Guidance for Bespoke Stress Calculation for assessing investment risk

Contents

Part 1. Terminology

1.1   A **Bespoke Stress Calculation** is the PPF's terminology for the calculation of stressed asset values in accordance with our guidance. This calculation will be carried out by or on behalf of the scheme.

1.2   The results of the Bespoke Stress Calculation will need to be submitted as part of the Scheme Return, via Exchange. In order to use this in the levy calculation, schemes will need to supply the following information as at the effective date of the most recently available audited scheme accounts:

     a)   Total stressed asset value
     b)   Total asset value

We will use these to calculate a stress factor (based on the ratio of stressed value to unstressed asset value), which will be applied to the smoothed section 179 value of assets.

1.3   A **standard stress** is a calculation carried out by the PPF based on information supplied by the scheme on Exchange in cases where a bespoke calculation is not necessary and has not been provided voluntarily.

1.4   **Exchange** is the Pensions Regulator's online scheme maintenance system, which schemes should use to notify us of their Bespoke Stress Calculation as part of the Scheme Return. Exchange allows schemes to update information contained on the Scheme Return after the Scheme Return submission deadline. The information used by the PPF will be that held on Exchange as at the relevant Measurement Time (31 March 2020 for the 2020/21 Levy Year).

1.5   **Scheme Return** is the information that schemes are required by legislation to provide to the Pensions Regulator on an annual basis. The Bespoke Stress Calculation fields are a mandatory part of the Scheme Return for the largest schemes and an optional part for all other schemes.

Part 2. Overview of the Bespoke Stress Calculation process

The Board's objectives

2.1   The Board has the following objectives in respect of measuring investment risk:

(a)   to reflect the potential volatility of a scheme's investment strategy in the level of risk-based levy charged; and

(b)   to give schemes that have adopted de-risking strategies the opportunity to obtain appropriate credit for these risk reduction measures.

What this Guidance covers

2.2   Schemes that have protected liabilities of £1.5 billion or more at their most recent Section 179 Valuation must carry out a Bespoke Stress Calculation as, for these schemes, it forms part of the Scheme Return which must (as a statutory requirement) be completed.

2.3   All other schemes may opt to carry out a Bespoke Stress Calculation on a voluntary basis.

2.4   This Guidance covers the process of carrying out and Submitting a Bespoke Stress Calculation for schemes in either scenario.

2.5   This Guidance supplements the Levy Rules in the Determination and the Investment Risk Appendix and should be read in conjunction with those documents; in the event of any conflict between the Levy Rules as described in the Determination and the guidance, the Determination will take precedence.

2.6   This guidance does not cover the calculation of the standard stress which will be carried out by the PPF on behalf of schemes that are not required to and do not opt to carry out a Bespoke Stress Calculation. Where a scheme carries out a Bespoke Stress Calculation, it should not adjust the values to allow for smoothed market conditions or the 'roll-forward' to the Levy Output Date as the PPF will perform this part of the levy calculation. For the same reason, no bespoke calculations are required in respect of the scheme liabilities. Please see the Determination for more information.

2.7   Guidance on the allocation of scheme investments between different asset categories (including a general description of the key characteristics of each asset category as well as some examples) is included in the "help file" accessible on Exchange (Asset Breakdown section of the Scheme Return). A copy of this help file is attached as an appendix to this Guidance, although schemes are encouraged to refer to Exchange for the most up to date version.

2.8   Details on how the bespoke investment stress feeds into the levy calculation are covered in the Levy Rules in the Determination and the Transformation Appendix.

Why might you opt to carry out a Bespoke Stress Calculation?

2.9   All schemes will be allowed to submit a Bespoke Stress Calculation if they choose to do so; however the Board requires that all schemes with section 179 liabilities of £1.5 billion or more will submit this Bespoke Stress Calculation.

2.10   The standard stresses have been calibrated such that in aggregate, the broad risk profile of the universe of pension schemes covered by the PPF is captured.

2.11   The standard and bespoke stresses have been set so as to provide broadly comparable results for the universe as a whole. However, schemes are advised that using the bespoke approach may provide for a reduced or increased levy at the individual scheme level, even if no risk-reducing derivative strategies are in place.

2.12   Schemes with certain types of derivative exposure are encouraged to carry out a Bespoke Stress Calculation in order that the levy more accurately reflects the investment exposure of the scheme. Please refer to Part 5 for further guidance.

2.13   The Board expects that, once a scheme has chosen to submit bespoke results, it will generally continue to do so for future years. However it is quite conceivable that a scheme might find that carrying out the test had less impact on the levy than expected, and with a similar investment strategy in later years might therefore not wish to repeat the bespoke test in future years. The Board has no wish to "trap" schemes in this situation into continuing to perform bespoke tests. On the other hand, it considers there is at least the potential for the bespoke test to be gamed, if schemes were from time to time to shift derivative strategies between risk-reducing and risk-enhancing (where a bespoke test would lead to a higher levy). To tackle this, the Board may seek to understand any unusual pattern in the calculation of bespoke tests, before recognising the results of a bespoke test in a later year.

What does carrying out a Bespoke Stress Calculation involve?

2.14   There are three stages in the Bespoke Stress Calculation:

- For physical assets (i.e. non-derivative investments), a more refined set of asset stresses than the PPF standard stresses detailed at paragraph 4.2 of the Transformation Appendix will be applied to calculate an "initial stressed value of assets". This stage is explained in more detail in Part 4.

    For the avoidance of doubt, any assets held in an ABC Arrangement should be excluded for the purpose of this calculation; see section 4.19 for details.

- For derivative positions (held either on a segregated basis or through pooled funds), schemes will be required to carry out risk factor stress calculations on those derivative positions.   This   stage   is   explained   in   more   detail   in   Part   5.

- The third stage is to combine the results of the risk factor stress analysis with the "initial stressed value of assets".

What level of knowledge and expertise is required to carry out the Bespoke Stress Calculation?

2.15 A detailed understanding of the scheme's investment strategy and the current asset allocation is needed to collate the appropriate information in order to carry out the refined asset stresses element of the Bespoke Stress Calculation, as described in Part 4.

2.16 Where derivative contracts are involved, trustees should take advice from investment professionals who are, in the trustees' opinion, appropriately qualified. We have provided guidance to help carry out these calculations in Parts 5 to 10.

What about the liability stress?

2.17 Liability stresses will be calculated by the PPF for all schemes based on the data supplied in Exchange. This calculation will be carried out in accordance with the Determination and appendices.

What are the submission requirements where the Bespoke Stress Calculation is mandatory?

2.18 The stressed and unstressed asset values need to be submitted as part of the annual Scheme Return, via Exchange, by the Scheme Return deadline (assigned individually to each scheme by the Pensions Regulator).

2.19 Note that the Bespoke Stress Calculation should be revisited each year and updated if appropriate. This requirement to update applies not only because of the assets themselves, but also because of the calculation methods and requirements in the relevant Levy Rules – this is why schemes must work through the Investment Risk Appendix calculations even where the audited scheme accounts have not been updated as compared to the previous Levy Year.

2.20 All the calculations should be carried out as at the same effective date as the audited scheme accounts most recently available at the time the Scheme Return is submitted. The asset breakdown from these accounts is already required as part of the Scheme Return. The Bespoke Stress Calculation should be based on the same information and can be submitted at the same time.

2.21 The Scheme Return is an annual requirement and the Bespoke Stress Calculation should also be updated each year and recorded as part of this. The PPF will calculate levies based on information held on Exchange at the relevant Measurement Time (31 March 2020 for the 2020/21 Levy Year). If more recent audited scheme accounts become available between the Scheme Return deadline, as assigned by the Pensions Regulator, and the Measurement Time, then schemes could choose to update the Bespoke Stress Calculation, provided Exchange is also updated in all respects to reflect the latest accounts (e.g. including the asset breakdown information).

