Solvency II Review: Rethinking the Fundamental Spread

March 2022

pwc

Contents

Executive summary **1**

1. The Solvency II Review **4**

2. Breaking down spreads **5**

2.1 Decomposing corporate bond spreads 6

2.2 Observations on the current fundamental spread 7

3. Reflections on the QIS calibration **10**

3.1 Size of the FS 10

3.2 Volatility of the FS 11

4. Rethinking the fundamental spread **14**

4.1 Dynamic versus stable FS 14

4.2 Allowance for forward looking risks 15

4.3 Increased granularity 15

4.4 Fixity of cashflows and investment restrictions in the MA fund 15

Appendix – Solvency II background **17**

Appendix – Academic literature **19**

Contacts

Please contact us if you have any questions regarding this report:

Andrew James
andrew.james@pwc.com
Tel +44 (0) 7725 706317

Neil Farmer
neil.farmer@pwc.com
Tel +44 (0) 7841 495506

PricewaterhouseCoopers LLP
7 More London Riverside
London SE1 2RT

Tel +44 (0) 20 7583 5000
Facsimile +44 (0) 20 7804 1002

Executive summary

Solvency II Review

In June 2020, the UK government announced a review of the implementation of Solvency II. The UK government is aiming to:

- spur a vibrant, innovative, and internationally competitive insurance sector;
- protect policyholders and ensure the safety and soundness of firms; and
- support insurance firms to provide long-term capital to underpin growth, including investment in infrastructure, venture capital and growth equity, and other long-term productive assets, as well as investment consistent with the Government's climate change objectives.

In response, in July 2021 the Prudential Regulation Authority (PRA), on behalf of the Treasury, launched a Quantitative Impact Study (QIS) asking insurance firms on a voluntary basis to provide data on Solvency II reform options. This used different calibrations and designs for the risk margin and fundamental spread (FS) across a range of economic scenarios. The QIS data aims to inform a comprehensive package of reforms for consultation, due to be issued in 2022.

Most recently John Glen MP, Economic Secretary to the Treasury, made a speech at the ABI's annual dinner in February 2022[1], outlining the Treasury's proposed Solvency II reforms and announcing a formal consultation on the reform package in April.

In this paper we consider the policy options explored in the QIS, the questions it did not address, and the reforms outlined in John Glen's speech.

[1] https://www.gov.uk/government/speeches/speech-by-john-glen-mp-economic-secretary-to-the-treasury-to-the-association-of-british-insurers-annual-dinner

Observations on the current fundamental spread

Under Solvency II some insurance firms can reduce their liabilities by using a matching adjustment (MA). The FS is used to set the size of the MA – a high FS reduces the MA benefit and a low FS increases the MA benefit. The FS is a measure of the cost of future credit downgrades and defaults of the insurers' assets. For insurers providing annuity products small changes in the FS can have significant impacts. Currently the FS is based on long-term averages, which means it is relatively constant. This has some attractive advantages:

- Insurers' balance sheets are protected against credit spread changes, making them easier to manage.
- It reduces the need to sell assets when spreads widen, reducing procyclicality in the markets.
- It increases the attractiveness of less liquid assets which are harder to sell when spreads widen – these assets often promote long-term growth in the economy.

Critics of the FS argue this comes at the expense of policyholder protection. They argue that if spread widening is a reliable market indicator of higher future credit defaults then this should be reflected in insurers' balance sheets to prompt management action. However, academic research has failed to come to a consensus on the link between spreads and future defaults.

The current approach has other issues too. For instance, it applies the same FS to a wide range of assets, it has a floor which penalises certain assets and it is backward-looking so it deals poorly with emerging risks such as climate change.

Scenarios assessed in the QIS

The QIS sensitivities investigate the impact of moving to a FS that is defined in terms of current and recent average spread levels. This means the FS increases and the MA benefit reduces as spreads widen.

The PRA has made it clear these are not policy proposals but it seems to reflect a preference for a more dynamic FS going forwards.

Scenario A – Compared to the current approach the results show an absolute increase in FS for all assets, with more significant strengthening for AAA and BBB rated assets than for AA and A rated assets. We would expect a 5-7% increase in the best estimate liabilities under Scenario A (based on a representative portfolio).

Scenario B – The results show levels of FS similar to the current FS for AAA and BB rated assets and slightly below for AA and A rated assets. We would expect a 0-1% increase in the best estimate liabilities under Scenario B but this is higher if a larger proportion of the portfolio is invested in BBB non-financials.

Volatility – Significant volatility is introduced by linking the FS to a proportion of current (and recent average) spreads. The sensitivity exploring a moderate increase in current spreads increased the best estimate liability further by approximately 2%.

In the sensitivity with an extreme increase in spreads the best estimate liability increased by 14% in scenario B. This impact is dampened by the caps in Scenario A where the impact is 8%.

Does the QIS calibration achieve the policy objective?

The recent remarks by John Glen MP imply a less dynamic FS is planned:

> "It's also important that we avoid introducing material volatility onto balance sheets. In particular, the fundamental spread should not be materially, if at all, impacted by short-term fluctuations in market spreads."

We support this. In our view it is not clear how reliable current spreads are as a predictor of long term downgrades and defaults. Also, given the interaction with the solvency capital requirement (SCR) it would result in fluctuations in the level of policyholder protection over time.

"spur a vibrant, innovative, and internationally competitive insurance sector"

A reform which increases the level of the FS or the volatility caused by the FS will potentially make EU insurers more competitive than UK ones because EU insurers will still be able to take advantage of the current levels of MA benefit. This increases the risk of the offshoring of credit risk and reduced policyholder protection.

"protect policyholders and ensure the safety and soundness of firms"

The SCR is designed to ensure firms can withstand a 1-in-200-year event. This calibration is not driven by current conditions and is relatively static, which is consistent with the current balance sheet. A dynamic balance sheet based on current spreads requires a dynamic SCR. Here, the SCR should strengthen as the fundamental spread falls and weaken as the fundamental spread rises.

Without a significant review of the SCR a FS based on spreads may result in too much capital being held when spreads are high and too little when spreads are low which is not in the interests of policyholders.

"support insurance firms to provide long-term capital to underpin growth…"

Insurers are large investors in long-term assets as they are a good match for their long-term liabilities and recent years have seen huge investments in areas such as social housing, infrastructure projects, student accommodation and commercial loans.

These assets will form the building blocks for future economic growth and prosperity. A regime where the FS is based on a percentage of spread will make such assets less attractive as they typically have higher yields.

What else needs to be done?

Granularity of FS

The FS is calibrated with reference to corporate bonds only. It differentiates by broad sector, currency and credit quality. This results in an insufficient level of granularity for today's MA portfolios which are likely to include a range of illiquid assets. The lack of illiquid specific FS calibrations mean that the FS does not capture the specific retained risks associated with illiquid assets. One way to better reflect the sensitivity of assets to credit risk without introducing the volatility of short-term spread movement would be to increase the granularity of the FS.

Fixity of cashflows and investment restrictions

Regulation 42 of Solvency II, which outlines the restrictions on setting up a MA fund, and the PRA's interpretation of it, requires each eligible asset to provide fixed cash flows. While there are some limited allowances, these are typically on a worst case scenario basis. In addition, the make-whole compensation requirements clearly reduce the investable universe available to insurers.

Easing of these restrictions by allowing for the assessment of certainty and fixity of asset cash flows to be at the portfolio level (as for the liabilities) and allowing for a more economic and proportionate view of the timing of cash flows and make-whole clauses would ease the management and regulatory burden and allow for new assets to be included within the MA fund.

