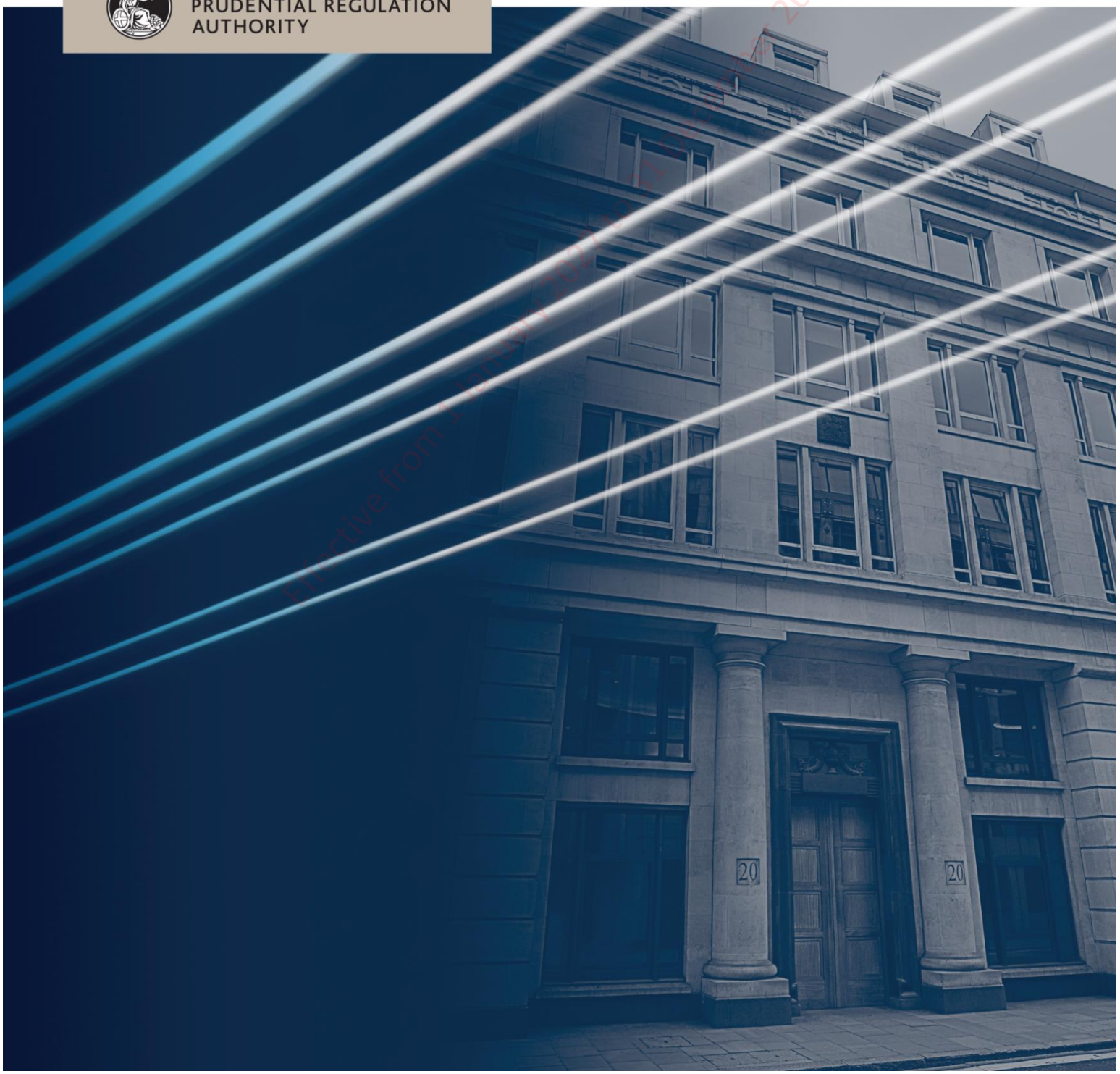
Supervisory Statement | SS13/13

Market risk

January 2026

(Updating November 2020)

BANK OF ENGLAND
PRUDENTIAL REGULATION AUTHORITY



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Contents

1 Introduction

1.1 This supervisory statement is aimed at Capital Requirements Regulation (CRR) firms and CRR consolidation entities.[1] This version of the supervisory statement applies during the *IMA transitional period*, as defined in the Glossary of the PRA Rulebook.