2.22 In the following example, all dates are illustrative except for the Measurement Time.

Suppose:
- Scheme's accounting year end = 30 September 2018
- Date 2018 scheme accounts signed off by the auditors = 31 March 2019
- Scheme Return deadline assigned to scheme by the Pensions Regulator = 31 January 2020
- Date 2019 scheme accounts signed off by the auditors = 29 February 2020
- Measurement Time for 2020/21 PPF Levy = midnight, 31 March 2020

In this case, a Bespoke Stress Calculation should be done as at 30 September 2018, i.e. asset values and PV01 values etc should be measured as at 30 September 2018. This would need to be submitted by 31 January 2020 as part of the Scheme Return. The scheme would have the option, at any time before the next Scheme Return deadline, to update the Bespoke Stress Calculation and the asset breakdown information on Exchange to reflect the latest audited scheme accounts. In this example, once the 2019 scheme accounts are signed off by the auditors on 29 February 2020, the scheme could submit a new Bespoke Stress Calculation as at 30 September 2019. If this second calculation is submitted on Exchange before midnight, 31 March 2020 then it would be used in the 2020/21 PPF Levy; otherwise, the Bespoke Stress Calculation as at 30 September 2018 will be used.

2.23 Schemes that have protected liabilities of £1.5 billion or more at their most recent Section 179 Valuation will not be able to submit their statutory Scheme Return without completing the Bespoke Stress Calculation.

What are the submission requirements where the Bespoke Stress Calculation is voluntary?

2.24 For schemes that have protected liabilities below £1.5 billion at their most recent Section 179 Valuation, the Scheme Return can be submitted without the Bespoke Stress Calculation. The information collected in the Scheme Return can be updated on Exchange at any time through the year. The PPF will calculate levies based on information held on Exchange at the relevant Measurement Time. So in order for the Bespoke Stress Calculation to be taken into account in the levy calculation, the stressed and unstressed asset values need to be submitted on Exchange by the Measurement Time (31 March 2020 for the 2020/21 Levy Year).

2.25   All the calculations should be carried out as at the same effective date as the audited scheme accounts most recently available at the time the Bespoke Stress Calculation is submitted.

How are Bespoke Stress Calculations monitored?

2.26   The PPF will monitor the bespoke results that are reported.   Further information on the calculations underlying the bespoke results may be requested and the PPF may disregard those results which are not verifiable.

Part 3. Sources of information

What information do you need to carry out the Bespoke Stress Calculation?

3.1   The Bespoke Stress Calculation should be carried out as at the same effective date as the most recently available audited scheme accounts. Asset values and exposures should be taken from information in the most recently available audited scheme accounts. This should be the same information as is used to complete the asset breakdown section of the Scheme Return.

3.2   If the scheme accounts do not contain sufficiently detailed information on the exposure to different asset categories then more detailed information, particularly for multi-asset funds and derivative contracts, may need to be provided by asset managers.

3.3   Although the asset allocation should be taken from the scheme accounts rather than from the Statement of Investment Principles, the scheme's latest Statement of Investment Principles may contain information on investment benchmarks which may be helpful when mapping the scheme's investments to the appropriate refined asset stress.

3.4   For derivative positions, risk factor sensitivity information should be available from asset managers, either as part of regular reporting or on request. This information should be collected as at the same effective date as the asset valuation (i.e. latest audited scheme accounts date).

3.5   No allowance should be made for assets whose value is excluded from the most recently available audited scheme accounts, for example any annuity assets that are excluded along with matching liability values. This will generally only be a consideration for accounting dates before 31 December 2015. Where the scheme's Section 179 Valuation submission shows that the asset value includes annuity policies excluded from the relevant accounts, the Bespoke Stress Calculation submitted by the scheme will be adjusted by the PPF to include an allowance for the annuity assets in the submitted stressed and unstressed asset values, unless the accounts underlying the Section 179 Valuation have an accounting date before 31 December 2015 and the accounting date corresponding to the most recently available scheme accounts is on or after 31 December 2015. Details of this calculation are set out in section 4.7 of the Transformation Appendix.

Part 4. Asset stresses

4.1   The PPF recognises that schemes' investment benchmarks may differ from those associated with the standard stresses.

4.2   The PPF is therefore providing a refined set of asset stresses that schemes can use to calculate and submit their own stressed valuation if they believe they provide a closer match to the characteristics of the particular assets held by the scheme. A refined set of asset stresses is provided for equities and bond investments. For all other asset classes it is not practical to divide the categories into greater granularity, so the asset stresses used under the bespoke approach are the same as under the standard approach.

4.3   The asset classes used in the Bespoke Stress Calculation are a refinement of those used in Exchange. Guidance on the allocation of scheme investments between different asset categories is included in the "help file" accessible on Exchange (Asset Breakdown section of the Scheme Return). A copy of this help file is attached as an appendix to this guidance, although schemes are encouraged to refer to Exchange for the most up to date version. This guidance remains relevant in the Bespoke Stress Calculation. A general description of the key characteristics of each asset category in Exchange has been provided. Where a scheme has assets that do not obviously fall into any of these categories, the pension scheme, perhaps in conjunction with their investment advisor or asset manager, can apply judgment as to which category best reflects that asset's characteristics – this may involve dividing the asset amongst more than one category.

4.4   For equities and bond investments, portfolios should be mapped to one or more of the refined asset stresses. Generally the scheme's investment consultant and/or asset manager should be able to apply professional judgment to advise how a portfolio should be broken down and which of the asset stresses are appropriate to each subset. Some general guidance is provided below.

Equities

4.5   For equity investments, there is an additional asset stress for Emerging Markets (as defined in the Investment Risk Appendix). Allocations to Emerging Market equities are normally separately identified within the Statement of Investment Principles and would normally be included in "Overseas equities" for Exchange purposes. For the avoidance of doubt, Trustees are not required to strip out the allocation to Emerging Markets from the rest of the portfolio of overseas equities for the Bespoke Stress Calculation, given that the relevant stress factors are identical.

4.6   Schemes may nonetheless be interested to refer to the classifications adopted by MSCI in its Global Equity Indices. See https://www.msci.com/market-cap-weighted-indexes. Those countries classified as being emerging markets or frontier markets by MSCI would be viewed as Emerging Market for the purposes of the Bespoke Stress Calculation, albeit the distinction is purely presentational.

Bonds

4.7   The main characteristic to identify the most appropriate stress for a bond portfolio (or subset) will be its "maturity". Maturity is a measure of the length of time until the bonds in the portfolio make their final payment. Fixed interest government bond, fixed interest non-government bond and inflation-linked bond portfolios should be split into subsets based on maturity (as per Table 1 below). Fixed interest bonds issued by overseas governments, including Emerging Markets governments, should be treated as fixed interest government bonds.

4.8   For fixed interest non-government bonds, portfolios should also be split into subsets according to whether the bonds are UK or overseas and investment or sub-investment grade. The classification between UK / overseas bonds should be based on the currency of denomination (rather than the country of domicile of the issuing body). Sub-investment grade is often also called "high yield" and this category groups bonds rated BB+ or below by Standard & Poor's or Fitch Ratings or rated Ba1 or below by Moody's Investors Service. 'Secure income alternatives' may be categorised as non-government bonds, but as they are unlikely to carry a formal published rating they should accordingly be treated as sub-investment grade.

4.9   For bonds where credit ratings are available and these are consistent between ratings agencies (in terms of classifying bonds between investment grade and sub-investment grade) these ratings should be used. For unrated and split-rated bonds, the classification may be ambiguous. For bonds with inconsistent ratings, use the following process.

4.10   Where a fund benchmark has defined proportions of investment grade and sub-investment grade bonds, use this proportion to allocate the ambiguous bonds. For example:
   • if a benchmark is 100% investment grade, assume investment grade;
   • if a benchmark is 100% sub-investment grade, assume sub-investment grade;
   • if a mixed benchmark, allocate the bonds for which there is ambiguity in line with the mixed benchmark.

4.11   Where there is no benchmark and a bond has inconsistent ratings, then use the median rating for each bond. For example:
   • if two out of three rating agencies suggest sub-investment grade then assume sub-investment grade (and vice versa);
   • if a bond has only two ratings and they are inconsistent, then assume 50% of the bond value is investment grade and 50% is sub investment grade.

