 1 needs to be assessed. If e.g. a lot of lapses occur in year 1, the potential for lapses in all following years might be lower, as there are less policy holders left that can lapse their policies. Therefore, the contingent future SCRs are lower and so is the risk margin. This lower risk margin leads to a lower net loss due to lapses in the 1-in-200-year scenarios. Note, that:

- The effective lowering of future SCRs needs to take diversification into account. Therefore, the effect can be quite limited and often very much negligible if diversification is significant. However, in later run-off years of the reference undertaking, the effect can be more significant.
- The calculations for such an assessment can be relatively straight-forward. One starts with the 1-in-200-year lapse stress, calculates the impact on the number of policy holders, calculates the contingent SCRs for future run-off years (taking the prevailing diversification into amount) and obtains a reduced risk margin.

This risk margin reduction can be thought of as the 'loss mitigating' effect of the risk margin. It can be deducted from the lapse stress loss to obtain a net lapse stress loss. The final SCR can then be based on this net stress loss and the final risk margin can be based on the final SCR.

- Unfortunately, with well diversified insurers, the effect is often relatively small.
- If the effect turns out to be material, it may be practical to perform the in-depth assessment only once in a couple of years and use the results of the latest available in-depth assessment in the meantime.

8.4 Perhaps more practical, if the effect is considered material, is to attenuate the projected SCRs (for relevant risks) at points in time after the valuation date in a manner that results in approximately the same impact as the more detailed calculation set out in Section 8.3. Alternatively, an increase to the discount curve equivalent to the desired attenuation could be adopted, see Sections 7.16 – 7.19. This can also reflect the bigger effect due to lower diversification by increasing the interest curve more in later years. Therefore, we generically refer to this sort of approach as 'attenuating' the CoC rate, even though there are other ways of modifying the RM computation that can achieve equivalent results.

8.5 The authors of this paper did not reach unanimity on when the effects described above might be material. However, not too surprisingly, one co-author noted that some firms known to him concentrated on business where:

- all policies could be expected to be profitable to the firm in virtually all circumstances and carried little or no traditional (biometric) insurance risk or expense risk
- these profits might need to be projected over an extended time period when calculating the Best Estimate Liability
- a major contributor to the firm's SCR came from mass lapse risk and effects such as those described above were arguably material

8.6 In contrast, another co-author noted that in a high proportion of cases in large and well diversified firms, the practical impact would quite immaterial.[28]

8.7 Also, instead of being negatively autocorrelated, emergence of risk might be positively autocorrelated, so that emergence of a risk in one period might make further emergence of risk in future time periods more rather than less likely. An example where this could be the case involves liability scenarios like asbestos. Here the first court verdict increases the uncertainty in all technical provisions dramatically. This comes in addition to the increase in the best estimate. Another example could be an operational risk issue with mis-selling in one year which might correlate with further mis-selling claims from other policyholders in some subsequent years, because it could reflect underlying control weaknesses. The 'event' causing the loss the individual mis-selling instance could be pointing to an underlying control

28 We do not consider further in this paper how regulatory policy should best address issues that are important to a minority of firms but peripheral for most firms.

weakness that takes some time to work out. In this case, the increase might only be for a relatively short time. And over the longer-term, presumably we might expect the firm to eventually improve its operating processes, i.e. the autocorrelation might change sign through time.

8.8 Perhaps more universally applicable but diverging further from the core concepts underlying the cost of capital approach is a potential need to take appropriate account of the way in which shareholders in the hypothetical reference entity might allow for risk emergence dependencies. Typically venture capitalists will target a healthy return in excess of risk-free rates before being prepared to invest in a venture. Their approach is also usually predicated on the ability to walk away from the venture if it is unsuccessful. This might be by winding up the venture or in extremis by allowing it default. Much of the return they may target may be predicated on future profits from new business, so it is not easy to identify what excess return they would consider is appropriate to target for a reference entity that is assumed to have no access to new business.

8.9 Here it is the entire SCR that can exhibit a sort of time-dependent risk emergence pattern akin to the one illustrated above with mass lapse risk. The projection of SCRs used to calculate the RM presupposes that losses of the sort that the SCR is designed to protect against haven't emerged prior to the point in time at which the projected SCR is being calculated. However, the reason the SCR exists is because the firm can be expected to suffer losses from time to time.

8.10 From the perspective of shareholders of the reference entity receiving the insurance liabilities, they can't be wiped out more than once by suffering losses exceeding the capital they have invested in the business (if they have suitably ring-fenced the reference entity from their other business activities). Thus, emergence of large losses early in the life of the transferred book does, for them[29], reduce the amount of losses they might suffer later, just as with mass lapse risk. This is the nature of the so-called 'shareholder put' implicit in modern limited liability corporate structures. The RM computation presupposes that the reference entity starts with capital equal merely to its SCR.

8.11 Also relevant to the topic of multi-year dependencies is whether correlations between risks vary depending on the timeframe in question. It is not obvious to us that such differences can be estimated robustly. However, a different reason for potentially adopting lower correlations in the RM computation than for the (base) SCR is highlighted in Appendix B.4. Effectively, correlations in the (base) SCR need to be set prudently, as they all relate to the same entity. However, we might perhaps expect real life transfers of obligations to involve some picking and choosing between destinations for risk depending on which destinations might find which

29 Emergence of such losses early in the life of the book does not of course necessarily reduce the potential losses suffered by other parties, e.g. policyholders or any applicable insurance guarantee schemes (which may ultimately be financed from future new business written by other firms within the industry). We do not in this paper explore further these broader policy issues.

risks most appealing on diversification grounds. The implication is that correlations between risks in the RM computation should ideally be more focused on market-wide diversification benefits, and less focused on individual company diversification benefits, even though this is not how the assumptions in DR Article 36(1) are currently structured.

8.12 Conversely, in practice mostly experts in the specific line of business seem to take over distressed portfolios. The portfolios are often put into separate Special Purpose Vehicles or other structures which receive capital and some limited protection, but not necessarily very much (to manage the risk for the assuming company). This might lessen the impact of factors noted in Section 8.11.