1.2 It sets out the Prudential Regulation Authority's (PRA's) expectations of firms in relation to market risk and should be considered in addition to requirements set out in the Trading Book (CRR), Market Risk: General Provisions (CRR), Market Risk: Simplified Standardised Approach (CRR), Market Risk: Advanced Standardised Approach (CRR) and Market Risk: Internal Model Approach (CRR) Parts of the PRA Rulebook and the high-level expectations outlined in 'The PRA's approach to banking supervision'.[2]

1.3 This statement details the PRA's expectations with regard to the following:

- Material deficiencies in risk capture by an institution's internal approach.
- Simplified standardised approach for options.
- Offsetting derivative instruments.
- Corrections to modified duration for debt instruments subject to prepayment risk.
- Exclusion of back-testing exceptions when determining multiplication factor addends.
- Derivation of notional positions for simplified standardised approaches.
- Qualifying debt instruments.
- Expectations relating to internal models.
- Value-at-Risk (VaR) and stressed VaR (sVaR)calculation.
- Requirement to have an internal incremental risk charge (IRC) model.
- Annual Senior Management Function (SMF) attestation of market risk internal models.
- Alternative definitions of sensitivities in the advanced standardised approach.
- Determination of the value of a CIU and its underlying investments for the purpose of Articles 104(2)(f), 104(2)(h), and 325j(1)(a).
- of a fund's value.

2 Material deficiencies in risk capture by an institution's internal approach

1 On 23 February 2017, this SS was updated – see appendix for full details.
2 www.bankofengland.co.uk/pra/Pages/supervision/approach/default.aspx.

2.1 This chapter sets out the PRA's requirements for the calculation of additional own funds for the purposes of Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part, which applies where a firm has permission to calculate own funds requirements for one or more categories of market risk under Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part. It requires firms to identify any risks which are not adequately captured by those models and to hold additional own funds against those risks. The methodology for the identification of those risks and the calculation of those additional own funds for VaR and sVaR models is referred to as the 'RNIV framework'.

2.2 Firms are responsible for identifying these additional risks, and this should be seen as an opportunity for risk managers and management to better understand the shortcomings of the firm's models. Firms are expected to validate the appropriateness of the RNIV framework.

Scope of the Risks not in VAR (RNIV) framework

2.3 The RNIV framework is intended to ensure that own funds are held to meet all risks which are not captured, or not captured adequately, by the firm's VaR and sVaR models. These include, but are not limited to, missing and/or illiquid risk factors such as cross-risks, basis risks, higher-order risks, and calibration parameters. The RNIV framework is also intended to cover event risks that could adversely affect the relevant business.

Identification and measurement framework

2.4 The PRA expects firms to systematically identify and measure all non-captured or poorly captured risks. This analysis should be updated at least quarterly, or more frequently at the request of the PRA. The measurement of these risks should capture the losses that could arise due to the risk factor(s) of all products that are within the scope of the relevant internal model permission, but are not adequately captured by the relevant internal models.

Identification of risk factors

2.5 The PRA expects firms to, on a quarterly basis, identify and assess individual risk factors covered by the RNIV framework. The PRA will review the results of this exercise and may require that firms identify additional risk factors as being eligible for measurement.

Measurement of risk factors

2.6 Where sufficient data are available, and where it is appropriate to do so, the PRA expects firms to calculate a VaR and sVaR metric as the RNIV measure for each risk factor within scope of the framework. The stressed period for the RNIV sVaR should be consistent with that used for sVAR. No offsetting or diversification may be recognised across risk factors included in the RNIV framework.

2.7 If it is not appropriate to calculate a VaR and sVaR metric for a risk factor, a firm should instead measure the size of the risk based on a stress test. The confidence level and capital horizon of the stress test should be commensurate with the liquidity of the risk factor, and should be at least as conservative as comparable risk factors under the internal model approach. The RNIV measure should be at least equal to the losses arising from the stress test.