4.12   Leveraged loans should be classified with 'Fixed interest non–government bonds – Global sub-investment grade'.

Currency Hedging

4.13   Pension schemes adopt a wide range of currency hedging strategies, both within and across asset classes. The stresses have been derived assuming that for each asset class the level of currency hedging (if any) is fixed.

4.14   Schemes are not expected, or able, to reflect their specific approach to currency hedging.

LDI Strategies

4.15   An LDI strategy may consist of a cash and derivative strategy or a bond portfolio tailored to the scheme's liability cashflow pattern, or a combination thereof. A buy-in insurance policy may also be treated in a similar way to an LDI strategy. If a scheme has adopted an LDI strategy, then there are two approaches that can be taken, depending on how much data is available from the asset manager. The second approach is likely to be the simpler method and we expect most asset managers should be able to provide the necessary information.

Option 1:   The strategy can be treated as a combination of physical assets and derivatives (with the asset stresses applied to the cash and bond components, and the risk stresses applied to the derivatives). This relies upon the asset manager being able to separately identify the components.

Option 2:   The asset manager may be able to provide interest rate ("PV01") and inflation ("IE01") sensitivities for all the assets within the LDI strategy, in which case all elements could be assessed together in line with Parts 7 and 8 of this Guidance. Option 2 should not be used if the LDI strategy includes any bonds that would be defined as 'fixed interest non-government bonds' on Exchange.

4.16   Care should be taken not to double count the stress applied as a result of taking a mixed approach.

Table 1 Asset stresses

Asset class	Asset class description	Maturity	Asset stress
Equities	UK quoted equities	N/A	-19%
Equities	Overseas developed market quoted equities	N/A	-16%
Equities	Emerging market quoted equities	N/A	-16%
Equities	Unquoted/private equity	N/A	-19%
Property	Property	N/A	-5%
Hedge funds	Hedge funds	N/A	-3%
Commodities	Commodities	N/A	-14%

Asset class	Asset class description	Maturity	Asset stress
Fixed interest government bonds	Short maturity	0 to 5 years	+2%
Fixed interest government bonds	Medium maturity	5 to 15 years	+6%
Fixed interest government bonds	Long maturity	Over 15 years	+15%
Inflation-linked bonds	Short maturity	0 to 5 years	+1%
Inflation-linked bonds	Medium maturity	5 to 15 years	+5%
Inflation-linked bonds	Long maturity	Over 15 years	+18%
Fixed interest non-government bonds	UK short- and medium-dated investment grade	0 to 15 years	+2%
Fixed interest non-government bonds	UK long-dated investment grade	Over 15 years	+5%
Fixed interest non-government bonds	Overseas short- and medium-dated investment grade	0 to 10 years	+2%
Fixed interest non-government bonds	Overseas long-dated investment grade	Over 10 years	+5%
Fixed interest non-government bonds	Global sub-investment grade	All maturities	-6%
Cash and net current assets	Cash and net current assets	N/A	0%
Annuities	Annuities	N/A	+16%
Insurance Funds[1]	Insurance Funds	N/A	-19%
Other	Other	N/A	-19%

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[1] To the extent that this cannot be broken down into component asset classes (see Exchange Help File included as an appendix to this document).

Future developments in pension scheme investment strategies

4.17   The investment strategies adopted by pension schemes will be kept under review and further guidance may be issued if developments in strategies require additional clarification. Current trends being kept under review by the PPF include:

4.18   Trigger-based investment strategies

     4.18.1   A recent trend in pension scheme investment strategies has been the development of trigger-based investment strategies whereby pension schemes set market or scheme funding levels at which they envisage making changes to strategic asset allocations.

     4.18.2   Where such mechanisms are written into asset manager documentation, we would expect schemes to consider how they interact with our stress factors; however such strategies tend to target "de-risking" in situations where funding levels improve, which are opposite to the scenarios being assessed through stress analysis.

4.19   ABC Arrangements

     4.19.1   Some companies have provided investments to their pension schemes via the scheme trustee becoming a limited partner in a limited partnership (alongside another entity in the employer's group) which provides security to the pension scheme over a future stream of income related to assets on the company's balance sheet.

     4.19.2   Such strategies are distinct from contingent assets as their payment is not purely contingent on a future insolvency event. The Board has classified these strategies as an "ABC Arrangement".

     4.19.3   As ABC Arrangements are excluded from the asset value used to determine underfunding risk[2]; they should also be excluded from the assets used in the bespoke stress calculation.

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[2] See paragraphs 4.4.2 and 4.4.3 of the 2020/21 Transformation Appendix.

Part 5. Risk factor stresses

What are risk factor stresses for?

5.1   There are a range of derivatives that schemes may buy or sell that alter their risk exposure such that analysis limited to physical assets would not accurately reflect the risks in the investment strategy. The risk factors form the building blocks from which the asset stresses in Part 4 have been derived. In the case of physical asset categories the sensitivity to each risk factor is well defined so asset stresses can be derived; however, for derivative positions the sensitivity to each risk factor could vary widely so asset stresses are not provided.

5.2   Schemes that have derivatives in their portfolio will need to carry out additional analysis of the impact of risk factor stresses on their derivative positions after applying the refined asset stresses to all non-derivative investments.

5.3   Some asset managers whose mandate principally covers the investment of physical assets may have some freedom to employ small short-term derivative positions from time to time as part of their efficient portfolio management. In these cases, schemes should be able to use the asset stress methodology described in Part 4 above, rather than using the risk factor stresses. Where a breakdown by asset class is required, this should reflect the effective economic exposures of the portfolio (as indicated in the manager's regular reporting).

How do I determine whether my scheme has derivatives?

5.4   Reference to derivatives is only intended to capture the use of derivatives as an explicit part of the trustees' long-term investment strategy (e.g. as documented in the scheme's Statement of Investment Principles or within the investment mandate given to asset managers). This can be either as a segregated holding or within pooled funds.

5.5   Reference to derivatives is not intended to refer to short-term derivative positions. Where there is an intention that a derivative position will be unwound, and not rolled over, within six months, the derivative should not be included in the risk factor stress analysis. Where the market value of any such short-term derivative position is separately identifiable, this value should be classified as cash and treated in line with Part 4 above (asset stresses). Where derivatives are used by asset managers for efficient management of their portfolios, and therefore form only an implicit part of the investments, they should be treated in line with the rest of the portfolio using Part 4 above (asset stresses).

5.6   Subject to 5.4 and 5.5 above, if the answer to any of the questions in section 5.7 is "Yes", then the scheme should be treated as having derivative strategies and will be required to carry out risk factor stress analysis (if carrying out the bespoke investment stress). Derivative positions can either be held on a segregated basis or through pooled funds. The questions set out in section 5.7 are non-exhaustive; schemes should consider whether any other relevant considerations apply.

5.7   The scheme's investment advisor and/or asset manager will be able to advise if such investments are held by the scheme. They may also be best placed to carry out the stress calculations on behalf of the scheme; however if the scheme wishes to calculate the stresses themselves, we provide further guidance and some worked examples in Parts 6 to 10.

1. **Does your scheme have investment in any of the following equity derivative strategies?**

An equity derivative strategy is one where the scheme has entered into a contract with another party to pay or receive a series of payments (or one single payment) whose amounts are determined by the future movement of equity markets.

Example equity derivative strategies:

Equity futures or forward contracts: these contracts promise to pay the holder the return on an equity index (e.g. FTSE 100, or S&P 500) or an individual share.

Equity total return swaps: these contracts promise to pay the contract holder the total return on an equity index (e.g. FTSE 100 or S&P 500) in return for a series of payments from the contract holder to the counterparty.

Equity options: these contracts give the buyer the right, but not the obligation, to buy (or sell) some equities at a particular strike price. These contracts are typically used to protect the scheme from equity markets falling below a certain level, in return for paying an upfront premium (e.g. a "put option" or "put spread"). In some cases, schemes may also have agreed to limit their gain from rising equity markets, in return for receiving an upfront premium (e.g. a "call option" or "call spread").   Most other commonly used option strategies are typically combinations of buying or selling put or call options (e.g. "put collar").