8.13 IN SUMMARY

a. As mentioned at the end of Section 7, several economic arguments can be put forward for why the most appropriate CoC rate might in some circumstances attenuate through time (or equivalently for why the discount rate used to put a present value in the risk margin on projected future SCRs might include a spread above the risk-free rate). Arguments around the impact of limited liability are arguably supportive although raise other issues about how the potential for failure might best be included in regulatory capital requirements. Attenuating the CoC rate or the equivalent is theoretically needed for certain policy types if we are to avoid results that are demonstrably not market consistent, but the authors of this paper disagreed amongst themselves as to how important in practice such policy types might be.
b. It might also be appropriate for any allowance for diversification in the risk margin to focus more on market-wide diversification than on company specific diversification, in case one assumes the potential to transfer risks to different reference undertakings depending on which sort of undertaking would offer the best price for doing so.
c. All other things being equal, a RM computation methodology that results in relatively stable answers is likely to be desirable.

9. TREATMENT OF TAX

9.1 There are two main ways in which tax might impact a CoC based risk margin:

a. The funding of the cost associated with the capital requirement depends on the typical tax position of the reference undertaking to which the liabilities are transferred[30]; and
b. The capital requirement itself might be influenced by the current or future tax position of the reference undertaking.

9.2 The tax position of a hypothetical buyer of a business would most likely show up in the CoC rate that ought to be applicable to the business in question. Different sorts of businesses can be funded in different ways (e.g. equities versus debt) which will have different tax characteristics. Tax was mentioned as a consideration by CEIOPS (2009). However, it is not a priori obvious how if at all an insurance business might differ in this respect to any other type of business, or if there is a difference why it wouldn't be appropriately captured by suitable selection of an insurance specific CoC rate as per Section 7. We have not therefore considered this possibility further in this paper.

9.3 One possible way in which (EU) insurers differ from other corporates is the need to establish a risk margin, as there is no corresponding balance sheet element directly akin to an insurer's risk margin for other types of corporate. Depending on jurisdiction, it might be that returns on capital tied up as risk margin are differentially taxed versus the generality of other corporates, and in such circumstances some differentiation may be justified.

9.4 However, the current or future tax position of a typical reference undertaking might be more relevant. DR Article 38(1)(k) specifies that when calculating the projected SCR for RM purposes it should be assumed that *"there is no loss-absorbing capacity of deferred taxes as referred to in Article 108 of Directive 2009/138/EC for the reference undertaking".*

9.5 It can be argued that insurance business in the reference undertaking will typically be profitable on a Solvency II basis (if we do not deduct from profit the cost of financing the risk margin). If the reference undertaking were to start as a shell and to receive a transfer-in of an insurance book it may therefore pay taxes on these profits. When translating from a GAAP / IFRS balance sheet to a Solvency II balance sheet this could in some circumstances give rise to an associated deferred tax liability expected to be payable on these profits, see DR Article 15.

30 For example, according to Bergesio et al. (2019), the CoC rate should be determined pre-tax (because e.g. the RM can generate a deferred tax asset on the balance sheet), so a WACC calibration that is post-tax needs some adjustment.

9.6 We can therefore see that in some circumstances the assumption that there is no loss-absorbing capacity for the reference undertaking could be conservative, although it may be difficult to identify a practical approach catering for this effect that does not also offer scope for double counting (which DR Recital (68) indicates should be avoided) or regulatory arbitrage.

9.7 A final tax issue related to the RM but not really to its design is whether the deferred asset or liability created when restating the balance sheet from a GAAP / IFRS basis onto a Solvency II basis as per DR Article 15 should include or exclude the RM. Our understanding is that typically firms interpret Article 15 as implying that the size of the deferred tax item should relate to the whole of the technical provisions (so include the RM), even though profits on which taxes might be payable might only relate to cash flows within the BEL (the RM being essentially a capitalisation of funding costs). The theoretically most appropriate approach to adopt here may depend on the way in which typical funding costs impact insurer taxable profits, which may vary by member state.

9.8 IN SUMMARY

a. It is difficult to generalise about tax, as tax arrangements can vary across jurisdictions and across firms. Whilst we might hope that tax authorities view the cost of capital relating to the in-force book as part of the cost of 'producing' the relevant policy cash flows (and therefore to view these costs as tax deductible), this is not how such costs are typically taxed for the sorts of capital instruments typically used by insurers.
b. The assumption that there is no loss absorbing capacity for the reference undertaking in the risk margin computation may in some circumstances be conservative but is likely to be pragmatic.

10 INTERACTION BETWEEN RM AND LTG MEASURES

10.1 As noted in Section 1.1, the EU Commission call for advice specifically asks that EIOPA's assessment *"should take into account the potential interactions between the recognition of market risk and the use of the volatility adjustment and the matching adjustment in the risk margin calculation"*. The volatility adjustment (VA) and the matching adjustment (MA) are parts of Solvency II's LTG measures.

THE MA AND VA

10.2 The LTG measures relating to the MA and VA arguably involve departures from the 'strict' market consistent principles that otherwise underpin most of the rest of Solvency II. The MA allows insurers to use higher insurer-specific discount rates when determining some of their technical provisions, the discount rate being based on an illiquidity-adjusted yield applicable to a ring-fenced portfolio that backs predictable liability cash flows to which the discount rate applies. The MA only appears to be used to a material extent in UK and Spain, partly because of difficulties insurers in other countries have in meeting the relevant ring-fencing requirements. The VA has a similar conceptual basis (i.e. that a higher discount rate can be applied when calculating the value of technical provisions for cash-flows that are predictable and illiquid) but does not require ring-fencing and uses a standardised illiquidity-adjusted discount rate (the same for all insurers for a given currency) that relevant insurers can use to discount sufficiently predictable liability cash flows. Its use is more widespread and less jurisdiction specific. Typically, but not always, a higher discount rate (i.e. greater credit for illiquidity in the liabilities) is available via the MA than via the VA.

