

Commercial Consolidator Appendix

1. Summary

This is the Commercial Consolidator Appendix to the Board's determination under Section 175(5) of the Act in respect of the 2019/20 Levy Year. Unless defined in this Appendix, expressions defined in the rules set out in the determination (the "Rules") shall have the same meanings as set out therein.

This Appendix applies to a Commercial Consolidator as defined in the Rules. It provides the formulae for calculating the RBL for such schemes.

For the purposes of this Appendix, an 'Adjusted Section 179 Valuation' is obtained by adjusting the corresponding Section 179 Valuation to take account of the following:

- accrual of benefits after the relevant time and up to the earlier of 31 March 2020 or Normal Pension Age (as defined in the relevant version of the Section 179 Valuation guidance) is included for all active members at the relevant time;
- benefits in deferment at the relevant time and accrued before 6 April 2009 are increased at the relevant time to anticipate any difference between the revaluation due and revaluation up to CPI capped at 5 per cent a year, both measures assessed over the period after the relevant time and up to the earlier of 31 March 2020 or Normal Pension Age for each affected member (where the benefits of active members as well as deferred members are assumed to be in deferment);
- benefits in deferment at the relevant time and accrued after 5 April 2009 are increased at the relevant time to anticipate any difference between the revaluation due and revaluation up to CPI capped at 2.5 per cent a year, both measures assessed over the period after the relevant time and up to the earlier of 31 March 2020 or Normal Pension Age for each affected member (where the benefits of active members as well as deferred members are assumed to be in deferment);
- the compensation cap is applied only to members who will be under Normal Pension Age at 31 March 2020;
- benefits are reduced by ten per cent only in respect of members who will be under Normal Pension Age at 31 March 2020;
- benefits in payment at the relevant time and accrued before 6 April 1997 are increased at the relevant time to anticipate any increases due between the relevant time and 31 March 2020 for each affected member;
- benefits in payment at the relevant time and accrued after 5 April 1997 are increased at the relevant time to anticipate any difference between the increases due and indexation up to CPI capped at 2.5 per cent each year, both measures assessed over the period after the relevant time and up to 31 March 2020 for each affected member; and
- temporary pensions in payment at the relevant time which are due to cease by 31 March 2020 are excluded.

For the avoidance of doubt:

- the Adjusted Section 179 Valuation is carried out at the same relevant time as the Section 179 Valuation, using the same version of the Section 179 Valuation assumptions guidance and the same version of the Section 179 Valuation guidance, with the latter modified only to the extent specified above. In particular, no adjustment is made to the value of the assets;
- the Adjusted Section 179 Valuation contains no allowance for salary increases in excess of revaluation after the relevant time; and

- the Adjusted Section 179 Valuation assumes that each active member at the relevant time will remain an active member to the earlier of 31 March 2020 and Normal Pension Age.

Subject to any adjustments made pursuant to Rule C6 of the Rules, the RBL for a Commercial Consolidator is the higher of RBL_0 and POP, where:

- a) RBL_0 is the RBL calculated as if the provisions of this Appendix did not apply (and, for the avoidance of doubt, also disregarding the provisions of the SWOSS Appendix), but based on:
- a single employer structure, with the employer placed in Levy Band 10;
 - no application of the RBL cap;
 - a bespoke stress analysis Submitted in accordance with the provisions of Rules D3.1(c) and D3.2 of the Rules; and
 - no allowance for voluntary certifications.

For the avoidance of doubt, RBL_0 does not allow for the results of any Adjusted Section 179 Valuation where this has been provided, any adjustment to reflect understatement of risk for older valuation submissions set out in section 3 below, or any deduction from the scheme assets to reflect potential ongoing capital extraction set out in section 8 below.

- b) POP is the value of a one year European put option calculated using the Garman-Kohlhagen formula, where:
- the strike price is the value of the scheme's protected liabilities on an adjusted basis, rolled forward or backward to the Output Date; and
 - the spot price of the underlying asset is the market value of the scheme's assets, rolled forward or backward to the Output Date, but reduced by an allowance to reflect potential ongoing capital extraction where this facility is available to the consolidator.