2. **Does your scheme have any direct investment in interest rate derivative strategies?**

An interest rate derivative strategy is one where the scheme has entered into a contract with another party to pay or receive a series of payments (or one single payment) whose amounts are determined by the future movement of interest rates.   They are a common component of "LDI" investment strategies. They typically consist of interest rate swaps and protect the scheme's funding level volatility from interest rate movements. Some schemes may enter these contracts directly with counterparties, or they can be done through pooled funds – often called "LDI" pooled funds.

As well as swaps, these strategies could include swaptions, gilt repos or gilt total return swaps.

If you have these strategies, you will need either to request the stress calculation from the asset manager/investment consultant or carry out the calculation yourself with some information from the asset manager. In the latter case you should ask your asset manager for the "PV01" (also known as "DV01") of the portfolio, i.e. the sensitivity of the portfolio value to a one basis point (or 0.01 per cent) change in interest rates at all durations. The market standard for

calculating "PV01" is to use the spot rate curve, however, if it is not available you may use the par rate curve.

3. **Does your scheme have any direct investment in inflation derivative strategies?**

    An inflation derivative strategy is one where the scheme has entered into a contract with another party to pay or receive a series of payments (or one single payment) whose amounts are determined, in whole or part, by the future movement of inflation rates. They are a common component of "LDI" investment strategies. They typically include inflation swaps and protect the scheme's funding level volatility from changes in inflation. Some schemes may enter these contracts directly with counterparties, or they can be done through pooled funds – often called "LDI" pooled funds.

    If you have these strategies, you will either need to request the stress calculation from the asset manager/investment consultant or carry out the calculation yourself with some information from the asset manager. In the latter case you should ask your asset manager for the "PV01" and "IE01" of the portfolio, i.e. the sensitivity of the portfolio value to a one basis point (or 0.01 per cent) change in interest rates and inflation respectively[3].

4. **Does your scheme have any direct investment in credit derivatives?**

    A credit derivative strategy is one where the scheme has entered into a contract with another party to pay or receive a series of payments (or one single payment) whose amounts are determined by the future movement of credit spreads or a credit event. The most common credit derivative is a credit default swap where the scheme has agreed to make a series of payments to buy or sell protection against the default of a corporate bond or corporate loan. They are commonly used by pension schemes to manage sizeable exposures to corporate bond/loan issuers or to mitigate the risk of sponsor insolvency.

    If you have these strategies, you will either need to request the stress calculation from the asset manager/investment consultant or carry out the calculation yourself with some information from the asset manager. In the latter case you should ask your asset manager for the "CDD01" of the portfolio, i.e. the sensitivity of the portfolio value to a one basis point (or 0.01 per cent) change in credit spreads.

Risk factor stresses

5.8   The risk factor stresses are set out in Table 2 below. It should be noted that the interest rate and inflation risk factor stresses are applicable to par or spot swaps rates as well as government bond yields.

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[3] Although the primary risk factor within inflation swaps will be inflation risk, the market value of the swaps contract will also have sensitivity to interest rates. On day 1, this sensitivity will be zero (for an unfunded swap).

5.9 For the 2018/19 Levy Year, the derivation of the Interest rate and Inflation risk factor stresses was altered. We have produced nominal rate and real rates stress factors and derived the interest rate and inflation stress factors from these, as follows:
- Interest rates stress factor = nominal rate stress factor
- Inflation stress factor = nominal rate stress factor – real rates stress factor

5.10 It should be noted that for the 2018/19, 2019/20 and 2020/21 Levy Years, this approach has resulted in a negative Inflation stress factor.

Table 2 Risk Factor Stresses

Credit	Interest rates	Inflation	UK Equity	Non-UK Developed Equity	Emerging Market Equity
+38bps	-75bps	-14bps	-19%	-16%	-16%

Applying risk factor stresses to derivative strategies

5.11 There are numerous derivative strategies that are available to schemes in both segregated and pooled format and it is not practical to provide an exhaustive list of strategies. As noted earlier, investment consultants or asset managers will be able to assist schemes in determining whether such strategies are in place. We expect that the examples in Parts 6 to 9 will cover most common strategies used by pension schemes:

Equity futures

Equity total return swaps

Equity options

Fixed income futures

Gilt futures

Gilt total return swaps

Gilt repos

Interest rate swaps (typical component of an "LDI" strategy)

Inflation swaps (typical component of an "LDI" strategy)

Interest rate swaptions

Credit default swaps

5.12 The underlying principle to be applied is that the stress calculation should reflect only the change in intrinsic value[4] for any option contract; and for any other derivative, the standard measures of risk factor sensitivity applicable to that strategy (e.g. PV01, IE01, CDD01). Examples

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[4] The intrinsic value of an option is the value that would be realised if the option expired immediately. The market value also takes into account the time value of the option arising from potential changes in intrinsic value between the valuation date and actual future expiry date. The time value is primarily driven by the volatility of the underlying instrument. For the holder of an option, the intrinsic value is typically lower than the market value.

A – E in Parts 6 – 10 below relate to some of the more common types of derivative contracts that are used by pension schemes in the UK. Should a scheme's specific approach to derivatives not be captured by the examples, that scheme should ask its investment consultant or asset manager to apply the risk factor stresses in a consistent way by considering the overall economic exposure of the pension scheme.

5.13   Where strategies are exposed to more than one risk factor, the impact should be assessed separately and aggregated.

5.14   There are three stages in the Bespoke Stress Calculation:

    (a)   Stage 1, covered in part 4 of this Guidance, is to calculate the initial stressed value of assets (before adjusting for any derivative stress).
    (b)   Stage 2, covered in part 5 of this Guidance, is to apply risk factor stresses to the derivative positions.
    (c)   Stage 3 is to aggregate the results of Stage 1 and Stage 2. See the example in Part 10.

5.15   The initial stressed value of assets calculated in Stage 1 should include the unstressed market value of the derivatives – which can be positive or negative – as well as taking into account all related liabilities e.g. any premiums due to be paid (the value should be as included in the most recently available audited scheme accounts). No asset stresses should be applied to the derivative market values when calculating the initial stressed value of assets.

Part 6. Equity derivatives

Equity futures

The stress on an equity futures position is the notional exposure of the futures position, multiplied by the relevant equity risk factor stress. The calculation may need to be carried out more than once to reflect whether the position is capturing UK equity, non-UK developed markets (i.e. overseas markets) equity or emerging market equity risk.

Input parameters

Calculation date	*Effective date of the most recently available audited scheme accounts*
Notional exposure of futures position at the calculation date	*N*
Equity risk factor stress (note this is different for UK, non-UK developed and emerging markets)	*d_equity*

Notional exposure is defined to be the economic exposure of the position at the date of inception, adjusted in line with the relevant equity index return from the date of inception to the calculation date.

Calculations
The impact of the stress on the portfolio =   *N × d_equity*

This amount should be added to the initial stressed value of assets, so that if a scheme holds:
- a long position, the overall asset value is reduced;
- a short position, the overall asset value is increased.

Equity forward contracts and equity total return swaps can be valued in a similar way to equity futures.

Equity option

The stress on the equity option is the change in the intrinsic value of the option as a result of applying the appropriate stress to the underlying equity index. The calculation is set out below and should be carried out separately for each option that the scheme has.

Input parameters

Calculation date	*Effective date of the most recently available audited scheme accounts*
Strike price of option	*S*
Level of the underlying index at the calculation date	*P*
Notional option exposure at the calculation date	*E*
Equity risk factor stress (note this is different for UK, non-UK developed and emerging markets)	*d_equity*

Notional exposure is defined to be the economic exposure of the position at the date of inception, adjusted in line with the relevant equity index return from the date of inception to the calculation date.