Forward-looking risks

Climate change is a long-term risk, which is not reflected in the FS. The main tool for considering this currently is stress and scenario testing but this does not create a direct link to the liabilities or the capital requirements.

Ideally the FS would reflect these risks so that, for example, firms with a lower exposure to climate-related risks have a lower FS. The issue is that, by their nature, they are forward-looking risks which are not reflected in past experience and so there is no data on which to base a best estimate. However, an allowance could be made in the SCR. Assets with a lower exposure to climate change risks could have a lower stressed FS. This would reduce the capital requirement and incentivise investment in assets where climate change risks are well-managed.

A possible measure of risk exposure could be one of the ESG ratings available in the market. While these are still early in their development it will encourage further work to refine the ratings.

1. The Solvency II Review

Solvency II outlines the regulatory requirements for insurance companies in the UK. It is EU legislation adopted when the UK was part of the EU and was built into the PRA's rule book. It covers the requirements for financial resources, governance and accountability, risk management, supervision, reporting and public disclosure.

The aim of the Government review announced in June 2020 is to ensure the regulatory regime is suitable for the unique features and regulatory approach of the UK's insurance sector. It has three objectives:

It has three objectives:

1

To spur a vibrant, innovative, and internationally competitive insurance sector.

2

To protect policyholders and ensure the safety and soundness of firms.

3

To support insurance firms to provide long-term capital to underpin growth, including investment in infrastructure, venture capital and growth equity, and other long-term productive assets, as well as investment consistent with the Government's climate change objectives.

In this paper we consider changes to Solvency II's fundamental spread (FS), which impact policyholder protection, competitiveness and the relative attractiveness of different asset types.

2. Breaking down spreads

Under Solvency II assets and liabilities are required to be market consistent estimates, i.e. the value at which they could be traded in the market. To achieve this for liabilities, the best estimate liability cashflows are discounted at the current risk-free rate of interest.

There are some liabilities where the cashflows are highly predictable and they can be closely matched by buying assets which also have highly predictable cashflows. An annuity is one such product. There are no future premiums receivable as it is purchased via a lump sum, the annuity cannot be surrendered and payments stop on death so the length of the payments can be estimated from mortality rates. These cashflows can be matched by fixed income assets such as gilts and corporate bonds which have defined coupon and redemption payments. Importantly there should be no need to trade these assets – the insurers become buy-and-hold investors.

Corporate bonds typically have a yield higher than the risk-free rate. The difference between the higher yield and the risk free is referred to as the spread. It represents the market view of the compensation required for holding the asset and covers the risks associated with a given bond and other supply and demand factors. The spread on a particular bond will be specific to the features of the given asset compared to the reference risk free government bond or swap curve, for example: default risk; liquidity risk; accounting transparency and other regulatory factors; political cycle risk; and option type features.

It also represents the buy-side constraints of the market-makers typically: banks, building societies, asset managers, pension schemes and insurance companies. Features which impact demand include: tax rates; ease of access; level of match for the liabilities; regulatory constraints on holdings; regulatory capital requirements; investment perspective; and time horizon.

In certain circumstances, Solvency II allows insurers to capitalise part of these higher returns by reducing their liabilities. It is justified if:

- The insurers are cashflow matched and hold investments to maturity; and
- The market builds in a return for risks that the insurer, due to its unique position, is not exposed to

When this is true, the insurer is only exposed to a subset of the risks that other market participants are exposed to and can take the benefit of this through a reduction in its liabilities. However, this requires credit spreads to be broken down into their underlying components.

2.1 Decomposing corporate bond spreads

The academic approach

Unfortunately the market does not decompose the spreads into the return required for each of the underlying risks listed above. This needs to be estimated. A common approach is to decompose the spread into the following components:

- Risk-free rate of return – The return on a risk-free asset.
- Expected defaults – Compensation for the expected level of future defaults, i.e. the non-payment of coupons or redemption proceeds.
- Credit risk premium – Compensation for taking on the risk that future defaults might be higher than expected.
- Liquidity premium – A balancing item. This has typically been referred to as the liquidity premium (or sometimes the illiquidity premium) but actually represents a return for all the other types of risk the investor is exposed to.

There has been a long and detailed debate about how to estimate these factors in academic literature. We have summarised some of these papers in the appendix. There is no consensus on the size or behaviour of the different components.

Research which looks at past levels of default is heavily dependent on the time frame considered. Longer periods which cover the 1930s will result in higher expected defaults. But is data from the 1930s still relevant to economies in the 2020s with stronger regulation? Similarly, do shorter periods add in sufficient levels of volatility? The other main approach is to build structural models (e.g. the Merton model) which model firms' behaviour. By their nature these models are very dependent on their design and calibration.

The Solvency II approach

Solvency II decomposes spreads in a different way:

- Risk-free rate of return.
- Fundamental spread (FS) – An assumption set by the European regulator designed to reflect future downgrades and defaults.
- Matching adjustment (MA) – A balancing item representing all other types of risk.

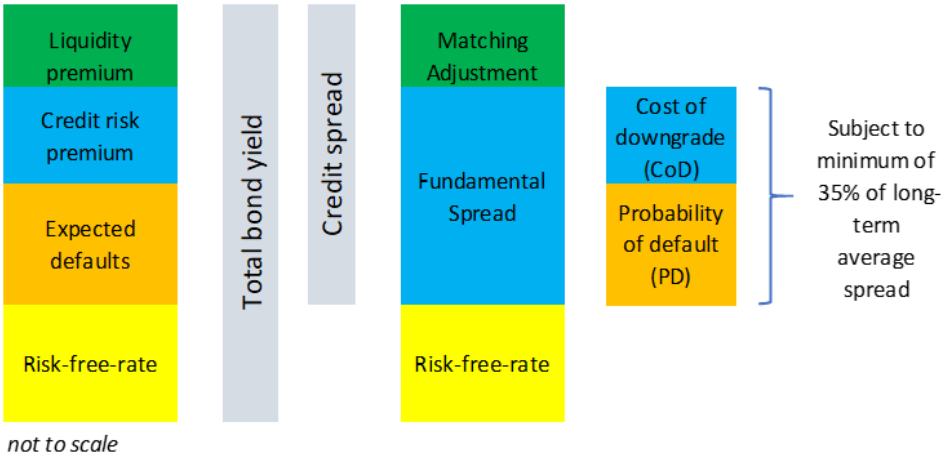
The FS is calculated as:

- Fundamental Spread (FS) = Maximum of (35% of LTAS) and (PD + CoD).

Where:

- LTAS = long-term (30-year) average spread for the bond type.
- PD = probability of default, which is the expected losses caused by the bond defaulting (based on long-term average transition rates and a 30% recovery rate).
- CoD = cost of downgrade, which is the expected losses caused by the bond's credit rating getting worse (based on long-term average transition rates and a cost of migration).

The two approaches are compared below. As the MA can be capitalised and used to reduce the liabilities, to provide adequate policyholder protection the MA should not be overstated.



2.2 Observations on the current fundamental spread

As it is based on long-term averages the FS is largely constant. This means that changes in spread flow through almost entirely into the MA. An increase in spreads reduces asset values but also increases the MA and reduces the liabilities, making the balance sheet of insurers insensitive to spread changes.