Any deduction from the assets to reflect potential ongoing capital extraction will be determined as the value of a one year European call option calculated using the Garman-Kohlhagen formula, where:

- the strike price is the threshold above which the consolidator is able to extract capital, expressed as a percentage of the value of the scheme's protected liabilities on an adjusted basis, rolled forward or backward to the Output Date; and
- the spot price of the underlying asset is the market value of the scheme's assets, rolled forward or backward to the Output Date.

Because POP is assumed to be paid from the scheme's assets, it is technically an input to the put option formula as well as the output of that formula. This is allowed for by calculating POP using an iterative approach. The output of the n th iteration, POP_n , is deemed to reduce the scheme's assets used for input to the $(n+1)$ th iteration, until the difference between $POP_{(n+1)}$ and POP_n has converged below a specified threshold.

2. Inputs

Where information is required by the Board as specified in this Appendix and/or as the Board requires in accordance with any Ongoing Governance Arrangement in order to calculate RBL₀ and POP in accordance with this Appendix, and such information is Submitted in accordance with Rules A2.2(5) and A2.3(6) of the Rules in a form and on terms acceptable to the Board, that information will be used for the purposes of that calculation. In the absence of one or more items of such information, whether due to the absence of an Ongoing Governance Arrangement or otherwise, Rule B1 will apply.

Liability data

The Section 179 Valuation results or Adjusted Section 179 Valuation results if available, which have been Submitted for use in this calculation, rolled forward or backward to the Output Date without smoothing or stressing in accordance with the Transformation Appendix¹. If the Output Date specified under this Appendix differs from the Output Date under the Transformation Appendix (31 March 2019), the Transformation Appendix should be applied as if the Output Date were the same as specified under this Appendix.

In addition, if the Submitted Section 179 Valuation results or Adjusted Section 179 Valuation results were prepared in accordance with a version number of the Section 179 assumptions other than A8, the results are not converted to A8.²

• Liabilities in respect of pensions in payment	S179PL
• Liabilities in respect of deferred members	S179DL
• Liabilities in respect of active members	S179AL
• Estimated wind-up costs (excluding benefit installation/payment)	S179WUExp
• Estimated expenses of benefit installation/payment	S179PayExp
• External liabilities	S179ExLiab
• Total value of protected liabilities	S179TL

¹ Paragraph 4.8 of the Transformation Appendix sets out the process for calculating smoothed but unstressed liability values. Unsmoothed, unstressed liability values are calculated by applying these provisions and also taking each Smoothed Yield (A(ii), B(ii), C(i), C(iii), D(i) or D(ii)) at the Output Date (as set out in paragraph 4.3 of the Transformation Appendix)) to be equal to the corresponding unsmoothed yield.

² This provision could arise in practice if the Submitted Section 179 Valuation results or Adjusted Section 179 Valuation results are prepared using a future version of the Section 179 assumptions guidance. In these circumstances, the various assumptions underlying the annuity factors '@OutputDate' and '@S179Input Date' set out in paragraph 4.3.3 of the Transformation Appendix should be set to be consistent with that future version of the Section 179 assumptions guidance, together with the rollforward rates 'i' and 'j' set out in paragraph 4.4.1 of the Transformation Appendix.

The Section 179 Valuation results or Adjusted Section 179 Valuation results if available, which have been Submitted for use in this calculation, rolled forward or backward to the Output Date with stressing but without smoothing in accordance with the Transformation Appendix³ If the Output Date specified under this Appendix differs from the Output Date under the Transformation Appendix (31 March 2019), the Transformation Appendix should be applied as if the Output Date were the same as specified under this Appendix.