2.7A The PRA expects that RNIV own funds requirements should generally be calculated at quarter-end as the average across the preceding three month period of an RNIV measure calculated at least monthly. For each RNIV measure calculated from VaR and sVaR metrics, the multipliers used for VaR and sVaR should be applied to the aforementioned average to determine the RNIV own funds requirement.

2.7B The PRA expects that firms should calculate the RNIV measure at least monthly for at least 90% of RNIV requirements. The PRA expects firms to document the calculation frequency and materiality (relative to total RNIV own funds requirements) of each RNIV.

2.7C The PRA expects firms to consider whether it is necessary for the RNIV measure to be calculated more frequently than monthly calculation for more material or more variable RNIV positions. Where a firm identifies RNIVs that should be calculated more frequently than monthly, the PRA expects that the RNIV position or risk sensitivity should be updated with that increased frequency. The PRA does not generally expect a recalibration of the RNIV methodology more frequently than monthly.

Reporting of RNIV

2.8 Firms that are required to compute RNIV should complete FSA005 — in addition to the MRK IM COREP reporting template — for the relevant rows. When submitting FSA005, firms are advised to complete the fields as follows:

- populate the table under element 63, filling in both fields in each row;
- element 64 should be the total of all values entered in 63 column B; and
- in order for the form to validate, the value entered in 64 should also be entered in 61 and 62.

2.9 Firms that are required to compute RNIV should complete the MKR IM COREP reporting template in addition to FSA005, and include the own funds required in their COREP reporting. The components of RNIV should be included within C24.00 as follows.

- RNIV from VaR should be added to [C24.00, {c030}, r010] and [C24.00, {c040}, r010];
- RNIV from sVaR should be added to [C24.00, {c050}, r010] and [C24.00, {c060}, r010]; and
- RNIV from stress tests should be added to [C24.00, {c050}, r010] and [C24.00, {c060}, r010].

Extensions and changes to the RNIV framework

2.10 The PRA expects firms to notify all model extensions and changes to the RNIV framework and the pro-forma available on the Capital Requirements Regulation permissions webpage, [1] on the Bank's website should be submitted.

2.11 The PRA considers material changes to the RNIV framework to be when the extension or change implies either: 1) a capital impact of 5% or more of the total market risk capital requirements, including RNIV capital, or 2) a capital impact of 10% or more of the total RNIV component in line 64 of FSA005 in accordance with paragraph 2.8. The PRA expects to be pre-notified for material extensions or changes to the RNIV framework and to be notified following the occurrence of any other non-material extensions or changes.

2.12 See Chapter 9 for the process around extensions and changes to IMA models under Annex 3, Part B of the Market Risk: Internal Model Approach (CRR) Part.

1 https://www.bankofengland.co.uk/prudential-regulation/Authorisations/capital-requirements-regulation-permissions

3 Simplified standardised approach for options

3.1 Firms that need to use own estimates of delta for the purposes of the simplified standardised approach for options, should provide the PRA with confirmation that they meet the minimum standards set out below for each type of option for which they calculate delta. Firms should only provide this confirmation if they meet the minimum standards. Where a firm meets the minimum standards, they will be permitted to use own estimates of delta for the relevant option. Firms should read the requirements for the granting of the permissions set out in Articles 329, 352, and 358 of the Market Risk: Simplified Standardised Approach (CRR) Part, as appropriate, before applying for any of these permissions.

3.2 If a firm has a permission under any of these Articles but ceases to be able to provide assurance with regard to a particular option type which is currently within its permissions, a capital add-on may be applied and a rectification plan agreed. If a firm is unable to comply with the rectification plan within the mandated time-frame, further supervisory measures may be taken. This may include variation of permissions so that they are no longer allowed to trade those particular types of option for which they do not meet the minimum standards.

Minimum standards

3.3 The level of sophistication of the pricing models, which are used to calculate own estimates of delta for use in the simplified standardised approach for options, should be proportionate to the complexity and risk of each option and the overall risk of the firm's options trading business. In general, it is considered that the risk of sold options will be higher than the risk of the same options when bought.