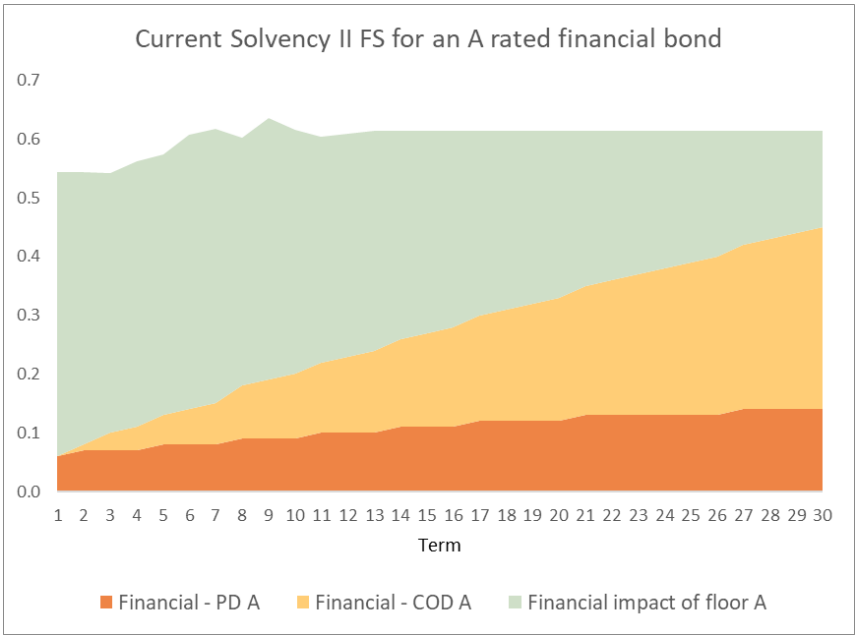
Supporters of the current MA argue that it has served its purpose well following the recent spike in spreads during the COVID pandemic:

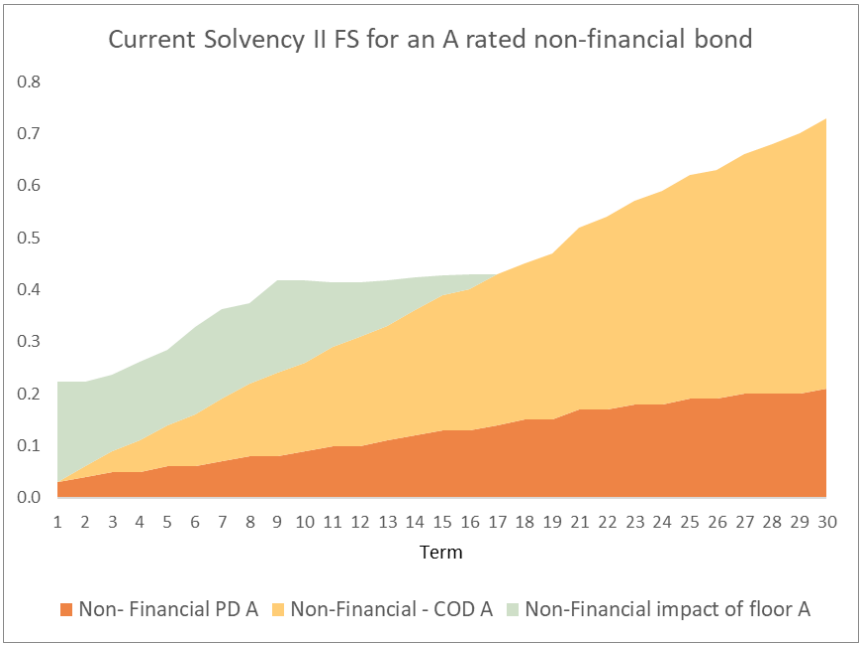
- Insurers' balance sheets were protected against credit spread changes making them easier to manage.
- It reduced the need to sell assets when spreads widen which reduced procyclicality in the markets.
- It increased the attractiveness of less liquid assets which are harder to sell when spreads widen – these assets often promote long-term growth in the economy.

However, detractors have criticised the FS for several reasons.

Distortions caused by the long-term average spread (LTAS) floor

- The LTAS floor bites for large parts of the FS calibration as illustrated below. We are not aware of any clear rationale for the calibration of the floor. The FS does not include a loading for the uncertainty that expected defaults are higher than expected and perhaps the floor acts as compensation for this.
- Without explicit justification it appears to penalise financial bonds and short-term assets. Also, the addition of one years' extra data does not move the long-term average significantly, so the floor is unresponsive to market movements.
- For these reasons the LTAS floor can distort decision-making and makes the FS unresponsive to market movements.





Inadequate allowance for market data

- Even if the LTAS floor does not bite, the PD and CoD are best estimates based on long term averages. As such they do not reflect current spreads and some academic literature suggests that increasing spreads are a market indicator of higher expected future defaults and downgrades. If spreads are an early warning of higher downgrades and defaults then the FS should, at least in part, be expressed as a percentage of spread.
- However, this is a hotly debated area with no clear conclusion and an increase in spreads could be driven by other issues. For instance, spreads could be driven by the position of other major market-makers such as banks, pension schemes and investment managers – changes in their regulation, taxation, and asset liability management strategies will impact demand and therefore spreads.
- The link needs to be clear as moving to an FS expressed as a proportion of spread would incentivise firms to sell bonds as spreads widen which is pro-cyclical. This crystallises losses, which, if spreads revert to long-term levels over time, the insurer did not need to incur. It can also disrupt the cash flow match between assets and liabilities.
- There is no clearly correct answer here and there is a judgement to be made:
  - If an increase in spreads is a reliable market signal that future downgrades and defaults will be higher then a FS based on spreads is appropriate.
  - However, if an increase in spreads is driven by other factors, an FS based on spreads creates unnecessary volatility in insurers' balance sheets and this does not aid policyholder protection.

Underlying reliance on the speed and accuracy of credit rating processes

- The level of FS is based on an asset's credit rating and so relies heavily on the speed and accuracy of the credit rating processes. If the credit rating is incorrect then so is the FS and MA. As seen in the financial crisis credit rating transitions can lag market sentiment of the perceived risk of a given asset resulting in an overstatement of the MA when credit ratings are deteriorating. However, it is not always the case that an increase in spreads will result in an increase in realised defaults over time.
- For some assets there is no market credit rating. This is common for less traded assets such as debt issued by infrastructure projects. In this position the insurer is required to assess its own internal credit rating (ICR) or purchase a private rating. Although there is PRA guidance that ICRs used within MA funds are expected to align to processes used by external credit rating agencies (see SS3/17), the ICR approach for less traded assets can vary from insurer to insurer in terms of approach and frequency of review which results in different ratings being applied.

Lack of granularity

- The FS has been calibrated with reference to corporate bonds and only has a high level sector/currency split. This results in an insufficient level of granularity for today's MA portfolios, which are likely to include a range of illiquid assets.
- The current FS calibrations do not cover the specific retained risks associated with illiquid assets, which are likely to be significantly different to those of a corporate bond. For instance, a loan secured on a named asset with a bespoke legal contract may have a higher level of operational and expense risk than a corporate bond.
- The current FS calibrations are also based on whole credit quality steps (CQS) and therefore may miss additional information available from notched ratings.

Inconsistency with the solvency capital requirement (SCR)

- The insensitivity of the FS has resulted in the PRA having to provide guidance within SS8/18 on how to approach the FS in the SCR so as not to understate the FS in stress. This results in a discontinuity in approach between the base balance sheet and the SCR.
- Effectively firms are required to imagine a new regulatory regime following a stress where the FS is based on a forward-looking rather than backward-looking assessment of defaults.
- The Solvency II review provides an opportunity to review SS8/18 and create a SCR which works in a more predictable and connected way with the base balance sheet.