10.3 The arguable divergence of both the MA and the VA from 'strict' market consistent principles arises because the risks associated with any supposed illiquidity premium underlying the MA or the VA depend on model assumptions which cannot be independently validated from market observables alone.

10.4 This point can be illustrated by exploring two different models of how illiquidity in corporate bonds might influence spreads (versus risk-free rates) exhibited by such bonds. Neither model can be ruled out from market observations alone since to do so requires the identification of the spread that might apply to ultra-illiquid risk-free instruments, but such instruments do not practically trade in the marketplace. The issue is that the two models lead to different estimations of the 'riskiness' of the illiquidity premium to ascribe to more credit-risky cash flows, and hence result in different conclusions about whether and how the risks associated with any such illiquidity premium should be incorporated in the risk margin computation.

10.5 The first model, an *additive* model, is perhaps the one most commonly assumed to describe illiquidity premia on corporate bonds. It is arguably the one implicit in the current design of the MA (and VA). It assumes that the decomposition of spreads on corporate bonds involves the following three elements, the third of which is assumed to be independent (in a statistical sense) from the first two, with the total spread being the sum of the three elements:

a. A component that derives from likely defaults on a portfolio of corporate bonds;
b. A component that derives from uncertainty in (a); and
c. A remainder (sometimes called the 'fundamental spread') which is usually associated with a premium for illiquidity

If this model is correct, part (c) can in principle be earned 'risk-free' by investing in a held-to-maturity portfolio of corporate bonds. It can in principle be estimated by separately estimating (a) from past default data and (b) from some variability in past default rates, ascribing the remainder of the overall spread to (c).

10.6 The second model, a *multiplicative* model, is explained further in Kemp (2009) where it is mentioned because evidence differentiating it from the additive model referred to above is tricky or impossible to identify. In this second model, part (c) above is assumed not to be an additive component conceptually independent of the corporate bonds held but is instead assumed to be some specified multiple or fraction of (a) (and/or of a combination of (a) and (b)), i.e. it is assumed to be higher for riskier cash flows.

10.7 It should also be noted that:

a. Even if some commentators express their concern regarding the theoretical validity of the VA and MA, they may still view the VA and MA as representing pragmatic ways of addressing broader (political) issues relating to the Solvency II framework. Without such overrides it would have arguably been impractical to get agreement on the introduction of Solvency II and it would have excessively limited the appetite of insurers to provide contracts with long term guarantees (hence the LTG name).
b. Certain other potential or actual departures from 'strict' market consistency were also introduced into Solvency II, arguably to smooth its introduction, including the introduction of several Transitional Measures and (arguably) of the Ultimate Forward Rate (UFR) and. We comment on these in Sections 10.14 – 10.17.

10.8 Given the variety of opinions on this topic, we have set out below comments differentiating between two assumptions, the first involving the assumption that a risk-free illiquidity premium is capturable on illiquid liability cash flows and the second involving the assumption that any illiquidity premium that is capturable is also risky.

IMPACT ON RM IF A RISK-FREE ILLIQUIDITY PREMIUM IS CAPTURABLE VIA AN MA OR VA

10.9 If the illiquidity premium underlying the VA and MA is considered to be 'risk-free' then:

a. It may be reasonable to allow the relevant VA or MA discount rate to be used in the calculation of the undertaking's RM. Both the VA and MA are part of the Solvency II framework. Provided they are considered valid within the framework it would seem logical to allow them to be taken into account in the RM.
b. However, some allowance should ideally then be included in the projected SCR used for the RM for the uncertainty in default risk referred to in Section 10.5(b) that is implicitly introduced by relying on the VA and MA. This is likely to deplete the increase in Own Funds available from (a).

IMPACT ON RM IF ANY AVAILABLE ILLIQUIDITY PREMIUM FROM MA OR VA IS INHERENTLY RISKY

10.10 If, instead, any illiquidity premium underlying the MA or VA is considered to be risky (e.g. if a multiplicative spread decomposition is considered valid) then ideally either:

a. The asset portfolio underlying the MA should be assumed to be transferred to the reference entity, along with the (typically) reduced technical provisions associated with discounting at a higher than otherwise risk-free rate that incorporates the illiquidity premium. However, to support the higher discount rate, the asset portfolio will need to be held to maturity. It will therefore be subject to unavoidable credit risk during the remainder of the lifetime of the obligation. This should be included in the projected SCRs used to calculate the RM (since the assets are illiquid so can't be hedged).
b. The reference entity should be assumed to be uninterested in taking on the existing asset portfolio, in which case the liabilities should be discounted at the basic risk-free discount rate (i.e. ignoring the VA or MA) but without any need to hold capital against the default risk present in the existing portfolio, reducing the RM but increasing the remainder of its technical provisions.

10.11 A priori, we might expect that Sections 10.10(a) and 10.10(b) would lead to economically equivalent results and hence the same overall capital position, in which case the calculation in 10.10(b) might be the simpler one to adopt. Possibly, there might need to be some consideration of any transaction costs involved in reorganising the assets in this manner, see also Appendix B.

10.12 Slightly different arguments apply with the VA but reaching much the same overall conclusion. No specific asset portfolio might be transferred. However, to achieve an investment return consistent with the VA, the reference entity would need to invest the assets backing the relevant liabilities in a manner that replicated the portfolio underlying the VA and would need to continue to do so during the remainder of the lifetime of the obligations. Therefore, its position needs to be like the one in Section 10.9 if it wishes to include the VA uplift when valuing its technical provisions and still be capable of running-off its the liabilities in the manner underlying the RM concept.

10.13 These arguments are expanded upon by Wilhelmy (2018), who concludes that:

"If market adjusted valuation means

- *production of insurance liabilities by cash-flow matching fixed income instruments and*
- *adding the cost to indemnify investors to provide the necessary capital during the run-off of the liabilities to ascertain policy holders with the desired protection,*

and if you secondly believe

- *that investors are asking market returns for credit default risk*

then using risk free instrument to match liabilities

a. *minimises the value of liabilities*
b. *minimises the required capital"*

They are also expanded upon in Appendix C.