3.4 Delta should be recalculated at least daily. Firms should also recalculate delta promptly following significant movements in the market parameters used as inputs to calculate delta.

3.5 The pricing model used to calculate delta should be:

- based on appropriate assumptions which have been assessed and challenged by suitably qualified parties independent of the development process;
- independently tested, including validation of the mathematics, assumptions, and software implementation; and
- developed or approved independently of the trading desk.

3.6 A firm should use generally accepted industry standard pricing models for the calculation of own deltas where these are available, such as for relatively simple options.

3.7 The IT systems used to calculate delta should be sufficient to ensure that delta can be calculated accurately and reliably.

3.8 Firms should have adequate systems and controls in place when using pricing models to calculate deltas. This should include the following documented policies and procedures:

- clearly defined responsibilities of the various areas involved in the calculation;
- frequency of independent testing of the accuracy of the model used to calculate delta; and

- guidelines for the use of unobservable inputs, where relevant.

3.9 A firm should ensure its risk management functions are aware of weaknesses of the model used to calculate deltas. Where weaknesses are identified, the firm should ensure that estimates of delta result in prudent capital requirements being held. The outcome should be prudent across the whole portfolio of options and underlying positions at a given time.

3A Sensitivity Models for Interest Rate Risk

3A.1 Firms intending to use sensitivity models to calculate the positions on derivative instruments covered in Articles 328 to 330 of the Market Risk: Simplified Standardised Approach (CRR) Part are expected to demonstrate that they meet the requirements for granting of the relevant permission by providing the PRA with confirmation that they meet the minimum standards set out in paragraphs 3A.3 to 3A.9 below. Where a firm meets the minimum standards, it will be permitted to use sensitivity models to calculate the positions referred to in those Articles and may use them for any bond which is amortised over its residual life rather than via one final repayment of the principal. Firms should read Article 331 of the Market Risk: Simplified Standardised Approach (CRR) Part before applying for this permission.

3A.2 If a firm has permission under any of these Articles but ceases to be able to provide assurance with regard to a particular position which is currently within its permissions, a capital add-on may be applied and a rectification plan agreed. If a firm is unable to comply with the rectification plan within the mandated time-frame, further supervisory measures may be taken.

Minimum standards

3A.3 Firms should indicate the instruments for which net sensitivity positions are used and the currencies in which those positions are denominated. In addition, for the product scope requested firms should:

- confirm that the interest rate risk is managed on a discounted cash-flow basis; and
- briefly indicate any growth plans for the exposures.

3A.4 Firms should confirm that all models generate positions which have the same sensitivity to interest rate changes as the underlying cash flows.

3A.5 The sensitivities should be assessed with reference to independent movement in sample rates across the yield curve, with at least one sensitivity point in each of the maturity bands and appropriate to produce accurate valuation changes based on the assumed interest rate changes as set out in Table 2 in Article 339 of the Market Risk: Simplified Standardised Approach (CRR) Part.

3A.6 The sophistication of all pricing models used should:

- be proportionate to the complexity and risk of the instruments and the nature of the business;
- be based on appropriate assumptions that have been assessed and challenged by suitably qualified parties independent of the development process;
- have been independently tested, including validation of the mathematics, assumptions, and software implementation; and

- have been developed or approved independently of the trading desk.

3A.7 The frequency of independent testing of the accuracy of the pricing model and guidelines for the use of unobservable inputs, where relevant, should be documented. The responsibilities of the various areas involved in the calculation should be clearly defined and documented.

3A.8 Risk management functions should be aware of weaknesses in the model used to calculate sensitivities to interest rate changes, and where weaknesses are identified a prudent amount of additional capital should be held against the relevant exposures.

3A.9 Firms should confirm that sensitivities to interest rate changes can be recalculated promptly following significant movements in inputs used to calculate sensitivities. IT systems used to calculate sensitivities to interest rate changes should be sufficient to ensure that sensitivity positions can be calculated accurately and reliably.