Investment restrictions

- There are restrictions on the nature of the assets that can be included in a MA fund:
  - The overall cash flows from the portfolio must be fixed in terms of timing and amount (with the exception of inflation linked assets to match similar cashlows).
  - Assets with cash flows that may be changed at the request of the issuer or a third party are allowed but only provided that in such an event the firm receives sufficient compensation to allow it to obtain the same cash flows by reinvesting in assets of an equivalent or better credit quality.
- Insurers have had to implement robust screening processes to ensure that existing and new assets meet these criteria, the criteria clearly reduce the investable universe available to insurers.
- New applications and approval may be required before new assets can be added to the MA fund depending on the assets in question and the nature of the existing MA application, this creates a barrier to investment in new assets.

3. Reflections on the QIS calibration

The PRA's QIS defined the FS as:

Expected loss (EL)	+	Credit risk premium (CRP)	+	Valuation uncertainty (VU)
(equal to the PD in the current FS)		(subject to floors and caps)		

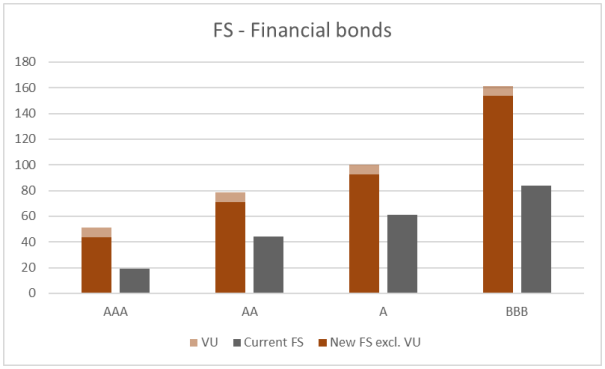
The CRP varies by scenario:

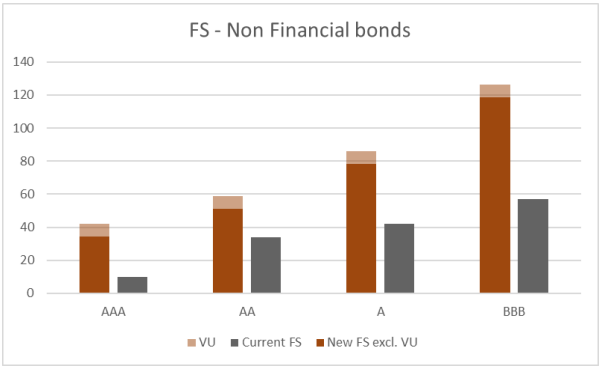
- Scenario A – 25% of current spreads plus 25% of the average spread over the last five years
- Scenario B – 25% of current spreads

3.1 Size of the FS

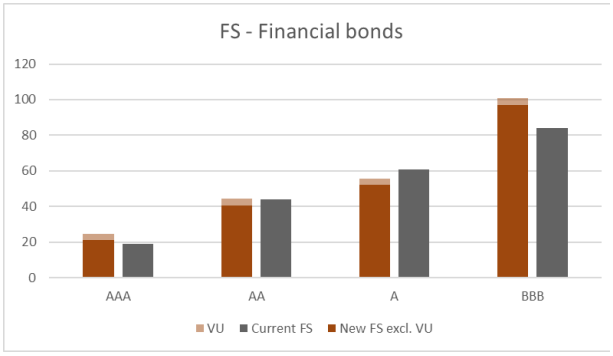
The diagrams below show how the FS varies compared to the current FS for scenarios A and B at 31 December 2020. Under Scenario A there is a large increase in the FS for investment grade assets. The increase is less pronounced under Scenario B but there is still a significant increase for BBB non-financials.

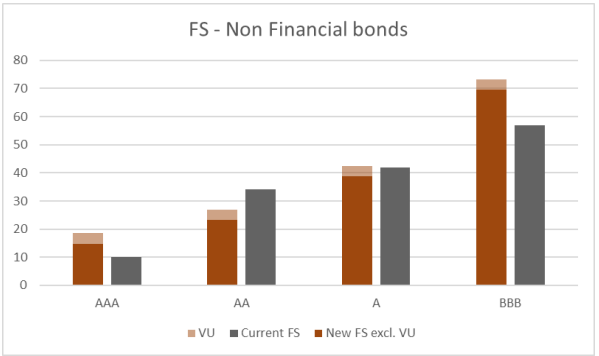
Scenario A





Scenario B





We have assessed the impact of these scenarios on a portfolio designed to be representative of what a typical UK annuity provider would hold but results will vary depending on actual holdings. Overall:

- We would expect a 5-7% increase in the best estimate liabilities under Scenario A.
- We would expect a 0-1% increase in the best estimate liabilities under Scenario B but this is higher if a larger proportion of the portfolio is invested in BBB non-financials.

3.2 Volatility of the FS

The QIS required firms to consider a range of sensitivities. We consider two of these here: a moderate increase in spreads and an extreme increase in spreads from current levels:

- Under the moderate increase in spreads both scenarios show that 25% of the increase in spread feeds through to a higher FS in most situations, subject to the limited impact of the caps, which reduces surplus assets by approximately 2% of the best estimate liabilities.
- Under the extreme increase in spreads the impact of the caps on FS is more apparent:
  - Scenario B does not cap the FS so, unsurprisingly, 25% of the increase in spread feeds through to a higher best estimate liability. Based on our standard portfolio this reduces surplus assets by 14% of the best estimate liabilities.
  - This impact is dampened by the caps in Scenario A and the impact is 8% of the best estimate liabilities.

Both of these results show much higher levels of volatility than the current approach where the balance sheet is protected against spread movements.

In the graphs below we consider how the QIS based FS would have compared to the current FS since the start of Solvency II in 2015. These graphs consider an A-rated bond, the first a financial bond and the second a non-financial bond. The QIS based FS are calculated with reference to index information.

Scenario A

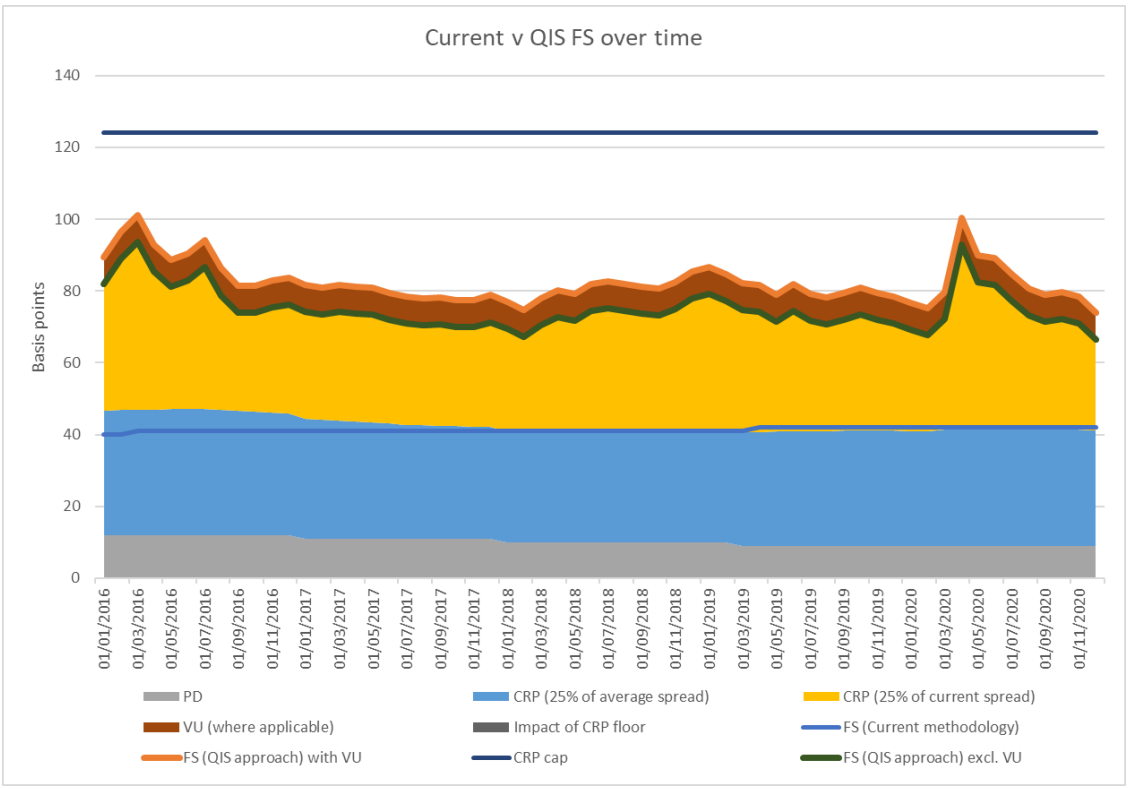
The results show an absolute increase in FS for all assets, with more significant strengthening for AAA and BBB rated assets than for AA and A rated assets. There is also significant volatility introduced by linking the FS to a proportion of current (and recent average) spreads. The cap introduced under scenario A is too high to bite during this period, including during the pandemic, so would not have reduced the impact.