In addition, if the Submitted Section 179 Valuation results or Adjusted Section 179 Valuation results were prepared in accordance with a version number of the Section 179 assumptions other than A8, the results are not converted to A8.²

• Stressed liabilities in respect of pensions in payment	S179PLStressed
• Stressed liabilities in respect of deferred members	S179DLStressed
• Stressed liabilities in respect of active members	S179ALStressed

Asset data

Scheme asset information Submitted for use in this calculation and rolled forward or backward to the Output Date without smoothing or stressing in accordance with the Transformation Appendix⁴ If the Output Date specified under this Appendix differs from the Output Date under the Transformation Appendix (31 March 2019), the Transformation Appendix should be applied as if the Output Date were the same as specified under this Appendix.

• Assets	S179Ass
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Scheme asset information underlying the bespoke stress analysis Submitted for use in this calculation (asset amounts at the calculation date of the bespoke stress analysis, before applying the bespoke asset stress factors):

• UK quoted equities	AS1
• Overseas developed market quoted equities	AS2
• Emerging Market quoted equities	AS3

³ Stressed but unsmoothed liability values are calculated by applying the provisions of footnote 1 above and also applying the liability stress factors at the values shown in paragraph 4.2 of the Transformation Appendix, rather than zero.

⁴ Paragraph 4.8 of the Transformation Appendix sets out the process for calculating smoothed but unstressed asset values. Unsmoothed, unstressed asset values are calculated by applying these provisions and also disapplying the smoothing of index values set out in paragraph 4.4.3 where Date2 is specified as the Output Date.

• Unquoted/private equity	AS4
• Property	AS5
• Hedge funds	AS6
• Commodities	AS7
• Fixed interest government bonds – short maturity	AS8
• Fixed interest government bonds – medium maturity	AS9
• Fixed interest government bonds – long maturity	AS10
• Inflation-linked bonds – short maturity	AS11
• Inflation-linked bonds – medium maturity	AS12
• Inflation-linked bonds – long maturity	AS13
• Fixed-interest non-government bonds – UK short and medium dated investment grade	AS14
• Fixed-interest non-government bonds – UK long-dated investment grade	AS15
• Fixed-interest non-government bonds – overseas short and medium dated investment grade	AS16
• Fixed-interest non-government bonds – overseas long-dated investment grade	AS17
• Fixed-interest non-government bonds – global sub-investment grade	AS18
• Cash and net current assets	AS19
• Annuities	AS20
• Insurance funds	AS21
• Other	AS22

Sensitivities of derivatives to interest rates and inflation rates underlying the bespoke stress analysis Submitted for use in this calculation (amounts at the calculation date of the bespoke stress analysis):

• Overall sensitivity of derivatives to a one basis point increase in interest rates	PV01
• Overall sensitivity of derivatives to a one basis point increase in inflation rates	IE01

3. Parameters

Factors to reflect understatement of risk for older valuation submissions

Adjustment to total liabilities	LiabAdjFac	0% if the effective date of the Section 179 Valuation (or Adjusted Section 179 Valuation if available) Submitted for use in this calculation is on or after 1 January 2017, and 5% in all other circumstances.
Applicable time period	TimePeriod	The period from the effective date of the Section 179 Valuation (or Adjusted Section 179 Valuation if available) Submitted for use in this calculation, to 31 March 2019, measured in years and complete months.

Stress factors

Risk factor stresses		
Interest rate risk factor stress	d_rates (basis points)	-75
Inflation risk factor stress	d_inf (basis points)	-14

Asset stress factors		Positive stresses (Str_i^+)	Negative stresses (Str_i^-)
UK quoted equities	Str1	0%	-19%
Overseas developed market quoted equities	Str2	0%	-16%
Emerging Market quoted equities	Str3	0%	-16%
Unquoted/private equity	Str4	0%	-19%
Property	Str5	0%	-5%
Hedge funds	Str6	0%	-3%
Commodities	Str7	0%	-14%
Fixed interest government bonds – short maturity	Str8	+2%	0%