TRANSITIONAL MEASURES

10.14 Solvency II includes several Transitional Measures including ones on technical provisions, on interest rates and the transitional equity market stress in the SCR. Typically, when new regulatory capital regimes are introduced there are transitional measures implemented as part of the introduction that eventually disappear but which in the interim smooth the impact of shifting from the old to the new regime. The timeline over which any such transitional measures apply is an explicitly political decision. It is beyond the scope of our analysis to consider how such factors should influence the RM calculation.

UFR

10.15 A further area where Solvency II can arguably be viewed as diverging from 'strict' market consistency is in relation to the UFR. By construction, the UFR is the rate that is used to set the behaviour of interest rates beyond parts of the yield curve that are readily amendable to market observation, which is defined in Solvency II as beyond the last liquid point ('LLP'). It is therefore not itself amenable to market measurement so can't be confirmed as being either market consistent or not market consistent. It was initially set at 4.2% pa but since the beginning of 2018 varies according to a formula set out in EIOPA (2017a). This was in part because although one couldn't say for sure that a rate of 4.2%pa was not market consistent this rate did appear to be implausibly high relative to then prevailing longer-term interest rates, particularly in the Eurozone.

10.16 The observed ability of the UFR to vary raises the question of whether UFR change risk should be included in the projected SCR for RM purposes[31] and if so how. It would seem logical here to adopt a similar approach as is adopted with other risks, i.e. to include the risk in the projected SCR for risk margin purposes only if it is also included in the base SCR and if it is assumed that the risk would not be hedged away by the reference entity. Given the nature of UFR change risk, it would seem inappropriate to exclude it from one but not the other[32].

10.17 A reduction in the UFR leads to a reduction in long-dated risk-free rates, which all other things being equal will increase the RM for long-dated business. This will exacerbate issues noted in Section 3 regarding the size, sensitivity and hence volatility of the RM for insurers with long-dated business. One possible way of alleviating these issues would be to keep a fixed UFR for the RM. However, this idea seems rather convoluted and difficult to justify from first principles. We think a better approach would be to tackle such issues more directly as per earlier Sections of this paper (to the extent that the issues represent flaws in the current RM design rather than properly capturing relevant risks that such insurers took on when they wrote such business).

31 We assume here that insurers with liability cash flows extending beyond the LLP do not typically fully hedge these cash flows using fixed income assets that also extend beyond this point.

32 It is possible to hedge UFR change risk using forward starting swaps, but the practical size of this market is small relative to the aggregate exposure present within the industry.

10.18 IN SUMMARY

a. Increasing the discount rate used when placing a present value on the cost of capital needed to fund projected future SCRs purely to reflect LTG measures is problematic, because additional risks are then introduced into the balance sheet which are not otherwise captured within the RM calculation. It should be noted that an attenuation of the CoC rate or an equivalent discount rate adjustment as per Sections 7 or 8 is a conceptually different adjustment that does not depend on whether the MA or VA is being used.

b. It is likely to be most appropriate for the projected SCR in the RM computation to include risks like UFR change risk only if they also appear in the base SCR (and are not considered hedgeable). A common UFR should underpin different aspects of the regulatory capital computation, to avoid introducing inconsistencies in the underlying logic.

c. The transitional measures have a different, more explicitly political, rationale, so are not considered further in this paper.

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APPENDIX A
Market consistency and the Solvency II Risk Margin

INTRODUCTION

A.1 A key policy decision made in the development of Solvency II was to focus on market consistency where practical. This reflected the desire to introduce a modern, harmonised and risk-sensitive regulatory valuation framework across Europe. It should be noted that not all regulatory frameworks in the financial services industry explicitly aim for market consistency and by implication 'fair' valuation of assets and liabilities. For example, the current standard way of valuing (loan) assets and liabilities for banking regulatory capital purposes places greater emphasis on amortised cost methodologies, if the undertaking concerned is planning to hold these assets and liabilities to maturity. Also, some overrides may be applied for macroprudential (i.e. financial stability) purposes. Even within the Solvency II arena, it can be argued that some of the Long Term Guarantee (LTG) measures diverge from strict market consistency, or at least make assumptions (e.g. with the UFR) on which no clear conclusion can be drawn from market consistency principles alone. In the remainder of this Appendix we assume that there is no wish to reopen the decision to focus on market consistency in the Solvency II Directive or to reopen some of the qualifications to this principle introduced by the LTG measures. Instead the aim of this Appendix is to explore how the current RM design might contradict the broader goal of market consistency.

A.2 Article 77(5) of the Solvency II Directive indicates that *"Where insurance and reinsurance undertakings value the best estimate and the risk margin separately, the risk margin shall be calculated by determining the cost of providing an amount of eligible own funds equal to the Solvency Capital Requirement necessary to support the insurance and reinsurance obligations over the lifetime thereof"*. We note that there is no specific definition of 'obligation lifetime' given in the Directive itself. Nor is there a specific definition of the methodology used to define the 'cost' of providing the relevant amount of eligible own funds. Instead, the interpretations of these terms derive from the DR or from interpretations placed on it by EIOPA or by National Competent Authorities. Some of the DR and/or these interpretations may therefore need reviewing as part of the review of the Solvency II RM. Some relevant issues are set out below.

THE OBLIGATION LIFETIME

A.3 Complications arise if the insurer has unilateral rights to terminate (or re-price) the policy prior to its expected maturity or if the insurer can adopt management actions that can achieve similar effects. In other words, debates that have previously arisen around the most appropriate contract boundary to use when calculating the BEL are also relevant to the RM, but the most appropriate approach (if strict market

consistency is being sought) may not always be identical. Current wordings in the DR or in relevant guidance on these Regulations do not appear to differentiate between different possible uses of the term 'obligation lifetime' so may not always generate appropriate results.