Scenario B

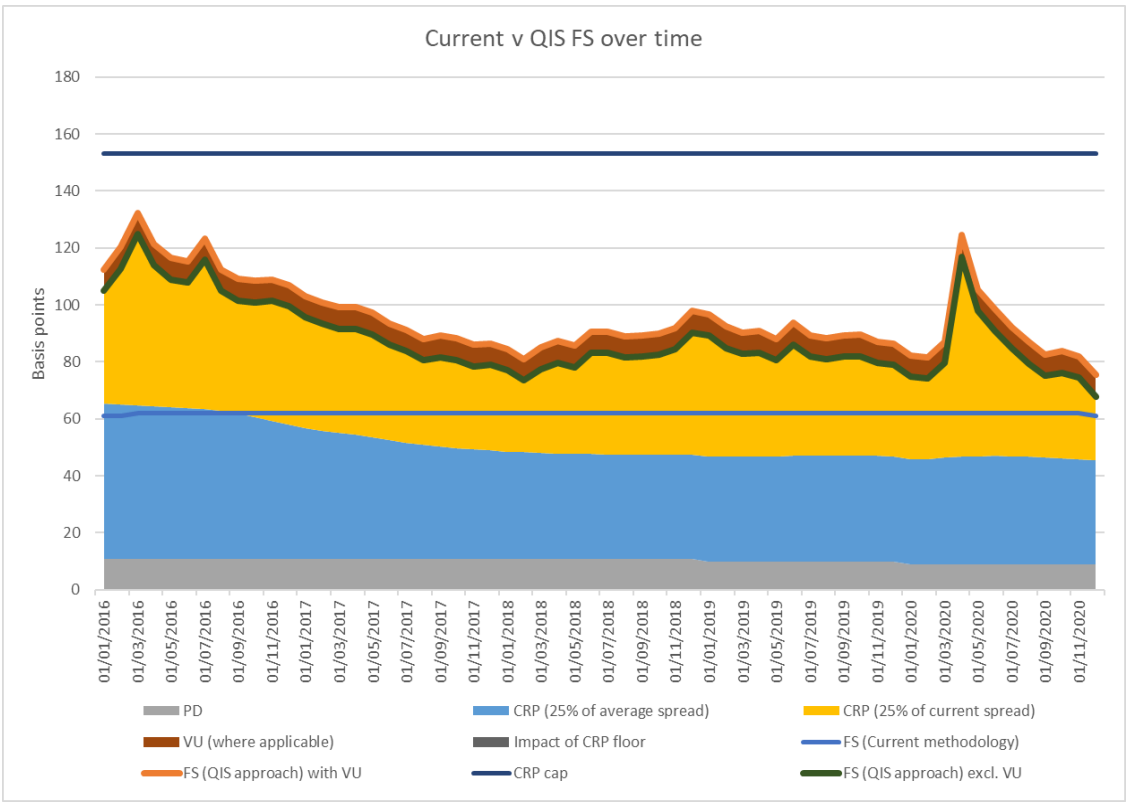
The results show the absolute levels of FS tracking similarly to the current FS for AAA and BB rated assets and below for AA and A rated assets. We also see the impact of the floor underpinning the level of FS in a number of the rating/sector projections.