3B Calculation of the overall net foreign exchange position

3B.1 Firms intending to exclude from the calculation of net open currency positions any positions which are deliberately taken or maintained in order to hedge against the adverse effect of the exchange rate on their ratios in accordance with Article 92(1) of the Required Level of Own Funds (CRR) Part are expected to demonstrate that they meet the requirements for granting permission under Article 325(9) of the Market Risk: General Provisions (CRR) Part (the 'Structural FX Permission') and provide the PRA with confirmation that they meet the minimum standards set out in paragraphs 3B.4-3B.13 below. Firms should read Article 325a1 of the Market Risk: General Provisions (CRR) Part before applying for this permission.

3B.2 If a firm has a permission under any of these Articles but ceases to be able to provide assurance of a particular position which is currently within its permissions, a capital add-on may be applied and a rectification plan agreed. If a firm is unable to comply with the rectification plan within the mandated time frame, further supervisory measures may be taken. This may include a variation of permissions so that the firm is no longer allowed to exclude those hedging positions from the calculation of net open currency positions for which it does not meet the minimum standards.

Level of application

3B.2A Chapter 2 of the Market Risk: General Provisions (CRR) Part of the PRA Rulebook sets out the level of application of the requirements in that part. In relation to the calculation of own funds requirements for foreign exchange risk, unless otherwise stated, a firm will need to assess the applicability of criteria at the relevant level of application. For example, when considering the exclusion of a position at a particular level of application under Article 325(9A), or under a permission given in accordance with Article 325(9), a firm should only exclude those positions which meet the criteria at that level of application.

3B.2B The PRA expects firms which make use of a Structural FX Permission (or firms seeking to make use of a Structural FX Permission) to consider the effects on their capital ratios at both consolidated and solo levels of risk positions it uses to hedge against the adverse effect of foreign exchange rates on any of its capital ratios. The PRA will generally only consider applications to exclude a position at the level(s) of consolidation for which the position acts as a hedge against the adverse effect of foreign exchange rates on a firm's capital ratios. For example, where a position acts as a hedge for a firm's consolidated ratios but not its solo-level ratios, the PRA will generally only permit the firm to

exclude the FX position from the calculation of the net FX position at consolidated level. Where a position acts as a hedge at both levels of consolidation, the firm should only exclude at a particular level of consolidation that portion of the position which acts as a hedge of its capital ratios at that level of consolidation.

Minimum standards

3B.3 [Deleted]

3B.4 A firm should confirm that mismatches resulting in an open structural FX position (other than those open structural FX positions it deliberately takes or maintains to protect its capital ratios) are avoided as far as possible and that positions are accounted for so that capital ratios are protected.

3B.5 Firms should confirm that they minimise any residual risks arising from structural FX positions, and consider such residual risks in their Pillar 2 assessment.

3B.6 Firms should confirm that policies and procedures are clearly articulated and are made available to the board and to regulators on an annual basis. The structural FX hedging strategy should be clearly articulated to investors and included in Pillar 3 disclosures.

3B.7 [Deleted]

3B.8 Firms should confirm that traders' remuneration structures do not in any way incentivise the structural FX positions becoming a profit centre.

3B.9 Oversight of the structural FX positions should be carried out by the appropriate committees of the boards of both the foreign entity and the group on at least a quarterly basis.

3B.10 Firms have to calculate their foreign exchange risk positions for market risk capital requirements in accordance with the methodologies referenced in Article 325(1) of the Market Risk: General Provisions (CRR) Part of the PRA Rulebook. However, firms may use an alternative measure for the net FX position when calculated only for the purposes of the SFX permission, as long as they can demonstrate to the PRA's satisfaction that their proposed alternative is a more appropriate measure for hedging capital adequacy ratios against adverse movements in FX rates, and that the proposed alternative does not omit any sources of FX risk that are of a non-trading or structural nature.

3B.11. The PRA expects firms to calculate their maximum risk position which may be excluded from the calculation of own funds requirements for foreign exchange risk, per currency i, using the formula outlined below. Firms may use more complex approaches to determine the maximum risk position, as long as they can demonstrate to the PRA that the alternative approach is an appropriate method of calculation.

$$\textit{Maximum risk position in foreign currency } i$$

$$= \textit{Sum of the foreign currency } i \textit{ RWAs}$$

$$\times \textit{current capital ratio of the entity hedging the risk}$$

3B.12. As set out in the formula above, the maximum risk position should be calculated based on the current capital ratio, at the relevant level of application of the entity.