Calculation of intrinsic values and stress impacts

A. *Equity put option*
1.   Calculate current intrinsic value of option

$$\text{Value\_I} = \max [0, E \times (S - P) \div P]$$

2.   Calculate stressed level of index

$$P\_stress = P \times (1 + d\_equity)$$

3.   Calculate stressed intrinsic value of option

$$\text{Value\_S} = \max [0, E \times (S - P\_stress) \div P]$$

4.   Calculate stress impact to apply

$$\text{Equity\_stress} = \text{Value\_S} - \text{Value\_I}$$

B. *Equity call option*
1.   Calculate current intrinsic value of option

$$\text{Value\_I} = \max [0, E \times (P - S) \div P]$$

2.   Calculate stressed level of index

$$P\_stress = P \times (1 + d\_equity)$$

3.   Calculate stressed intrinsic value of option

$$\text{Value\_S} = \max [0, E \times (P\_stress - S) \div P]$$

4.   Calculate stress impact to apply

$$\text{Equity\_stress} = \text{Value\_S} - \text{Value\_I}$$

Adjustment to be applied to initial stressed value of assets

If the scheme has bought the option, the Equity_stress should be added to the overall asset value.

If the scheme has sold the option, the Equity_stress should be subtracted from the overall asset value.

So, where Equity_stress is non-zero, the impact on the overall stressed value of assets will be as follows:
- increase for put option bought
- decrease for put option sold
- decrease for call option bought
- increase for call option sold (we would expect this to be an unusual position for a pension scheme to take unless in combination with other equity options that are bought.)

The vast majority of equity option-based strategies can be deconstructed into a number of the above component parts. For example, a zero cost collar is made up of buying a put option and selling a call option (at different strike prices). A put spread is a combination of buying a put option and selling another put option at a different strike price. Each element of these should be valued separately and the stresses added together.

Example A – Equity options

A pension fund has the following positions as at its latest audited scheme accounts date:

A) It holds an unexpired put option that it bought on the UK FTSE 100 Index with a strike price of 3,800 and notional exposure of £100m.

B) It has sold an unexpired call option on the US S&P 500 Index with a strike price of 550 and notional exposure of £75m.

At the latest audited scheme accounts date, the initial stressed value of the fund's assets (after applying the refined asset stresses to the fund's non-derivative investments and including the unstressed market value of the options) is £500m and the levels of the UK FTSE 100 Index and US S&P 500 Index are 3,926 and 798 respectively. It has no other derivative strategies.

Calculations
A. Intrinsic value of put option on UK FTSE 100 Index

S = 3,800
P = 3,926
E = £100m
d_equity = –19%

1. Value_I = max [0, E x (S – P) ÷ P]

   = max [0, £100m x (3,800 – 3,926) ÷ 3,926]

   = £0m

2. P_stress = P × (1 + d_equity) = 3,926 × (1 – 19%)

   = 3,180

3. Value_S = max [0, E x (S – P_stress) ÷ P]

   = max [0, £100m x (3,800 – 3,180) ÷ 3,926]

= £16m

4. Equity_stress = Value_S – Value_I

                                    = £16m – £0m = £16m

B. Intrinsic value of call option on US S&P 500 Index

S = 550
P = 798
E = £75m
d_equity = –16%

1. Value_I = max [0, E x (P – S) ÷ P]

                                    = max [0, £75m x (798 – 550) ÷ 798]

                                    = £23m

2. P_stress   = P × (1 + d_equity)

                                    = 798 × (1 – 16%)

                                    = 670

3. Value_S   = max [0, E x (P_stress – S) ÷ P]

                                    = max [0, £75m x (670 – 550) ÷ 798]

                                    = £11m

4. Equity_stress = Value_S – Value_I

                                    = £11m – £23m = –£12m

C. Overall stressed asset value

                                    = Initial stressed value of assets + Equity_stress (put option bought) -
                                    Equity_stress (call option sold)

                                    = £500m + £16m – (–£12m)

                                    = £528m

Part 7. Interest rate derivatives

The most common interest rate derivatives used by pension funds in the UK are swaps contracts. These can be held in either segregated or pooled format, the latter commonly described as "LDI".

Some schemes may also use gilt repos, gilt futures, gilt total return swaps or interest rate swaption strategies, which will typically be on a segregated basis.

The stress calculation quantifies the change in the value of the derivative contract associated with the interest rate risk factor stress.

Swaps contracts

Swaps contracts are between two parties – one pays a floating interest rate, the other pays a fixed interest rate. It is most typical for pension funds (or pooled funds on their behalf) to enter into contracts where they are receiving a fixed interest rate from the counterparty (and hence paying the floating interest rate).

Input parameters

Calculation date	*Effective date of the most recently available audited scheme accounts*
PV01 of the portfolio at the calculation date This can be obtained from the asset manager. This is the sensitivity of the portfolio value to a one basis point (or 0.01 per cent) change in interest rates.	*PV01*
Interest rate risk factor stress	*d_rates* (basis points)

Calculations
The impact of the interest rate stress on the portfolio is *PV01 × d_rates*

Typically, pension funds (or pooled funds on their behalf) will be receiving the fixed leg of an interest rate swap, in which case the absolute value of the stress impact should be added to the overall asset value.

If the fund (or pooled fund on its behalf) is paying the fixed leg of an interest rate swap, the absolute value of the stress impact should be deducted from the overall asset value.

Scheme/Pooled fund position	**Effect on overall stressed asset value**
Receive fixed, pay floating	Add absolute value of interest rate stress
Receive floating, pay fixed	Deduct absolute value of interest rate stress

Swaptions contracts

Interest rate swaptions are options to enter into a swaps contract at some defined point in the future. A pension fund can either be the buyer or seller of the option and can be either paying or receiving the fixed interest rate on the resulting swaps contract.

Interest rate swaptions are complex instruments and the intrinsic value of a swaption requires schemes both to have an assessment of the market's expectation of the future evolution of interest rates as well as the ability to carry out a theoretical swap valuation. Both these pieces of information are difficult to define in generality.

The number of schemes with swaptions strategies is currently anticipated to be extremely low and any such schemes would be expected to have the governance or ability to have specific stress analysis carried out by their asset manager or investment consultant. Such schemes should ask their asset manager or investment consultant to assist with the calculation.

Asset managers and investment consultants should note that:

- The interest rate risk factor is a parallel shift in the spot rate curve. For swaption calculations, in theory the equivalent impact on the forward rates would need to be assessed. But applying the same parallel shift to the forward rate curve is a reasonable approximation.
- Non-zero intrinsic values will only occur when the swaption is in-the-money.[5] The intrinsic value in these cases will be the value of the swap contract assuming the swaption expires immediately and that the swap rate is the forward rate.

Gilt derivatives

Gilt derivatives include gilt repos, gilt futures and gilt total return swaps. Derivatives of overseas government bonds (e.g. US Treasury futures, German bund futures) and bonds issued by supranational organisations may also be included here.

Pension schemes may hold these instruments to give them synthetic exposure to the underlying gilts. The calculation of the stress is similar to that for swaps. We would expect pension schemes to be the holders of these instruments, rather than the seller.

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[5] A receiver-swaption is in-the-money if the forward rate of the underlying swap at the maturity of the option is lower than the strike-rate of the swaption. A payer-swaption is in-the-money if the forward rate of the underlying swap at the maturity of the option is greater than the strike-rate of the swaption.

Input parameters

Calculation date	*Effective date of the most recently available audited scheme accounts*
PV01 of the portfolio at the calculation date This can be obtained from the asset manager. This is the sensitivity of the portfolio value to a one basis point (or 0.01 per cent) change in interest rates.	*PV01*
Interest rate risk factor stress	*d_rates* (basis points)

Calculations

The impact of the interest rate stress on the portfolio is *PV01 × d_rates*

Where the synthetic exposure is a long position in gilts, the stress calculation would have the effect of increasing the overall stressed asset value, and vice versa.

Example B – Interest rate swaps

A pension fund has £5m notional of interest rate swaps, on which it is paying floating rate and receiving fixed rate. The total initial stressed value of the pension fund's assets (after applying the refined asset stresses to the fund's non-derivative investments and including the market value of the swaps) at the latest audited scheme accounts date is £25m. The fund has no other derivative contracts.

The asset manager has provided the following information on the contract as at the latest audited scheme accounts date:

Market value   = £265,204
PV01   = –£14,761

The risk factor stress from Table 2 is:
d_rates   = –75bps

Calculations

Impact of the Interest Rate Stressed Value(IRSV)	= PV01 x d_rates
	= –£14,761 × –75
	= £1,107,075

The absolute value of this stress is added to the initial stressed value of assets as the fund is receiving fixed rate payments.