Fixed interest government bonds – medium maturity	Str9	+6%	0%
Fixed interest government bonds – long maturity	Str10	+15%	0%
Inflation-linked bonds – short maturity	Str11	+1%	0%
Inflation-linked bonds – medium maturity	Str12	+5%	0%
Inflation-linked government bonds – long maturity	Str13	+18%	0%
Fixed-interest non-government bonds – UK short and medium dated investment grade	Str14	+4%	-2%
Fixed-interest non-government bonds – UK long-dated investment grade	Str15	+10%	-5%
Fixed-interest non-government bonds – overseas short and medium dated investment grade	Str16	+4%	-2%
Fixed-interest non-government bonds – overseas long-dated investment grade	Str17	+10%	-5%
Fixed-interest non-government bonds – global sub-investment grade	Str18	+2%	-8%
Cash and net current assets	Str19	0%	0%
Annuities	Str20	+16%	0%
Insurance funds	Str21	0%	-19%
Other	Str22	0%	-19%

Other parameters

Longevity volatility	LongVol	2.5%
Volatility adjustment	VolAdj	2.6%

Risk-free rate of return on assets	rA	Bank of England 12 month Overnight Index Swap (OIS) spot rate ⁵
Risk-free rate of return on liabilities	rL	rA if an Adjusted Section 179 Valuation has been Submitted, else rA + 2%
Convergence threshold for successive iterations of POP	T	£1

4. Calculation of the standard Risk-Based Levy with adjustments (RBL_0)

RBL_0 is the RBL calculated in accordance with the provisions of the Rules (except Rules C5 and C6) and the Appendices (except this Appendix and the SWOSS Appendix), but using the information Submitted in accordance with Rules A2.2(5) and A2.3(6) of the Rules (or in accordance with any discretion exercised by the Board pursuant to Rule C6.7 of the Rules), and based on the following assumptions:

- the Scheme has a single Employer;
- the LR of the Employer is the LR of Levy Band 10 and, for the avoidance of doubt, that LR will not be treated as an Appealable Score;
- Rule C3.1 (the RBL cap) is dis-applied;
- the Scheme has Submitted the information specified in the Investment Risk Appendix, in accordance with the provisions of Rules D3.1(c) and D3.2 of the Rules; and
- Parts F, G and H of the Rules are dis-applied.

For the avoidance of doubt, RBL_0 does not allow for the results of any Adjusted Section 179 Valuation where this has been provided, any adjustment to reflect understatement of risk for older valuation submissions set out in section 3 above, or any deduction from the scheme assets to reflect potential ongoing capital extraction set out in section 8 below.

5. Calculation of Call Option Strike Price (COSP)

If the Commercial Consolidator has a Section 179 Capital Extraction Threshold, denoted for the purposes of this Appendix as $S179CET\%$:

$$COSP = S179CET\% \times S179TL$$

If the Commercial Consolidator does not have a Section 179 Capital Extraction Threshold but does have a Non-Section 179 Capital Extraction Threshold, the Board shall calculate the Levies pursuant to Rule B1.

For the purposes of this paragraph 5:

⁵ Note that the Overnight Index Swap (OIS) spot rate to use for 2019/20 will be the figure as at 30 November 2018 and will be confirmed in the December Policy Statement. As an indication, the OIS spot rate used for 2018/19 was 0.59% as at 30 November 2017.

“Section 179 Capital Extraction Threshold” is the funding level contained in any Ongoing Governance Arrangement, in respect of which the terms of operation of a Commercial Consolidator provide for payment of a return at or above such funding level (other than to Members by way of defined benefit pension payments, and other than the ordinary expenses of an occupational pension scheme) during the 2019/20 Levy Year and before any buyout of liabilities, provided:

- (a) such funding level is ascertainable by the Board by reference to a Section 179 funding level; and
- (b) S179 Ass specified in section 2 above has not been reduced to allow for the payment of any such return.

If the Commercial Consolidator satisfies the requirements for a Section 179 Capital Extraction Threshold save for the requirement set out in sub-paragraph (b) above, the Board may determine that such requirement should be waived.