A.4 To illustrate this point consider a situation where the insurer has a unilateral right to terminate a policy at short notice in most circumstances. For example, consider two otherwise identical unit-linked policies:

a. A policy that is essentially certain to last a specific length of time, say 10 years, with the policyholder receiving in 10 years' time whatever EUR 1000 initially invested in a specific asset pool accumulates to at the end of the 10-year period; and
b. A policy that might last up to 10 years as per (a), but where the insurer has the unilateral right in nearly all circumstances[33] to terminate the contract giving 1 year's notice to the policyholder, with the policyholder receiving whatever EUR 1000 initially invested in the same asset pool has reached at the point the policy is terminated by the insurer.

In both cases, we assume that the policyholder is free to lapse the policy at any time up to maturity and that if the policyholder does so then he or she receives the accumulated value of the asset pool at the point of lapse. Prior to lapse / maturity, there are some (modest) death benefits, costs and revenues associated with the policy.

A.5 The second policy is likely to be materially less risky to the insurer than the first. For example, the insurer is likely to be free to terminate the policy if expenses rise too much relative to margins present within the contract.

A.6 To put it another way, the insurer's (unilateral) option to terminate the contact early has an economic value, which should influence the amount that the liabilities could be settled onto a willing third party. It should therefore influence the amount of the risk margin (or possibly the best estimate liability) that should be ascribed to the policy, according to Directive Article 77(3).

A.7 However current regulatory wording suggests that the risk margin should often be accumulated until the end of the potential lifetime of the obligation in a manner that effectively ignores this unilateral option held by the undertaking. This can potentially lead to a risk margin that is higher than is market consistent. We believe that current regulatory wording should be amended to make clear that firms can take some credit for the market consistent value of this option when setting their risk margin. For example, firms could be allowed (if there is little or no limit on the insurer's power to terminate the policy early) to limit the size of the risk margin to

33 The position under Solvency II if the insurer has a unilateral right in all circumstances to cancel the policy at relatively short notice depends on the extent to which EIOPA guidance on contract boundaries, such as EIOPA Q&A 827, applies, see e.g. https://eiopa.europa.eu/Pages/Guidelines/Q-and-A-on-Regulation-Answers-Guidelines.aspx.

whatever would result in the overall surplus capital of the firm being the same as would arise were it to be assumed that the firm exercised these rights. Any practical constraints on how quickly the firm might be able to decide to serve such notices on its policyholders should be allowed for in such a computation.

THE COST OF PROVIDING THE RELEVANT AMOUNT OF ELIGIBLE OWN FUNDS

A.8 The current methodology also leads to market inconsistent results for contracts that are particularly long term in nature bearing some types of risk. For example, consider a cohort of policies where on each policy the insurer receives 100 of profit from the policy at maturity T years from outset, where $T = 40$, assuming that the policy does not lapse in the meantime. The policyholder has the ability to lapse the policy only in relatively exceptional circumstances, so it is assumed in the BEL that the lapse rate is (close to) 0% pa but in the SCR there is still an allowance for mass lapse risk (it is assumed that the mass lapse risk factor is $k = 40\%$). Suppose also (for simplicity) that risk-free rates are 0% pa for all terms, that the insurer has no right to unilaterally terminate the contract early and that the only risk each policy is exposed to is lapse risk.

A.9 At outset, $t = 0$, each policy has a positive value to the insurer of 100, i.e. its contribution to the insurer's BEL[34] would be minus 100. Given the assumed risk-free rate and lapse rate, the policy's projected value and hence BEL in the risk margin projection remains at minus 100 until just before maturity (i.e. here $t = 40$) when it becomes zero. The SCR at outset is 0.4 x 100 = 40, and in the current risk margin projection also remains at 40 until just before maturity. Given the current CoC rate of 6% (and the assumed risk-free rates of 0% pa at all terms), the risk margin using the methodology currently specified in the Delegated Regulation would thus be:

$$CoC\ rate \times SCR \times T = 0.06 \times 40 \times 40 = 96$$

A.10 However, such a figure for the risk margin is not market consistent. The expected capital loss the insurer could sustain even if all the relevant risk crystallised at outset is only 100 (as this is close to the loss if 100% of the policy cohort lapses immediately). The market consistent ceiling for the sum of the SCR and the risk margin in this situation (ignoring any adjustments for tax) should therefore be 100. The risk margin in isolation should therefore not exceed 60 (assuming the SCR calculation is not somehow changed to reflect the pattern of emergence of this risk, see Section 8.3). The larger T becomes, the further the current risk margin computation exceeds the market consistent upper bound.

A.11 The situation described above is an example of a more general phenomenon in which uncertainties being captured by the risk margin can be expected to emerge

34 In practice, such a contract might also include a unit-linked component the value of which might be added to this BEL. In what follows it is assumed that the assets and liabilities corresponding to any such unit-linked component exactly match and so can be ignored for the purposes of this analysis.

through time and where the more the uncertainty has already been crystallised / allowed for up to a given point in time, the lower, typically will be the remaining uncertainties yet to be revealed or needing to be allowed for during the remaining lifetime of the policy. With lapse risk, only the proportion of the cohort that hasn't already lapsed can remain subject to lapse risk in the future. The uncertainties to be included at any point in time in the summation used in the risk margin calculation should therefore take account of

a. How much of the uncertainty in future outcomes was allowed for up-front in the SCR; and
b. How much of the remaining uncertainty would already have emerged or been allowed for by the point in time being considered in the projection

A.12 There are several possible ways of taking this sort of effect into account. For example[35]:

1. The projected SCR could be attenuated, i.e. reduced as time progresses in the projection (e.g. by a factor $1/(1+CoC)^t$)
2. The projected SCR could be left unchanged, but the CoC made time dependent, in a manner that replicates the attenuation in (1)
3. The projected SCR and CoC could remain unchanged, but the discount rate used in the summation formula used to derive the risk margin could be increased (e.g. by the CoC rate).