Overall stressed asset value = Initial stressed value + absolute value of IRSV

                 = £25m + £1,107,075

                 = £26,107,075

Part 8. Inflation derivatives

The stress calculation quantifies the change in the value of the derivative associated with the inflation risk factor stress.

In addition, although the primary sensitivity of the derivative will be to inflation, over time the derivative will increase or decrease in value, such that its market value on any particular day will not be zero. To the extent the market value is non-zero, inflation derivatives will also have sensitivity to interest rate risk.

The inflation risk factor and interest rate risk factor stresses will be applied independently of each other. A more accurate calculation could be considered by applying the inflation risk factor stress first and then applying the interest rate risk factor stress to the stressed value of the derivative contract. We are not proposing this more complex approach because the PV01 and IE01 data provided by the asset manager will only reflect the market conditions at the specific date.

Input parameters

Calculation date	*Effective date of the most recently available audited scheme accounts*
IE01 of the portfolio at the calculation date. This can be obtained from the asset manager. This is the sensitivity of the portfolio value to a one basis point (or 0.01 per cent) change in inflation.	*IE01*
PV01 of the portfolio at the calculation date. This can be obtained from the asset manager. This is the sensitivity of the portfolio value to a one basis point (or 0.01 per cent) change in interest rates.	*PV01*
Market value of inflation swaps contract	*Value*
Inflation risk factor stress	*d_inf* (basis points)
Interest rate risk factor stress	*d_rates* (basis points)

Calculations

The impact of the inflation stress (ISV) is	*IE01 × d_inf*
The impact of the interest rate stress (IRSV) is	*PV01 × d_rates*

Step 1: Applying the inflation stress

Typically, pension funds (or pooled funds on their behalf) will enter inflation swaps as the receiver of the inflation linked payments. In this case, the absolute value of the inflation stress impact should be **deducted** from the overall stressed asset value.

If the fund (or pooled fund on its behalf) is paying inflation-linked payments, the absolute value of the inflation stress impact should be **added** to the overall stressed asset value.

Step 2: Applying the interest rate stress

If the market value of the inflation swaps contract is positive, the absolute value of the interest rate stress impact should be **added** to the overall stressed asset value.

If the market value of the inflation swaps contract is negative, the absolute value of the interest rate stress impact should be **deducted** from the overall stressed asset value.

Scheme or pooled fund position	Market value of inflation swap	Effect on overall stressed asset value
Receive inflation, pay fixed	Negative	1) Deduct absolute value of ISV 2) Deduct absolute value of IRSV
Receive inflation, pay fixed	Positive	1) Deduct absolute value of ISV 2) Add absolute value of IRSV
Receive fixed, pay inflation	Negative	1) Add absolute value of ISV 2) Deduct absolute value of IRSV
Receive fixed, pay inflation	Positive	1) Add absolute value of ISV 2) Add absolute value of IRSV

Example C – Inflation swaps

A pension fund has £5m notional of inflation swaps in a pooled fund. On behalf of the pension fund, the pooled fund manager is paying fixed rate and receiving inflation. The total initial stressed value of the pension fund's assets (after applying the refined asset stresses to the fund's non-derivative investments and including the market value of the swaps) at the latest audited scheme accounts date is £13m. The fund has no other derivative contracts.

The pooled fund manager has provided the following information on the inflation swaps contract as at the latest audited scheme accounts date:

Market value   = –£250,908
IE01   = £12,643
PV01   = £908

The risk factor stresses from table 2 are:

d_inf = –14bps
d_rates = –75bps

Calculations
Calculate Inflation Stressed Value (ISV)   = IE01 x d_inf
                                                  = £12,643 × –14
                                                  = –£177,002

Calculate Interest Rate Stressed Value (IRSV)   = PV01 x d_rates
                                                  = £908 × –75
                                                  = –£68,100

Step 1: Applying the inflation stress
The absolute value of ISV is deducted from the overall stressed asset value as the fund is receiving inflation-linked payments.

Step 2: Applying the interest rate stress
As the market value of the swap is negative, the absolute value of IRSV is deducted from the overall stressed asset value.

Overall stressed asset value
= Initial stressed value of assets - absolute value of ISV – absolute value of IRSV
= £13m – £177,002 – £68,100
= £12,754,898

Example D – Index-linked gilt repos

A pension fund has entered into a repo arrangement in respect of its long-dated index-linked gilt portfolio. As a result of this arrangement the portfolio comprises actual physical gilt holdings, gilts out on repo and a cash obligation for gilt repurchase.

The assets at the latest audited scheme accounts date total £110m, broken down as follows:

Long-dated index-linked gilts: £105m
Cash: -£200m
Gilt repos (market value):   £205m

The gilt repos have a PV01 of -£300,000 and an IE01 of £300,000.

Step 1: Calculate the initial stressed value of assets based on the refined asset stresses for non-derivative instruments

Asset	(A) Amount (£m)	(B) Refined asset stress	(A)x[1+(B)] Stressed value (£m)
Long maturity index-linked gilts	105.0	+18%	123.9
Cash	-200.0	0%	-200.0
Market value of gilt repos	205.0	0% (stress analysis carried out in Stage 2)	205.0
Total	**110.0**	**N/A**	**128.9**

The initial stressed value of assets is therefore £128.9m

Step 2: Risk factor stress on derivative instruments

Index-linked gilt repos

Inflation Stressed Value (ISV)
= IE01 x d_inf
= £300,000 x -14
= -£4.2m

Interest Rate Stressed Value (IRSV)
= PV01 x d_rates
= -£300,000 x -75
= £22.5m

Step 3: Combine all the calculations

Overall stressed value of assets
= Initial stressed value – absolute value of Index-linked gilt repos ISV
 + absolute value Index-linked gilt repos IRSV
= £128.9m – £4.2m + £22.5m
= £147.2m

Part 9. Credit derivatives

The stress calculation quantifies the change in the value of a derivative associated with the credit risk factor stress.

Input parameters

Calculation date	*Effective date of the most recently available audited scheme accounts*
CDD01 of the portfolio at the calculation date This can be obtained from the asset manager. This is the sensitivity of the portfolio value to a one basis point change in credit spreads.	*CDD01*
Credit risk factor stress	*d_credit* (basis points) i.e. +38 from Table 2

Calculations

The impact of credit stress on the portfolio   *CDD01 × d_credit*

If the scheme has bought credit protection, the absolute value of the impact of the stress should be added to the overall asset value.

If the scheme has sold credit protection, the absolute value of the impact of the stress should be subtracted from the overall asset value.

Part 10. Bespoke Stress Calculation - Example

Example E – Portfolio with physical and derivative assets

A pension fund has £1,230m of assets broken down as follows as at its latest audited scheme accounts date:

UK equities	£200m
Emerging market equities	£100m
Overseas investment grade corporate bonds	£200m
UK long-dated investment grade corporate bonds	£100m
Medium maturity index-linked gilts	£200m
Very long maturity index-linked gilts	£300m
Cash	£100m
Interest rate swaps contract (market value)	£30m
Equity derivative contracts (market values)	£0m

The fund holds an unexpired put option that it bought on the UK FTSE 100 Index with a strike price of 3,800. The level of the UK FTSE 100 Index as at the latest audited scheme accounts date is 3,926. It also holds a long position in overseas developed equity futures.

The notional exposures of the equity derivative contracts as at the latest audited scheme accounts date are as follows:

UK (FTSE 100) equity put option (bought)	£100m
Overseas developed equity futures (long position)	£100m

The PV01 of the interest rate swaps contract is -£200,000 as at the latest audited scheme accounts date. The scheme is receiving the fixed leg of the swap and paying the floating leg.