3B.13. Firms should at a minimum include their credit risk risk-weighted assets (RWAs) as part of their foreign currency RWAs for the purposes of determining their maximum position per currency i in accordance with paragraph 3B.11 above. For the purposes of this calculation, 'credit risk' RWAs are those RWAs referred to in Article 92(3)(a) of the Required Level of Own Funds (CRR) Part of the PRA Rulebook. If firms wish to also include RWAs other than 'credit risk' RWAs, they should submit the methodology for including them and their respective sensitivity to movements in FX to be reviewed and agreed by the PRA.

4 Netting a convertible with its underlying instrument

[This section has been deleted]

4.1 [Deleted]

5 Offsetting derivative instruments

5.1 CRR Article 331(2) states conditions that should be met before firms not using interest rate pre-processing models can fully offset interest rate risk on derivative instruments. One of the conditions is that the reference rate (for floating rate positions) or coupon (for fixed rate positions) should be 'closely matched'. The PRA would normally consider a difference of less than 15 basis points as indicative of the reference rate or coupon being 'closely matched' for the purposes of this Article.

5A Corrections to modified duration for debt instruments under Article 340 of the Market Risk: Simplified Standardised Approach (CRR) Part

5A.1 The PRA expects firms making corrections to the calculation of modified duration for debt instruments, which are subject to prepayment risk under the second subparagraph of Article 340(3) of the Market Risk: Simplified Standardised Approach (CRR) Part, to apply one of the following:

(a) The formula set out in paragraph 5A.2

(b) The formula set out in paragraph 5A.3.

5A.2 For the purposes of paragraph 5A.1(a), firms should apply the following formula to correct the Modified Duration and compute a Corrected Modified Duration (CMD):

$$CMD = MD \times \Phi \times \Omega$$

where:

$MD =$ modified duration as in Article 340(3) of the Market Risk: Simplified Standardised Approach (CRR) Part

$\Phi = \frac{B}{P}$

$\Omega = 1 + \Delta + \frac{1}{2} \times \Gamma \times dB + \Psi$

$P =$ price of the bond with embedded optionality

$B =$ theoretical price of the vanilla bond

$\Delta =$ delta of the embedded option

$\Gamma =$ gamma of the embedded option

$\Psi =$ where not considered in the calculation of Δ and Γ, and where material, an additional factor for transaction costs and behavioural variables consistent with an Internal Rate of Return ("IRR") shift of 100 basis points ("b.p.").

$dB =$ change in value of the underlying

5A.3 For the purposes of paragraph 5A.1(b), firms should apply the following formula to re-compute directly a Corrected Modified Duration ('CMD') by re-pricing the instrument after a shift of 100 b.p. in the IRR:

$$CMD = \frac{P_{-\Delta r} - P_{+\Delta r}}{2 \times P_0 \times \Delta \mathrm{r}} + \Psi$$

where:

$P_0 =$ the current market price of the product

$P_{-\Delta r}$ = theoretical price of the product after a negative IRR shock equal to Δr

$P_{+\Delta r}$ = theoretical price of the produce after a positive IRR shock equal to Δr

Δr = a hypothetical IRR change of 50 b.p.

Ψ = where not considered in the calculation of $P_{-\Delta r}$ and $P_{+\Delta r}$, and where material, an additional factor for transaction costs and behavioural variables consistent with an IRR shift of 100 b.p.

5A.4 The computation of the additional factor Ψ need only be considered if material, and should not lead to a shorter CMD than if it had not been considered in the calculation.

5A.5 For the purposes of assessing the additional factor Ψ in accordance with paragraph 5A.3, firms should take into account each of the following:

(a) that transaction costs reduce the value of the option, making the option unlikely to be executed below the threshold established by the transaction costs; and

(b) that there are behavioural factors suggesting that some clients, in particular retail clients, may not always exercise an option, even when it is in the money, in certain circumstances including the following:

(i) where the remaining principal is close to the initial amount lent, leading some 'aggressive' borrowers to leave or refinance at an early stage; and

(ii) in the case of borrowers with the largest loan size who have the largest gain from prepayment as the cost attached to prepayment is a fixed amount.