A.13 In each case, the risk margin calculation should ideally include a multiplier, F, calculated as:

F = possible loss above that already allowed for in the SCR to be allowed for in the risk margin

i.e. should in theory take the form (where the risk spread and time-varying nature of the CoC rate are selected jointly):

$$RM = \sum_{t=0}^{T-1} CoC\ rate(t) \times F \times \frac{SCR(t)}{(1 + r(t+1) + risk\ spread(t))^{t+1}}$$

For several risks, it is possible to justify a value for F of approximately 1, which how Directive Article 77(3) appears to require the calculation to be carried out.

35 All three of the example approaches given here can result in the same end answer. The choice between them may therefore be driven by presentational angles (e.g. whether relevant regulatory texts facilitate the relevant approach).

A.14 All of the above, suitably specified, make it possible for the risk margin to be structured so that it, say, tends to the market consistent upper bound when T reaches infinity.

A.15 We understand that some commentators focus on the impact that the current RM design can have for annuity products, which are typically long-term and arguably have risks (such as longevity risk) with an emergence pattern[36] with similar features to those explored earlier in this Appendix.

36 The current standard formula SCR shock involves an assumed -20% longevity stress but it is arguably overly onerous to require the setting up of a risk margin against this risk that assumes that the stress (in a CoC PV of future SCR sense) happens every future year rather than just once (or even just a handful of times).

APPENDIX B

Elements of the Solvency II SCR included in the Risk Margin calculation

B.1 As explained elsewhere in this paper the RM is currently calculated by discounting projected assumed costs of supporting SCRs in the future. Some of the risks included in the (base) SCR[37] are not included in the projected SCRs used to calculate the RM. For standard formula firms the risks included in the (base) SCR and in the projected SCRs for the RM are:

TABLE 2: RISKS CURRENTLY INCLUDED IN (BASE) SCR AND IN PROJECTED SCRS FOR THE RM

Risk included in (base) SCR	Which of these risks are included in projected SCR for the RM
Market risk - Interest rate risk - Equity risk - Property risk - Spread risk - Market risk concentrations - Currency risk	Interest rate risk specifically excluded. Others typically can or are excluded to the extent that they relate to hedgable risks.
Counterparty default risk - Policyholder debtors and debtors relating to insurance intermediaries - Reinsurance - Bank counterparty exposures	Most of these would be included (potentially excluding bank counterparty risk if it can be hedged)
Life underwriting - Mortality - Lapse - Expense	Typically yes, although in principle we might argue that e.g. longevity risks are hedgeable, see B.3
Non-life underwriting	Yes
Intangible assets module	Maybe[38]
Operational risk	Yes
Loss absorbing capacity of deferred taxes	No (specifically excluded in current DR)
Loss absorbing capacity of technical provisions	Yes (as an offset)

B.2 As noted in Section 6, assumptions regarding the reference undertaking ('RU') in the RM calculation can introduce a bias in the RM relative to what might have resulted had all the characteristics of a typical buyer of obligations been considered. Avoiding such bias should ideally be reflected either in adjustments to the wording of DR Article 38, if the bias is particularly large and specific, or in the calibration of other

37 I.e. the SCR that is included directly in the undertaking's regulatory balance sheet

38 This would presumably depend on how closely associated the intangibles are with the book of liabilities being transferred.

elements of the RM, e.g. the CoC rate. In Table 3 we set out the main assumptions and our comments on the likely level of materiality of any resulting bias.

TABLE 3: MAIN ASSUMPTIONS CURRENTLY ASSUMED FOR THE REFERENCE UNDERTAKING

DR Article 38(1) Section	Summary explanation of required assumption	Comments
(a)	Whole portfolio of obligations transferred to a single entity	See B.3
(b)	Notwithstanding (a), life and non-life obligations taken over by separate undertakings	Will not necessarily be the case, particularly at a group level[39] and might result in less diversification for the end reference undertakings and hence a poorer price (higher RM) than needed. However, segregation of new insurers between life and non-life is a structural feature of EU insurance legislation
(c)	Include any reinsurance contracts and SPVs relating to obligations	Some reinsurance contracts might be renegotiated as part of transfer, but unclear whether this might create any material bias, other than in relation to the more general point highlighted in B.3
(d)	RU has no insurance or reinsurance obligations or own funds before transfer	Likely underestimates the diversification benefits accruing to an acquirer to whom the transferring book of business might be most appealing
(e)	After transfer, RU does not assume any new insurance or reinsurance obligations	Assumes a run-off, but in practice reference undertaking likely to seek new business and hence profit opportunities, either from existing customers (franchise value) or from consolidating with other transfers (cost reductions). As explained in Section 8, these effects may reduce the effective RM the RU might price into the transfer.
(f)	After transfer, RU raises eligible own funds equal to the SCR necessary to support the insurance and reinsurance obligations over the lifetime thereof	Unless risks transferred outside regulatory perimeter seems logical. However, a corollary is that firms may be incentivised to reinsure risks if RM design is too onerous, perhaps particularly to jurisdictions where RM equivalents are lower, see Section 4.5.
(g)	After transfer, RU has assets which amount to the sum of its Solvency Capital Requirement and of the technical provisions net of the amounts recoverable from reinsurance contracts and special purpose vehicle	Consistent with (f)
(h)	RU's assets selected to minimise its SCR for market risk	Reasonable from a Financial Economics perspective, as gains or losses from decision to take such risks priced separately

39 The issue of whether the reference entity should always be assumed to be a solo entity rather than e.g. a group is broader than just a discussion about life versus non-life, see also B.4. If a group is likely to be the buyer and can gain diversification benefits not available to a solo entity then this is likely to reduce the size of the RM and ideally would be reflected somehow in the computation.