Scenario A

10-year, non-financial A-rated bond

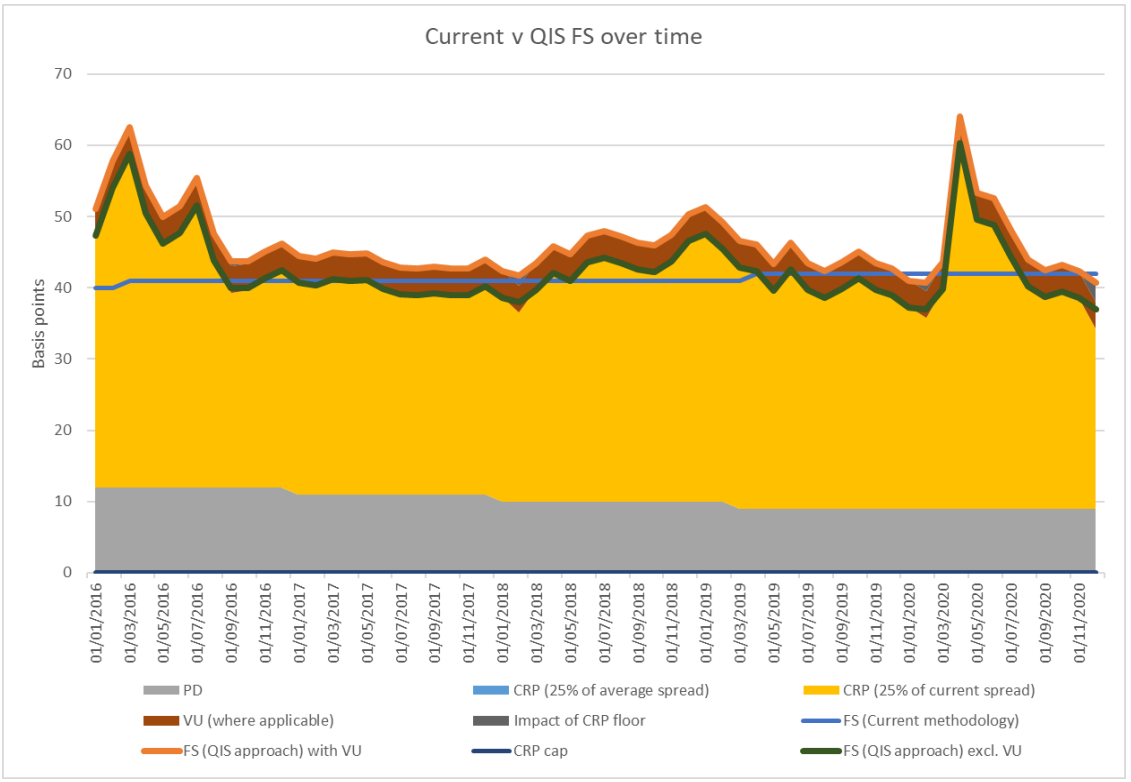


10-year, financial A-rated bond

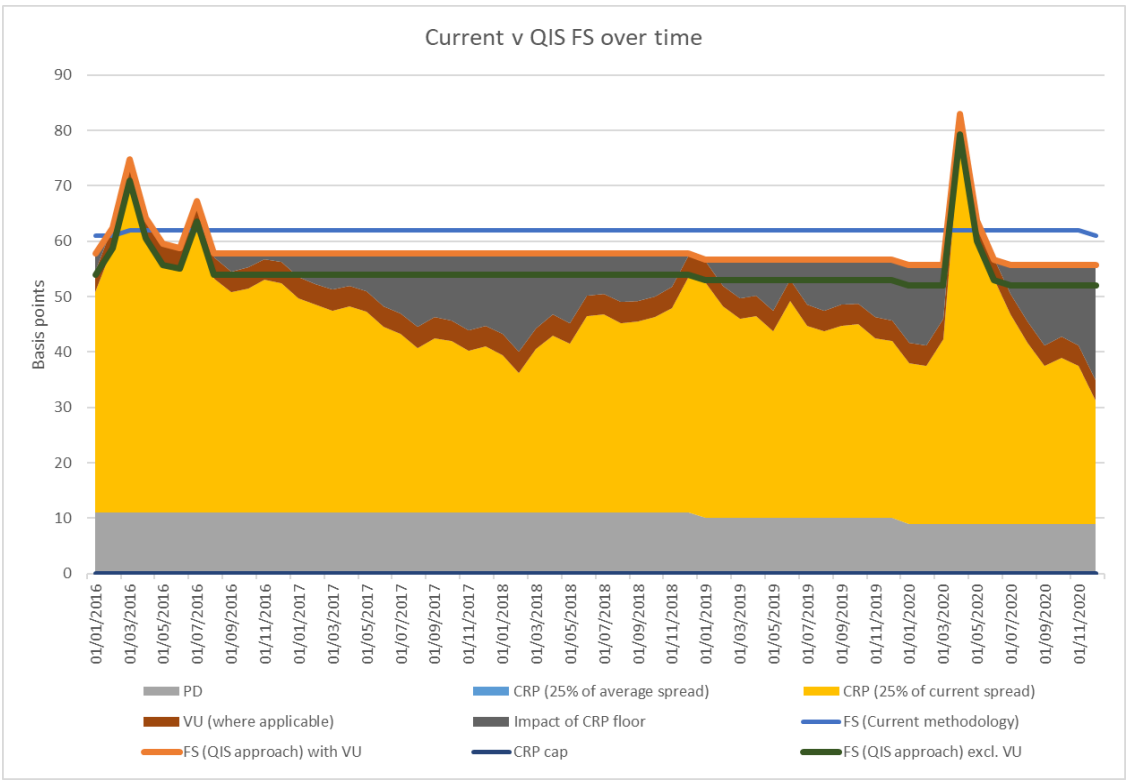


Scenario B

10-year, non-financial A-rated bond



10-year, financial A-rated bond



4. Rethinking the fundamental spread

4.1 Dynamic versus stable FS

Setting the FS is clearly judgemental. Academic research has not come to a conclusion on its size let alone how it varies with credit spreads. This leads us to focus on the aims of the review to consider what judgement is most appropriate.

The review aims to:

Spur a vibrant, innovative, and internationally competitive insurance sector;

Protect policyholders and ensure the safety and soundness of firms; and

Support insurance firms to provide long-term capital to underpin growth, including investment in infrastructure, venture capital and growth equity, and other long-term productive assets, as well as investment consistent with the Government's climate change objectives.

We consider competitiveness and long-term growth before returning to policyholder protection below.

International competitiveness

There are two other main regimes to consider when considering how the UK's competitiveness will be affected.

Solvency II will continue for EU countries, most likely with the current FS unchanged. The FS was almost entirely used by UK firms with annuity books so it will not be a focus for European regulators. A higher FS or a more volatile FS within the UK will make it more attractive to write annuity business within the EU.

Some insurers, classified as Internationally Active Insurance Groups (IAIG), have been informally reporting to their regulators on the Insurance Capital Standard (ICS) as set out by the International Association of Insurance Supervisors (IAIS) since the start of 2020. The goal is to make the ICS compulsory for IAIGs by the end of 2025. The ICS is very similar in structure to Solvency II but the ICS allows an illiquidity premium to be applied to a wider set of liabilities.

The changes in the QIS would make the industry less competitive compared to these regimes, either through a lower MA benefit and/or more volatile balance sheets.The UK market has already seen large amounts of longevity risk reinsured overseas due its treatment within the risk margin. If there is a significant disadvantage between the treatment of the FS in the UK and the equivalent in other territories, the UK could see higher levels of asset default risk being reinsured in the future.

Long-term capital

Insurers are large investors in long-term assets as they are a good match for their long-term liabilities and recent years have seen huge investments in areas such as social housing, infrastructure projects, student accommodation and commercial loans. These assets will form the building blocks for future economic growth and prosperity.

These assets are attractive to investors who know they will not have to trade them at short notice as there are a limited number of buyers and the assets have unique features. Under the current FS regime insurers have been confident they can hold these assets without a short term need to trade. However, a regime where the FS is based on a percentage of spread will change this dynamic and make such assets less attractive.

Policyholder protection and interaction with the solvency capital requirement

Given the current regime has a better outcome for competitiveness and long term investment we need to consider policyholder protection.

Academic research has not come to a conclusion of the size of the liquidity premium but some models suggest that spreads contain valuable information on future defaults. If this is the case then the FS should, at least in part, be driven by spreads.

However, insurers are also required to hold a solvency capital requirement (SCR). When calculating the SCR, firms are required to hold sufficient capital to withstand a 1-in-200-year event. For credit risk this is typically calibrated to experience during the 1930s. Firms are expected to consider what the FS would be in this scenario and calculate the MA benefit on this basis.

The SCR stressed position is static and not driven by current conditions so a stronger base balance sheet position should ideally result in a lower SCR and a weaker base balance sheet position in a larger SCR. If the FS is expressed as proportion of the credit spread, as spreads widen and the FS increases, arguably the SCR should fall to act as a dampening mechanism. Otherwise the insurer will be capitalised to withstand an event more extreme than 1-in-200 years.

The debate around a largely constant FS versus a FS based on spreads can therefore be considered as a debate on where to hold the required capital – either in the technical provisions or in the SCR.

Given this, unless the SCR is fundamentally reviewed, a relatively static FS would be preferable:

- It encourages a buy and hold investment strategy which counteracts procyclicality in the economy.
- It allows insurers to invest with more confidence in illiquid assets such as infrastructure which promote long-term growth.
- Also, from a logistical point of view, the SCR is calculated less frequently and is more complex than the technical provisions so having a static basis for the SCR is operationally easier.

4.2 Allowance for forward looking risks

The FS is currently not specified to appropriately allow for emerging risks in specific sectors:

An underlying assumption of the current FS is that the credit rating is robust - if, for example, the credit rating does not reflect the risk posed by climate change adequately the FS will be incorrect. A reliance on ratings is a fundamental of the current FS but a possible adjustment could be to overlay one of the ESG rating measures available in the market onto the credit rating. While these are still early in their development it will encourage further work to refine the ratings.

As detailed in the academic literature it is not clear that spreads act as a good measure of current credit risk premia. An alternative may be to directly assess current PD and CoD elements of the FS using methods similar to those used by banks for IFRS9. However, as discussed elsewhere in this paper, the impact of the FS should not be considered in isolation and commensurate changes to the SCR would be required. Concerns regarding future-looking changes to the FS may be better dealt with through the SCR and adjustments to the stressed FS for specific assets exposed to future looking long-term risks.