“Non-Section 179 Capital Extraction Threshold” is the funding level contained in any Ongoing Governance Arrangement, in respect of which the terms of operation of a Commercial Consolidator provide for payment of a return at or above such funding level (other than to Members by way of defined benefit pension payments, and other than the ordinary expenses of an occupational pension scheme) during the 2019/20 Levy Year, and before any buyout of liabilities, provided:

- (c) such funding level is not ascertainable by the Board by reference to a Section 179 funding level; and
- (d) S179 Ass specified in section 2 above has not been reduced to allow for the payment of any such return.

If the Commercial Consolidator satisfies the requirements for a Non-Section 179 Capital Extraction Threshold save for the requirement set out in sub-paragraph (d) above, the Board may determine that such requirement should be waived.

6. Calculation of aggregate stresses

6.1. Calculation of Asset and Liability Stresses (AS_+ , AS_- , LbS)

Positive asset stress (AS_+)

AS_+ is obtained by applying all the positive stresses Str_i^+ (as shown in the third column of the asset stress factors table in section 3 above) to the corresponding assets of the scheme and then adding the impacts of the risk factor stresses on the derivative holdings.

$$AS_+ = \sum_{i=1}^{22} (AS_i \times Str_i^+) + (PV01 \times d_{rates}) + (IE01 \times d_{inf})$$

AS_+ is expected to be positive other than for exceptional cases (for example with significant negative asset allocations within the summation).

Negative asset stress (AS_-)

AS_- is obtained by applying all the negative stresses Str_i^- (as shown in the fourth column of the asset stress factors table in section 3 above) to the absolute (or modulus) value of the corresponding assets of the scheme.

$$AS_- = \sum_{i=1}^{22} (|AS_i| \times Str_i^-)$$

By construction AS_- is a negative number.

Liability Stress (LbS)

LbS is obtained by applying the interest rate and inflation stresses to the liability value (excluding expenses and external liabilities) on a Section 179 Valuation basis or Adjusted Section 179 Valuation basis if available. It is calculated by taking the difference between the stressed and unstressed values after roll forward or backward to the Output Date and then adjusting this difference to reflect any adjustment in respect of understatement of risk for older valuation submissions as set out in section 3 above.

$$LiabAdj = S179TL \times (1 + LiabAdjFac)^{TimePeriod}$$

$$LbS = [(S179PLStressed - S179PL) + (S179DLStressed - S179DL) + (S179ALStressed - S179AL)] \times (1 + LiabAdjFac)^{TimePeriod}$$

By construction LbS is a positive number.

6.2. Calculation of first level aggregate stress including risk due to over-hedging or under-hedging interest rates (X_1)

The first level aggregate stress is given by the formula:

$$X_1 = \sqrt{AS_-^2 + \max(0, AS_+ - LbS)^2} - \min(0, AS_+ - LbS)$$

This can be simplified by deconstructing the formula to differentiate between schemes which are over-hedged on the adjusted basis (liability stress smaller than the overall positive asset stress) and under-hedged on the adjusted basis (liability stress greater than the overall positive asset stress).

If $LbS < AS_+$:

$$X_1 = \sqrt{AS_-^2 + (AS_+ - LbS)^2}$$

Else:

$$X_1 = |AS_-| - AS_+ + LbS$$

6.3. Calculation of second level aggregate stress including longevity risk (X_2)

This calculation aggregates the effect of the investment risk factor stresses with a longevity shock (*LongShock*). It assumes that longevity risk and investment risk are independent.

$$LongShock = LongVol \times LiabAdj$$

$$X_2 = \sqrt{X_1^2 + LongShock^2}$$

7. Calculation of volatility estimate (*VolEst*)

$$VolEst = \frac{X_2}{S179Ass} + VolAdj$$

8. Calculation of the call option price (*COP*)

First calculate the volatility adjusted distances to the call option strike price (d_{1C} and d_{2C}).