(i)(i)	RU's SCR captures underwriting risk with respect to the transferred business	Maybe reasonable, as such risks inherent to obligations being transferred, but see B.3
(i)(ii)	RU's SCR captures (where it is material) the market risk referred to in point (h), other than interest rate risk	Exclusion of interest rate pragmatic but not necessarily appropriate, see Sections 5 and 9
(i)(iii)	RU's SCR captures credit risk with respect to reinsurance contracts, arrangements with special purpose vehicles, intermediaries, policyholders and any other material exposures which are closely related to the insurance and reinsurance obligations	Complex to interpret in practice, as definition of what are 'closely related' is ambiguous. However, the principle seems logical, if these risks are also inherent to the obligations being transferred.
(i)(iv)	RU's SCR captures operational risk	See Section 6
(j)	The loss-absorbing capacity of technical provisions, in the RU corresponds for each risk to the loss-absorbing capacity of technical provisions in the original undertaking	Reasonable for most forms of LACTP
(k)	There is no loss-absorbing capacity of deferred taxes for RU	See Section 9. May in effect ignore any taxes likely to arise on future profits. However, hypothetical construction of reference entity appears to be assuming that it will have little future profits.
(l)	RU will, subject to (e) and (f), adopt future management actions consistent with those assumed for the original undertaking	The reference undertaking might be expected to be particularly focused on implementation of management actions mitigating its own risk, particularly if we are assuming that it is not writing any new business, but extent of bias difficult to quantify

B.3 Also implicit in the above RU structure is that the RM impact of some hedging strategies firms may undertake can be quite firm-specific. For example, suppose a firm is exploring whether to undertake longevity hedging. The RM benefit to the firm will depend very much on the firm's own risk profile. If longevity risk is large compared to other risks, hedging benefits to the firm in its RM may be approximately linear. However, if the firm has a 'well-diversified' longevity position, any further hedges will contribute far less to the RM. Pelkiewicz et al. (2019) explore this topic further.

B.4 The current RM formula is thus inconsistent with 'market-pricing' except in the hypothetical situation where the whole book is transferred simultaneously to a single RU. More probable is that an insurer would investigate slicing up its exposures into different parts if it was exploring transferring its liabilities to someone else. This for example means that the most appropriate correlations to assume between different risks in the RM may be lower than for the (base) SCR as the ones for the RM should in theory adopt a more market-wide perspective (as they can involve multiple players) than the ones for the (base) SCR (which should be more specific to the firm in question).

B.5 A further reason why different correlations might be appropriate is that Solvency II is predicated on a going concern basis. Where appropriate this means that future expenses arising from current business can be pooled with expenses assumed to arise from future new business. In such circumstances, it would seem reasonable to assume that the 'risk' costs (i.e. diversification offsets) arising from future business activities might also be adjusted to reflect the future impact of the same expected new business. However, such a nicety may be too complex to incorporate within the RM computation.

B.6 Certain risks appear to be excluded for pragmatic reasons from the base SCR and hence from the projected SCRs that contribute to the RM. We suggest that these are reviewed as part of the 2020 Solvency II review to ensure that their exclusion remains appropriate. Such risks include:

a. Inflation risk
b. Liquidity risk
c. Transaction costs incurred by the reference entity (or the transferring entity) if e.g. liabilities backed by a MA portfolio are assumed to be transferred to a reference entity and the reference entity does not want the associated MA portfolio.

APPENDIX C

An actuarially sound formula for the Risk Margin in a Solvency II Setting

C.1 The Solvency II framework does not directly focus on the cost of holding the capital required for robust delivery of the insurance liabilities on a going concern basis *for the undertaking itself*. Instead, it focuses on the cost of holding the capital needed by a *reference undertaking* delivering the insurance liabilities that is assumed to adopt a minimum risk position (apart from taking risks as needed to continue a potential Matching or Volatility Adjustment). The reference undertaking runs off the liabilities of the undertaking. To do this, it needs to hold a minimum regulatory capital of SCR_n for each run-off year $(n,n+1)$. The reference undertaking needs to compensate capital providers for providing this capital. The capital providers are assumed to be rational market participants of the financial market at time n. This is interpreted as meaning that they must be convinced that the reference undertaking will be able to pay (in expectation at time n) a 1-year return meeting capital providers' expectations with a dividend payment in year $n + 1$. Extending Bergesio et al. (2019) to include the case where liabilities are backed by assets that do not eliminate all market risk[40], we infer that these market participants will seek a dividend at that time of:

$$Pay_{n+1} = SCR_n \left(RFR_{n,n+1} + MRCC_{n,n+1} + MRCL_{n,n+1} + FCoC_{n,n+1}\right)$$

where:

$RFR_{n,n+1}$ is the (forward) 1-year risk free rate,

$MRCC_{n,n+1}$ is the (forward) 1-year market risk charge for the investment of the SCR_n,

$MRCL_{n,n+1}$ is the (forward) 1-year market risk charge for the investments covering the liabilities (here the technical provisions excluding the risk margin), and

$FCoC_{n,n+1}$ is the (forward) 1-year frictional cost of capital that the capital provider will charge on the basis of the frictions that the reference undertaking is incurring.

For all $n > 0$, all these quantities are random variables at time 0.

40 We ignore for this purpose any debate about whether risks other than market risks might be hedgeable.

C.2 For the purpose of much of this Appendix it is assumed, as per Sections 10.10 to 10.13, that investment strategies that correspond to the Matching Adjustment (MA) or the Volatility Adjustment (VA) are not risk-free.

C.3 Note that:

a. $MRCL_{n,n+1} = 0$ if the reference undertaking completely removes all market risk (more generally, all hedgable risk) from its liability cash flow by replication. The latter is not the case if it applies the MA or the VA or if its cash flow exhibit market dependencies that are not replicated, e.g. if some payment dates of the cash flows are so far in the future that no risk-free instruments exist to replicate them or if the cashflow exhibit options or guarantees that cannot be replicated.

b. $MRCC_{n,n+1} = 0$ if the reference undertaking invests its SCR_n risk free[41].

C.4 We now calculate how the dividend payments Pay_{n+1} can be funded. Firstly, we note that Pay_{n+1} is a (dividend) payment post corporate tax[42]. Pre-tax, the undertaking must fund:

$$\frac{1}{1-CTR_{n,n+1}} Pay_{n+1} = Pay_{n+1} + \frac{CTR_{n,n+1}}{1-CTR_{n,n+1}} Pay_{n+1},$$

where $CTR_{n,n+1}$ is the corporate tax rate at time $n+1$ for the year $(n,n+1)$.