The FS also makes no specific allowance for concentration risk. If forward-looking risks are concentrated in specific sectors or geographies the FS will be understated in these areas. The specific concern for climate change affected assets is that of a systemic risk impacting a whole sector. Concerns regarding concentration risk within a given sector may be better dealt with through the SCR either by bond by bond modelling or concentration adjustments to the stressed FS.

4.3 Increased granularity

The FS is calibrated with reference to corporate bonds only. It differentiates by broad sector, currency and credit quality. This results in an insufficient level of granularity for today's MA portfolios which are likely to include a range of illiquid assets. The lack of illiquid specific FS calibrations mean that the FS does not capture the specific retained risks associated with illiquid assets. One way to better reflect the sensitivity of assets to credit risk without introducing the volatility of short-term spread movement would be to increase the granularity of the FS buckets.

Increasing the granularity of the FS with specific alignment to illiquid assets would improve the sensitivity to risk of the MA without introducing material volatility. Inclusion of notches with the CQS approach would also reduce the risk of excess MA being captured.

4.4 Fixity of cashflows and investment restrictions in the MA fund

Regulation 42 of Solvency II and the PRAs interpretation of it requires each MA eligible assets to provide fixed cash flows. There are some limited allowances for variable cash flows such as: inflation linked cash flows; callable bonds;

redemptions out of the control of issuers; and cash flows with uncertain but bound timings but the allowances are typically on a worst case scenario basis. In addition, compensation requirements requiring the ability to obtain the same cash flows by re-investing in assets of an equivalent or better credit quality clearly reduces the investment options available to insurers and create additional management overheads.

One approach could be to allow for certainty and fixity of assets at the portfolio level rather than at asset level. This would be the same approach as required for liabilities.

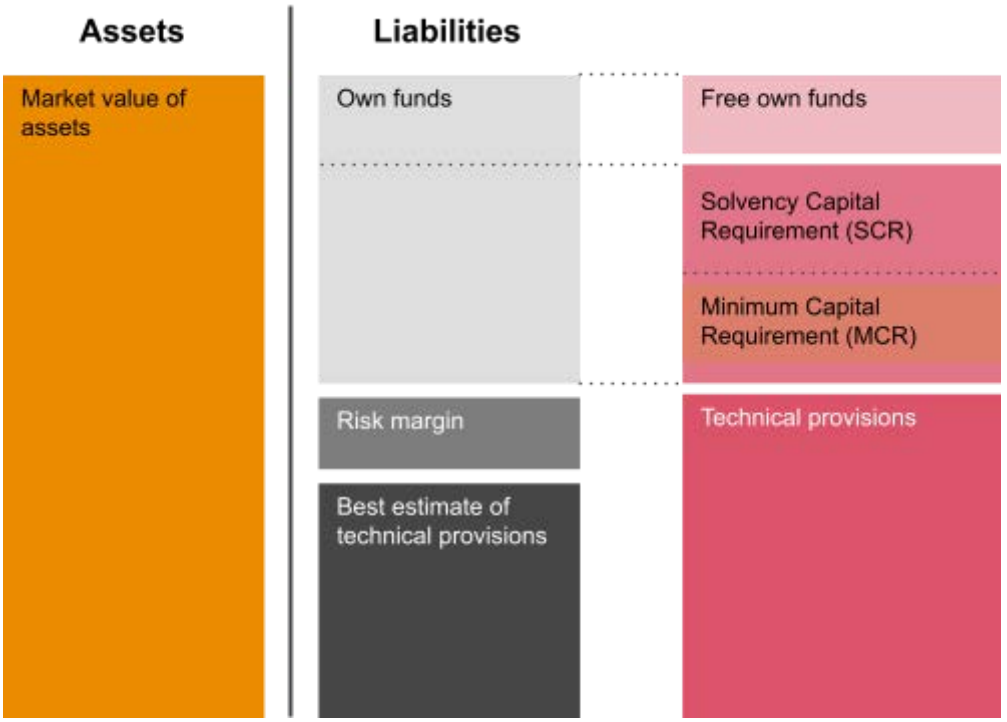
Another could be to take a more economic and proportionate view of timing of cash flows and make-whole clauses by allowing more flexibility in the universe of assets which can be included within the MA portfolio but with suitable haircuts to the level of cash flows allowed. This added flexibility may also allow insurers a more dynamic investment strategy as it would allow them to pursue new assets without necessarily requiring additional PRA approval. Clearly there would be a need to follow the guidance of the Prudent Person Principle in assessing which assets are appropriate and the haircuts required.

Appendix – Solvency II background

Solvency II is based on three pillars:

Pillar 1 sets out the capital requirements. There are rules for valuing the assets and liabilities and the SCR, which is held in addition to the liabilities. The SCR can be calculated using a prescribed standard formula (SF) approach, or by using a company-specific internal model (IM), which has to be approved by the regulator. The results are published in the Solvency and Financial Condition Report (SFCR).	**Pillar 2** covers the required systems of governance and risk management. Each firm is required to carry out an own risk and solvency assessment (ORSA), which identifies all the risks the firm is exposed to, including those not covered under Pillar 1. The results are not published.	**Pillar 3** sets out the disclosure and supervisory reporting regime.

Significant focus is placed on Pillar 1 as it is quantitative and public. It was also the focus of the recent QIS performed by the PRA. The Solvency II balance sheet for an insurer is constructed as in the following diagram.



The aim of Solvency II was to make the solvency balance sheet market consistent, i.e. based on and responsive to market conditions:

- The assets are included at current market value. If there is no quoted market value firms use a mark to model approach – i.e. they estimate the value using a model which is calibrated as far as possible using market information.
- The best estimate liabilities are typically a cashflow projection of the firm's commitments to policyholders based on up-to-date data and discounted at current risk-free interest rates.
- A risk margin is added to the best estimate liabilities to reflect the additional compensation a third party would require to take on the best estimate liabilities – the sum of the best estimate liabilities and the risk margin is known as the technical provisions.
- The SCR is equivalent to the change in own funds following a 1-in-200-year event over the next 12 months.

- In reality insurers hold sufficient surplus to ensure they can cover the SCR even if events reduce the strength of the balance sheet. This is described in terms of a risk appetite – for example, firms might say they want sufficient surplus to be able to cover the SCR even if a 1-in-200-year event were to occur.

The rationale for this structure is that the SCR ensures solvency over the next 12 months and the risk margin provides sufficient funds to recapitalise after a 1-in-200-year event. There is general market consensus that this is a sensible structure. There is significantly more debate about the size and behaviour of the best estimate liabilities, the risk margin and SCR. While the underlying principle is to make the balance sheet market consistent, this principle is broken (intentionally or unavoidably) for certain elements. The matching adjustment, volatility adjustment, risk margin and SCR all have elements which move away from this principle and these areas are typically the ones that are the most contentious.

Appendix – Academic literature

Collin-Dufresne, P., R. S. Goldstein and J. S. Martin (2001). The Determinants of Credit Spread Changes.

The authors conclude that variables that should in theory determine credit spread changes have rather limited explanatory power. Results show they are mostly driven by a single common factor but although they consider several macroeconomic and financial variables the common systematic component cannot be explained. Results suggest that monthly credit spread changes are principally driven by local supply/demand shocks that are independent of both credit-risk factors and standard proxies for liquidity.

Eom, Y. H., J. Helwege and J.-Z. Huang (2004). Structural Models of Corporate Bond Pricing: An Empirical Analysis.

The paper tests five structural models of corporate bond pricing: the predicted spreads in the Merton model are too low but most of the other structural models predict spreads that are too high on average.

Longstaff, F. A., S. Mithal and E. Neis (2005). Corporate Yield Spreads: Default Risk or Liquidity?