Stage 1 – Calculate the initial stressed value of assets based on the refined asset stresses for non-derivative investments

Applying the refined asset stresses, the initial stressed value of assets (including the unstressed market value of the derivative investments, but before allowing for the stress impact of these derivatives) is £1,252m, calculated as follows:

Asset	(A) Amount (£m)	(B) Refined asset stress	(A)×[1+(B)] Stressed value (£m)
UK equities	200	−19%	162
Emerging market equities	100	−16%	84
Overseas short- and medium-dated investment grade corporate bonds	100	+2%	102
Overseas long-dated investment grade corporate bonds	100	+5%	105
UK long-dated investment grade corporate bonds	100	+5%	105
Medium maturity index-linked gilts	200	+5%	210
Very long maturity index-linked gilts	300	+18%	354
Cash	100	0%	100
Market value of swaps	30	0% (stress analysis carried out in Stage 2)	30
Market value of equity derivatives	0	0% (stress analysis carried out in Stage 2)	0
Total	1,230	N/A	1,252

In the absence of a Bespoke Stress Calculation the stressed asset value would have been calculated by the PPF as £1,260m under the standard approach. This compares to the initial stressed value of assets, £1,252m, calculated above.

Stage 2 – Risk factor stress on derivative investments

Equity options
The stress in respect of the equity options is the difference between the stressed and unstressed intrinsic values:

The equity stress on the UK FTSE 100 Index put option is +£16m (see Example A in Part 6 for more details of this calculation). This acts to increase the overall stressed value of assets as the fund has bought the put option.

Equity futures
The stress on the equity futures is the notional exposure multiplied by the risk factor stress:

The equity stress on the overseas developed equities futures is -£16m, calculated as £100m × (-16%).

Interest rate swap
Interest Rate Stressed Value (IRSV)
= PV01 × Interest Rate risk factor stress
= –£200,000 × –75
= £15m
This overall stressed asset value is increased by the absolute value of IRSV because the scheme is receiving the fixed leg of the swap and paying the floating leg.

Stage 3 – Combine all the calculations

Overall stressed value of assets
= Initial stressed value + Equity options stress + Equity futures stress + absolute value of IRSV
= £1,252m + £16m– £16m + £15m
= £1,267m

Illustration of how the asset stress will be used in the levy bill

The scheme's Section 179 Valuation is rolled forward to the levy calculation date by the PPF, with the following results:

- smoothed and stressed liabilities of £1,500m
- smoothed liabilities of £1,300m
- smoothed assets of £1,200m

The stress factor (i.e. ratio of the stressed asset value divided by the unstressed asset value provided as part of the Bespoke Stress Calculation) is then applied to the smoothed assets. So:

Smoothed and stressed assets	= £1,200m x (£1,267m ÷ £1,230m)
	=£1,236.1m
Underfunding (stressed)	= Liabilities (on a smoothed and stressed basis)
	– Assets (on a smoothed and stressed basis)
	= £1,500m – £1,236.1m
	= £264m
Underfunding (unstressed)	= Liabilities (on a smoothed basis)
	– Assets (on a smoothed basis)
	= £1,300m – £1,200m
	= £100m
Underfunding (for determining levy)	=greater of Underfunding (stressed)
	and Underfunding (unstressed)
	= greater of £264m and £100m
	= £264m

Risk based levy = Underfunding x insolvency rate x levy scaling factor

Appendix: Exchange Help File

Help for submitting asset breakdown on Exchange

Please note that the asset breakdown submitted here is used in the calculation of the Pension Protection Levy – it affects the roll-forward, smoothing and investment risk stressing of the section 179 asset value, which feeds into the calculation of the risk-based levy.

Asset allocations should be taken from the scheme's most recently audited accounts.

Allocating Assets on Exchange

Some investments do not obviously fall into any of the categories available on Exchange. A general description of the key characteristics of each asset category has been provided so that schemes can apply judgement as to which category best reflects that investment's risk characteristics. This is likely to require advice from investment professionals who are, in the Trustees' opinion, appropriately qualified, for example the Scheme's investment advisor or asset manager.

Multi-asset funds

For multi-asset funds, schemes are encouraged to obtain a detailed breakdown between asset classes and divide the investment amongst more than one category. For example, this could include:
- managed/balanced funds,
- insurance funds,
- diversified growth funds,
- global aggregate bond portfolios, or
- LDI arrangements.

Some multi asset funds with rapidly changing asset allocations or whose constituents are not physical assets that can be classified amongst the asset classes available on Exchange may be classified most appropriately as hedge funds. Please also refer to the hedge fund description below. These may be referred to as "idiosyncratic" diversified growth funds (i.e. they do not rely on market related returns).

Allocating assets where the breakdown is not reported

If the breakdown of equities and bonds into their constituent components or the breakdown of multi-asset funds is not reported in the audited accounts, then there are two options available. Firstly, you could obtain the split at the accounting date from the scheme's investment manager(s). Alternatively, where such a split would be disproportionately costly to obtain, you could obtain the split from the investment manager's report nearest to the accounting date. For example, if your accounting date is 5 April and you have the split as at 31 March from your regular monitoring of investments, you should enter the split as at 31 March as a proxy for the split at 5 April.

Allocating assets where the category may vary

For some investment classes, the most appropriate Exchange category may depend on the way that the pension scheme has invested. For example, investment in "infrastructure" is widely accessed via private equity-type vehicles and should in those circumstances be classified as "private equity" investments. In some circumstances, however, the exposure to "infrastructure" can also be accessed through debt instruments, which means that the characteristics would be more like that of a corporate bond, so the investment should be classified accordingly.

Similar considerations apply to structured products (e.g. a structured equity investment made up of cash, bonds and equity derivatives). We expect that the advice of investment professionals be taken in deciding whether, given their risk characteristics, such investments can appropriately be allocated between the asset categories available on Exchange. If not, the value should be classified as "other". In this situation, the scheme could consider carrying out a Bespoke Stress Calculation. Please see the PPF's 'Guidance for Bespoke Stress Calculation for assessing investment risk', which is available on the PPF website.

The classification of some investments may depend on financial market conditions, and in such cases schemes should consult their asset manager or investment advisor. For example, it may either be appropriate to classify a portfolio of convertible bonds along with equity investments or along with non-government bond investments. If the conversion option represents a high proportion of the overall asset value (generally when the underlying share price is high), then the convertibles are likely to be highly sensitive to the value of the underlying shares – so equity classification is likely to be most appropriate. On the other hand, if the conversion option represents a small proportion of the overall asset value (generally when the underlying share price is low), then the convertibles are likely to behave more like debt instruments – so classification along with non-government bonds is likely to be most appropriate.

Allocating repo arrangements

This paragraph sets out some additional guidance on the classification of gilt sale and repurchase agreements, or "gilt repos".   It is common for gilt repos to be presented in scheme accounts in the following way:

a) the value of gilts out on repo are included along with the value of any other gilts not out on repo,
b) the cash obligation (for repurchase of the gilts) is disclosed as a negative value under the heading 'repo', and
c) the cash received as part of the repo deal is included as cash (or along with other asset classes if re-invested).

Where the value in the scheme accounts is broken down in this way, element a) can be classified between the 'Fixed interest government bonds' and the 'Inflation-linked bonds' categories on Exchange, as appropriate; element b) should be classified along with 'Cash and net current assets';

and element c) would be classified along with 'Cash and net current assets' (or along with other asset classes if re-invested).

Under an alternative presentation of the gilt repo value the net overall value of the gilt repos might be disclosed under the heading 'repo', broadly a) net of b) above. This net overall value would be expected to be equal or close to zero initially. If this alternative presentation is used in the scheme accounts, you may be able to obtain additional information from the scheme's fund manager in order to breakdown the value of the arrangement in line with a), b), c) above. If it is not possible to obtain the expanded breakdown, then the gilt repo net overall value should be classified along with 'Cash and net current assets'.

The asset categories on Exchange are:

Fixed interest government bonds

This category covers investments issued by a sovereign body that provide a series of known income payments at pre-determined points in time. There is, however, a risk that some or all of these payments may not be made should the sovereign body default on its obligation. The values of such investments are sensitive to changes in interest rates and will typically have minimal or no sensitivity to credit spreads.

For most schemes, the majority of these will be UK government bonds (i.e. "gilts"). All overseas government bonds (e.g. US Treasury bonds, German bunds) and bonds issued by supranational organisations may also be included here. Bonds with explicit government guarantees should be classified along with government bonds.