C.5 Part of this is funded by the return on the invested SCR_n which is SCR_n $(RFR_{n,n+1}+MRCC_{n,n+1})$. Therefore, the remaining funding cashflow is:

$$FCF_{n+1} = SCR_n\left(MRCL_{n,n+1} + FCoC_{n,n+1}\right) + SCR_n \frac{CTR_{n,n+1}}{1-CTR_{n,n+1}}\left(RFR_{n,n+1} + MRCC_{n,n+1} + MRCL_{n,n+1} + FCoC_{n,n+1}\right)$$

or

$$FCF_{n+1} = \frac{SCR_n}{1-CTR_{n,n+1}}\left(MRCL_{n,n+1} + FCoC_{n,n+1}\right) + SCR_n \frac{CTR_{n,n+1}}{1-CTR_{n,n+1}}\left(RFR_{n,n+1} + MRCC_{n,n+1}\right)$$

41 We ignore for the purpose of this Appendix exactly how a 'risk-free' asset might be identified in practice.

42 We do not consider here all the complications that can arise in relation to tax, see Section 9.

INVESTMENT OF THE FIRM'S CAPITAL

C.6 We note that, for the reference undertaking, investing its capital in risky assets is unattractive. The investor is exposed to $1 - CTR_{n,n+1}$ times the market risk of this investment. So, the reasonable capital cost rate is $(1 - CTR_{n,n+1})\, SP_{n,n+1}$ where $SP_{n,n+1}$ is the spread earned on the capital in year $(n,n+1)$. Therefore, investing capital in risky assets leads to an additional cost cash flow of $CTR_{n,n+1}\, SP_{n,n+1}$.

C.7 This is not surprising; it is just the tax man's toll on the investment profit. Moreover, investing the capital in risky assets increases the solvency capital requirement SCR_n. Therefore, Solvency II does not support the reference undertaking investing its capital in risky assets. We will assume $MRCC_{n,n+1} = 0$ in what follows.

BACKING INSURANCE LIABILITIES WITH RISKY ASSETS

C.8 Now consider the case where the assets backing liabilities (i.e. technical provisions less the risk margin) are *deliberately* invested in risky assets. To the extent that this risk is not carried by the policyholder, it must be carried by the capital provider. Denote by $MRCLD_{n,n+1}$ the market risk charge on the assets that are deliberately held to earn an additional spread in the year $(n,n+1)$. Like in the argument above, the monetary charge $SCR_n\, MRCLD_{n,n+1} = (1 - CTR_{n,n+1})\, SPA_{n+1}$, where SPA_{n+1} is the monetary spread amount earned on the assets backing the liabilities in year $(n,n+1)$. Inserting this into the formula for FCF_{n+1} above yields:

$$FCF_{n+1} = SPA_{n+1} + \frac{SCR_n}{1 - CTR_{n,n+1}}\left(MRCLND_{n,n+1} + FCoC_{n,n+1}\right) + SCR_n \frac{CTR_{n,n+1}}{1 - CTR_{n,n+1}}\left(RFR_{n,n+1}\right)$$

where $MRCLND_{n,n+1}$ is the non-deliberate part of the market risk charge on the net position of the reference undertaking's liabilities and assets backing them.

C.9 Consider the SPA_{n+1} cash flow. Its implication is that all market risk related excess proceeds from deliberately held risky assets used as a spread to discount insurance liabilities should be accounted for in the risk margin. The present value of this cash flow is just the value difference of the liabilities risk-free discounted and the additional spread applied in the discounting of the liabilities.

C.10 Thus, if investors are assumed to require the market return for any market risk they are exposed to, there appears to be no benefit to the firm from applying a Matching or Volatility Adjustment to policyholder liabilities (assuming that the MA or VA cannot be earned 'risk-free'). On the contrary, in the absence of a guarantee that there will be always capital providers that do not charge fully for the market risk they are exposed to, some penalty should be included in the regulatory framework stopping the reference undertaking from being assumed to deliberately invest in market risky assets.

C.11 The liquidity features of insurance liabilities or assets do not appear in the above logic. These features are certainly very relevant in liquidity risk management, but it would seem that they are not relevant to whether a lower market consistent value should be applied to illiquid insurance liabilities (unless it is assumed that the existence of such liabilities alters the extent to which the MA or VA can be earned 'risk-free').

C.12 It has been argued that investors could be willing to treat a part of the spread as an illiquidity premium where they take on the market risk of a bond portfolio without funding it. Arguably, a similar situation exists where the default risk of a bond portfolio is transferred without transferring the bonds, i.e. in a so-called portfolio credit default swap. The standard market pricing of these instruments leaves little doubt that investors generally demand the full return including any illiquidity premium.

C.13 If regulation assumes that investors do not require a part of a potential illiquidity premium, then a detailed analysis should be carried out to assess the balance between this relief and the increase in the frictional cost including tax on the increased SCR_n. Moreover, there should be transparency about who should provide the capital needed in case it turns out that this assumption does not hold true.

THE ACTUARIAL ASSOCIATION OF EUROPE

The Actuarial Association of Europe (AAE), founded in 1978 under the name of Groupe Consultatif Actuariel Européen, is the Brussels-based umbrella organisation, which brings together the 36 professional associations of actuaries in 35 countries of the EU, together with the countries of the European Economic Area and Switzerland and some EU candidate countries.

The AAE has established and keeps up-to-date a core syllabus of education requirements, a code of conduct and discipline scheme requirements, for all its full member associations. It is also developing model actuarial standards of practice for its members to use and it oversees a mutual recognition agreement, which facilitates actuaries being able to exercise their profession in any of the countries concerned.

The AAE also serves the public interest by providing advice and opinions, independent of industry interests, to the various institutions of the European Union - the Commission, The Council of Ministers, the European Parliament, ECB, EIOPA and their various committees - on actuarial issues in European legislation and regulation.

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