Using information in credit default swaps the authors obtain direct measures of the size of the default and non default components in corporate spreads and find that the majority of the corporate spread is due to default risk. This result holds for all rating categories and is robust to the definition of the riskless curve. The non default component is time varying and strongly related to measures of bond-specific illiquidity as well as to macroeconomic measures of bond market liquidity.

Houweling, P., A. Mentink and T. Vorst (2005). Comparing Possible Proxies of Corporate Bond Liquidity

The authors considered nine different proxies to measure corporate bond liquidity and used a four-variable model to control for interest rate risk, credit risk, maturity and rating differences between bonds. They concluded that there is significant liquidity premia, ranging from 13 to 23 basis points. A comparison test between liquidity proxies showed limited differences between the proxies.

de Jong, F. and J. Driessen (2005). Liquidity Risk Premia in Corporate Bond Markets

The authors concluded that corporate bond returns have significant exposures to fluctuations in treasury bond liquidity and equity market liquidity and this liquidity risk is a priced factor for the expected returns on corporate bonds. The total estimated liquidity risk premium was around 0.6% per annum for US long-maturity investment grade bonds and for speculative grade bonds, which have higher exposures to the liquidity factors, the liquidity risk premium was around 1.5% per annum. They found similar evidence for the liquidity risk exposure of corporate bonds for a sample of European corporate bond prices.

Ericsson, J. and O. Renault (2006). Liquidity and Credit Risk.

The authors developed a structural bond valuation model to simultaneously capture liquidity and credit risk. Among other findings they concluded that as default becomes more likely, the components of bond yield spreads attributable to illiquidity increase.

Lewis Webber and Rohan Churm (2007). Decomposing corporate bond spreads – Bank of England Quarterly Bulletin

In this article the authors use a structural credit risk model to examine the extent to which movements in spreads over the previous decade had been driven by credit and non-credit related factors. Compensation for bearing non-credit related illiquidity risk appeared to have been a particularly important driver of high-yield spreads, including during the financial crisis, but the compensation required for credit risk has also increased.

Chen, L., D. Lesmond, and J. Wei (2007). Corporate Yield Spreads and Bond Liquidity

The authors concluded that liquidity is priced in corporate yield spreads. Using a battery of liquidity measures covering over 4,000 corporate bonds and spanning both investment grade and speculative categories they found that more illiquid bonds earn higher yield spreads, and an improvement in liquidity causes a significant reduction in yield spreads.

Chen, L., P. Collin-Dufresne and R. S. Goldstein (2009). On the Relation Between the Credit Spread Puzzle and the Equity Premium Puzzle.

The authors investigate credit spread implications of the Campbell and Cochrane (1999) pricing kernel calibrated to equity returns and aggregate consumption data. Identifying the historical surplus consumption ratio from aggregate consumption data, they found that the implied level and time variation of spreads match historical levels well

Lin, H., J. Wang, and C. Wu (2010). Liquidity Risk and the Cross-Section of Expected Corporate Bond Returns.

The paper considered the pricing of liquidity risk in the cross section of corporate bonds for the period from January 1994 to March 2009.. The results suggested that liquidity risk is an important determinant of expected corporate bond returns.

Bao, J., J. Pan and J. Wang (2011). The Illiquidity of Corporate Bonds.

Using transactions data from 2003 to 2009, the authors concluded that illiquidity in corporate bonds is substantial, and significantly greater than what can be explained by bid–ask spreads and there is a strong link between bond illiquidity and bond prices. In aggregate, changes in market-level illiquidity explain a substantial part of the time variation in yield spreads of high-rated (AAA through A) bonds, overshadowing the credit risk component.

Huang, J.-Z. and M. Huang (2012). How Much of the Corporate-Treasury Yield Spread Is Due to Credit Risk?

The paper concludes that credit risk accounts for only a small fraction of yield spreads for investment-grade bonds of all maturities, with the fraction lower for bonds of shorter maturities, and that it accounts for a much higher fraction of yield spreads for high yield bonds. This conclusion is shown across a wide class of structural models.

Dick-Nielsen, J., P. Feldhutter and D. Lando (2012). Corporate Bond Liquidity Before and After the Onset of the Subprime Crisis.

The authors analyse the liquidity components of corporate bond spreads during 2005–2009 using a new illiquidity measure. The spread contribution from illiquidity increases dramatically with the onset of the subprime crisis. The increase is slow and persistent for investment grade bonds while the effect is stronger but more short-lived for speculative grade bonds.

Helwege, J., J.-Z. Huang and Y. Wang (2014). Liquidity Effects in Corporate Bond Spreads.

The authors examined bonds that are issued by the same firm and that trade on the same day to examine the effects of liquidity in a sample of bond pairs. A significant portion of the spread is left unexplained and it is largely driven by a common unknown factor and they conclude that good proxies for the liquidity component of corporate bond spreads remain elusive.

Nozawa, Y. (2017). What Drives the Cross-Section of Credit Spreads?

Using a variance decomposition approach the author concludes that most of the time-series variation in credit spreads for the market portfolio corresponds to risk premiums.

Culp, C. L., Y. Nozawa and P. Veronesi (2018). Option-Based Credit Spreads.

The authors conclude that bond market illiquidity, investors' overestimation of default risks, and corporate frictions do not seem to explain excessive observed credit spreads but, instead, a risk premium for tail and idiosyncratic asset risks is the primary determinant of corporate spreads.

Feldhutter, P. and S. M. Schaefer (2018). The Myth of the Credit Spread Puzzle.

The authors applied the Black-Cox model to investment-grade spreads and concluded spread was primarily driven by credit factors. Model spreads for speculative-grade debt were too low suggesting bond illiquidity contributed to the yield.

Berndt, A., R. Douglas, D. Duffie and M. Ferguson (2018). Corporate Credit Risk Premia.

The authors measure credit risk premia using Markit CDS and Moody’s Analytics EDF data and conclude there is dramatic variation over time in credit risk premia, with peaks in 2002, during the global financial crisis of 2008–09, and in the second half of 2011.

Du, D., R. Elkamhi and J. Ericsson (2019). Time-Varying Asset Volatility and the Credit Spread Puzzle.

The authors develop a model with priced stochastic asset risk that is able to fit medium– to long-term spreads. The model uses jumps to help explain short-term spreads and is estimated on firm-level data. There is significant time variation in risk premia induced by the uncertainty about asset risk.

Huang, J.-Z., Y. Nozawa and Z. Shi (2019). The Global Credit Spread Puzzle

Using credit spread data in eight developed economies, the authors noted large cross country differences in credit spreads conditional on credit ratings and other default risk measures. The standard benchmark structural models do not replicate credit spreads well and also fail to explain the cross-country variation and their dynamic behaviour. An extended model allowing for illiquidity largely explains credit spreads in cross sections and over time.

Claussen, Kriebel, Pfingsten (2021) The Credit Spread Puzzle – Evidence from a Quasi-Natural Experiment

The authors use the removal of sovereign guarantees for savings banks and state banks in Germany as a unique quasi-natural experiment to identify the credit risk component. During a transition period of over ten years, bonds of the same issuer with and without credit risk could be directly compared. They conclude that less than 20% of the yield spread is due to credit risk for these bonds.

Elkamhi, R., C. Jo and Y. Nozawa (2021). A One-Factor Model of Corporate Bond Premia

A one-factor model based on long-run consumption growth is developed and explains the risk premiums on corporate bond portfolios sorted on credit rating, credit spreads, downside risk, idiosyncratic volatility, long-term reversals, maturity, and sensitivity to the financial intermediary capital factor.

RITM7600916