Include relevant components of multi asset funds and insurance funds.

Fixed interest non-government bonds

This category covers investments issued by a corporate body that provide a series of known income payments at pre-determined points in time. There is however a risk that some or all of these payments may not be received due to the corporate body defaulting on its obligation. The values of such investments are sensitive to changes in interest rates and credit spreads.

Include UK and overseas corporate bonds and all levels of credit rating and debt-like investments. Investment managers may also refer to these as "credit" mandates. Assets that fall under this category include:

- investment grade corporate bonds,
- convertible bonds where they are classified as debt-like,
- asset-backed securities (ABS),
- mortgage-backed securities (MBS) and
- alternative credit, which includes:
  - sub-investment grade (also known as high yield bonds),
  - distressed debt,
  - subordinated debt,

- o senior debt,
- o mezzanine debt,
- o leveraged loans.

Include relevant components of multi asset funds and insurance funds.

This can also include unrated investments where there is sufficient certainty in payment to be equivalent in risk and default profile to investment grade corporate bonds, such as ground rents or secure income alternatives. Similar assets with a significant inflation linked component could be considered to be allocated to inflation-linked bonds.

Inflation-linked bonds

This category covers investments that provide a series of inflation-linked income at pre-determined points in time. There is a risk that some or all of these payments may not be received due to the issuer defaulting on its obligations. The values of such investments are sensitive to changes in interest rates and inflation and will typically have minimal or no sensitivity to credit spreads.

Include UK and overseas inflation/index linked government bonds and inflation/index linked corporate bonds. For most schemes, the majority of such bonds will be UK government bonds (i.e. "index-linked gilts") but may also be issued by overseas governments and supranational organisations. Schemes should also reflect holdings in inflation-linked corporate bonds in this category.

Include relevant components of multi asset funds and insurance funds.

UK quoted equities

Include all shares listed/quoted on the London Stock Exchange or AIM. This category may also include convertible bonds where they are classified as equity-like.

Include relevant components of multi asset funds and insurance funds.

Overseas quoted equities

Include all shares listed/quoted on any overseas stock exchange or denominated in a currency other than GB Pounds (rather than classifying between UK and overseas based on the country of domicile of the issuing body).

This category may also include convertible bonds where they are classified as equity-like.

Include relevant components of multi asset funds and insurance funds.

Unquoted equities / private equity

Represents investment in the equity capital of an unlisted company or investment structure whereby the investor is exposed to the first loss on that capital.

Include all UK and overseas unquoted shares, private equity, venture capital and leveraged buy-outs.

Include relevant components of multi asset funds and insurance funds.

Property

Include all UK and overseas land or property (commercial, residential and industrial). Include any land or property owned by the pension scheme that is occupied by a scheme sponsor. Holdings in non-listed property funds (e.g. property unit trusts) should be included here.

Listed property funds (e.g. REITs) may be included here where the holding is explicitly intended to provide exposure to the property sector. However, small concentrations of these held as part of a larger equity portfolio need not be separately identified and can be included along with the rest of the portfolio as quoted equities.

Include relevant components of multi asset funds and insurance funds.

Insurance funds

Insurance fund investments may include pooled funds, deposit administration contracts, with-profits contracts and similar. For such investments, schemes are encouraged to obtain a detailed breakdown between asset categories as at (or near to) the relevant scheme accounts date. Each component should be included within the relevant categories. In the few instances where this breakdown is not available, the amount should be included in the "other" category.

Deferred or immediate fully insured annuities

Insured annuities are contracts through which payments in respect of a portion of the scheme's liabilities are met by a third party insurance company. Typically such contracts will be written in the name of the pension scheme trustees. These annuities generally relate to a particular group of named members and/or dependants of the scheme.

Include the proportion of total assets invested in annuities where the audited accounts reflect a value for these assets.

If annuity assets (and matching liabilities) are excluded from the scheme accounts then the asset breakdown in the Scheme Return should not include these assets either. Where the scheme's Section 179 Valuation submission shows that the asset value includes annuity policies excluded from the relevant accounts, the Bespoke Stress Calculation submitted by the scheme will be adjusted by the PPF to include an allowance for the annuity assets in the submitted stressed and unstressed asset values, unless the accounts underlying the Section 179 Valuation have an accounting date before 31 December 2015 and the accounting date corresponding to the most recently available scheme accounts is on or after 31 December 2015. Details of this calculation are set out in section 4.7 of the Transformation Appendix to the PPF Levy Determination. The Determination can be found on the PPF website:

https://www.ppf.co.uk/are-you-levy-payer

Hedge funds

A hedge fund may invest in a diverse range of assets and may employ a variety of investment strategies to maintain a hedged portfolio intended to protect investors from downturns in the market while maximizing returns on market upswings. Generally hedge fund strategies would aim to limit volatility relative to equities and tend to have a cash based performance benchmark, e.g. LIBOR+x per cent. A typical feature of hedge funds will be their ability to use derivatives, long/short positions and leverage to gain significant long/short exposure to certain markets or opportunities.

This is a particularly difficult area of investment to define, given the variety of asset classes and strategies that are used in practice. General descriptions of the types of strategies that might be considered include:

- "global macro",
- "event-driven",
- "relative value",
- "real return",
- "multi strategy",
- "absolute-return funds", and
- "global tactical asset allocation" (GTAA) strategies.

Where currency explicitly forms part of a pension scheme's investment strategy, this is typically done through a leveraged vehicle, so such funds should be included with hedge funds. Examples of fund types to include here are: FX carry and emerging market currency funds.

Commodities

Commodities are goods that are generally used as primary goods in the manufacturing of other products. Examples include oil, metals and agricultural goods.

Pension schemes will typically not have direct exposure to commodities but will access the returns on them via commodity indices. Timber and forestry products can be considered as commodities. Funds that are designed to provide long-only exposure to commodity markets should be classified as commodities.

Cash and net current assets

Cash investments have high liquidity and very short maturities (usually 90 days or less). Include cash in any currency or denomination, cash held in savings accounts, bank accounts, money market funds, negotiable certificates of deposit (CDs), commercial paper, Floating Rate Notes, etc. Note that active currency strategies should be included with hedge funds. Include net current assets.

The market value of any derivative exposures (e.g. interest rate swaps, equity futures, longevity swaps, rights, warrants, repo arrangements) should be included in this category. Schemes that have such instruments could consider carrying out a Bespoke Stress Calculation. Please see the PPF's

'Guidance for Bespoke Stress Calculation for assessing investment risk', which is available on the PPF website.
Some further guidance on how to classify repo arrangements is provided above.

Where derivatives are used by asset managers for efficient management of their portfolios, and therefore form only an implicit part of the investments, they should be classified in line with the rest of the portfolio.

Asset Backed Contributions (ABCs)

An asset-backed contribution arrangement ("ABC") is a contractual arrangement between trustees and one or more entities within the sponsoring employer's group. ABCs involve regular payments to the scheme for the duration of the arrangement, often being indirectly funded by the sponsoring employer. Such payments are underpinned by an asset.

For general information about ABCs, please refer to the Regulator's guidance: https://www.thepensionsregulator.gov.uk/en/document-library/regulatory-guidance/asset-backed-contributions

Please note that the PPF collects additional information about ABC arrangements itself to feed into the levy calculation – more details can be found on the PPF website:
https://www.ppf.co.uk/are-you-levy-payer

Please note that the ABC information required for PPF levy calculation purposes will need to be captured and submitted using a form available from the PPF. Without completion of the PPF form, the PPF may take some information from Exchange and/or may make conservative assumptions. This would mean that schemes may not gain appropriate credit for the ABC (or the coupons paid from it) in their levy calculation and the deduction the PPF makes from the scheme assets to calculate the levy may not be fully accurate.

Other

Some assets do not obviously fall into any of the above categories. A general description of the key characteristics of each asset category has been provided so that in such circumstances, the trustees, in conjunction with their investment advisor or asset manager (unless the trustees have sufficient expertise) can apply judgement as to which category best reflects that asset's risk characteristics – this may involve dividing the asset amongst more than one category.

If assets cannot be assigned in this way, they should be recorded in this category.