$$d_{1C} = \frac{\ln\left(\frac{S179Ass}{COSP}\right) + (rA - rL + VolEst^2/2)}{VolEst}$$

$$d_{2C} = d_{1C} - VolEst$$

The price of the call option (*COP*) is given by the formula:

$$COP = S179Ass \times e^{-rL} \times N(d_{1C}) - COSP \times e^{-rA} \times N(d_{2C})$$

where:

"*e*" is Euler's number, a mathematical constant⁶;

" $\ln(x)$ " denotes the natural logarithm of x , i.e. the power to which e would have to be raised to equal x ;

$N(.)$ denotes the cumulative standard normal distribution function, given by the formula:

$$N(x) = \int_{-\infty}^x \frac{e^{-t^2/2}}{\sqrt{2\pi}} dt ; \text{ and}$$

" π " is a mathematical constant, the ratio of a circle's circumference to its diameter.⁷

⁶ For the purposes of information only, "*e*", to 10 decimal places is: 2.7182818285

⁷ For the purposes of information only, " π ", to 10 decimal places is: 3.1415926536

For the avoidance of doubt, if the Commercial Consolidator has neither a Section 179 Capital Extraction Threshold nor a Non-Section 179 Capital Extraction Threshold, $COP = 0$.

9. Calculation of the first iteration of the put option price (POP_1)

First calculate the spot price, which is the assets after deducting COP .

$$S179AssAdj = S179Ass - COP.$$

Repeat the calculations in sections 6 and 7 above based on input assets and spot price of $S179AssAdj$ rather than $S179Ass$. For this purpose the assets are assumed to retain the same proportionate breakdown and the same values of PV01 and IE01.

The outcome of this process is a revised value of $VolEst$, $VolEstAdj$.

Next, calculate the volatility adjusted distances to the put option strike price (d_{1P} and d_{2P}).

$$d_{1P} = \frac{\ln\left(\frac{S179AssAdj}{LiabAdj}\right) + (rA - rL + VolEstAdj^2 / 2)}{VolEstAdj}$$

$$d_{2P} = d_{1P} - VolEstAdj$$

The first iteration of the price of the put option (POP_1) is given by the formula:

$$POP_1 = LiabAdj \times e^{-rA} \times N(-d_{2P}) - S179AssAdj \times e^{-rL} \times N(-d_{1P})$$

10. Calculation of successive iterations of the put option price (POP_n)

The calculations in section 9 above are repeated to calculate successive iterations of the put option price. For all values of n greater than or equal to two but less than or equal to 100, the n th iteration, POP_n , is calculated as POP_{n-1} but with the input assets and spot price, $S179AssAdj_n$, taken as the corresponding figure from the first iteration, $S179AssAdj$, reduced by POP_{n-1} . For this purpose the assets are assumed to retain the same proportionate breakdown and the same values of PV01 and IE01 in each successive iteration.

$$\partial n = |POP_n - POP_{n-1}|$$

For all values of n from 2 to 99 inclusive:

If:

- $\partial n \leq T$; and
- $POP_n < S179Ass - SBL$

$$POP = POP_n$$

Else if $POP_n \geq S179Ass - SBL$

$$POP = S179Ass - SBL$$

Else proceed to the (n+1)th iteration.

If $POP_{100} < S179Ass - SBL$,

$POP = POP_{100}$

else

$POP = S179Ass - SBL$

11. Calculation of the Risk-Based Levy (*RBL*)

Subject to any adjustments made pursuant to Rule C6 of the Rules, RBL for a Commercial Consolidator is the greater of:

(a) the standard risk-based levy calculated in accordance with the Rules (except Rules C5 and C6) and Appendices (except this Appendix and the SWOSS Appendix), but using the information Submitted in accordance with Rules A2.2(5) and A2.3(6) of the Rules (or in accordance with any discretion exercised by the Board pursuant to Rule C6.7 of the Rules), and based on the assumptions described in section 4 above; and

(b) the put option price calculated in section 10 above.

$RBL = \text{Max}(RBL_0, POP)$