5A.6 The assessment of the additional factor Ψ should be based on historical data, obtained from a firm's own experience or from external sources. Data on the behavioural factors referred to in 5A.5(b) may be obtained from the assessment of other balance sheet elements subject to prepayment risk, such as those observed for retail clients in the non-trading book.

5A.7 Institutions should calibrate the additional factor Ψ by assessing significant divergences between the real behaviour historically observed for a type of client and the theoretical behaviour that would have been envisaged for counterparties acting in a purely rational way.

5A.8 The calibration of the additional factor Ψ , due to behavioural factors referred to in paragraph 5A.7, should be made where a relevant amount of these instruments with prepayment risk are held in the trading book and especially where the counterparties are retail clients. Additional factors should not be considered for the embedded options where the institution has the right to call for an early termination of the instrument.

6 Exclusion of overshootings when determining multiplication factor addends

6.1 The PRA's starting assumption will be that all overshootings should be taken into account for the purpose of the calculation of addends. If a firm believes that an overshooting should not count for

that purpose, then it should contact the PRA in order to obtain its agreement to exclude that particular overshooting. The PRA will then decide whether to agree to such an exclusion.

6.2 One example of when a firm's overshooting might properly be disregarded is when it has arisen as a result of a risk that is not captured in its VaR model, but against which capital resources are already held.

7 Derivation of notional positions for simplified standardised approaches

Futures and forwards on a basket or index of debt securities

7.1 These should be converted into forwards on single debt securities as follows:

(1) futures or forwards on a single currency basket or index of debt securities should be treated as either:

(c) a series of forwards, one for each of the constituent debt securities in the basket or index, of an amount which is a proportionate part of the total underlying the contract according to the weighting of the relevant debt security in the basket; or

(d) a single forward on a notional debt security; and

(2) futures or forwards on multiple currency baskets or indices of debt securities should be treated as either:

(a) a series of forwards (using the method described in 1(a)); or

(b) a series of forwards, each one on a notional debt security to represent one of the currencies in the basket or index, of an amount which is a proportionate part of the total underlying the contract according to the weighting of the relevant currency in the basket.

7.2 Notional debt securities derived through this treatment should be assigned a specific risk position risk adjustment and a general market risk position risk adjustment equal to the highest that would apply to the debt securities in the basket or index.

7.3 The debt security with the highest specific risk position risk adjustment within the basket might not be the same as the one with the highest general market risk position risk adjustment. A firm should select the highest percentages even where they relate to different debt securities in the basket or index, and regardless of the proportion of those debt securities in the basket or index.

Bonds where the coupons and principal are paid in different currencies

7.4 Where a debt security pays coupons in one currency, but will be redeemed in a different currency, it should be treated as:

(i) a debt security denominated in the coupon's currency; and

(ii) a foreign currency forward to capture the fact that the debt security's principal will be repaid in a different currency from that in which it pays coupons, specifically:

(a) a notional forward sale of the coupon currency and purchase of the redemption currency, in the case of a long position in the debt security; or

(b) a notional forward purchase of the coupon currency and sale of the redemption currency, in the case of a short position in the debt security.

Interest rate risk on other futures, forwards and swaps

7.5 Other futures, forwards, and swaps where a treatment is not specified in Article 328 of the Market Risk: Simplified Standardised Approach (CRR) Part should be treated as positions in zero specific risk securities, each of which:

(i) has a zero coupon;

(ii) has a maturity equal to that of the relevant contract; and

(iii) is long or short according to the following table:

Instrument		Notional positions	
Foreign currency forward or future	A long position denominated in the currency purchased	and	A short position denominated in the currency sold.
Gold forward	A long position if the forward or future involves an actual (or notional) sale of gold	or	A short position if the forward or future involves an actual (or notional) purchase of gold.
Equity forward	A long position if the contract involves an actual(or notional) sale of the underlying equity	or	A short position if the contract or future involves an actual (or notional) purchase of the underlying equity.

Deferred start interest rate swaps or foreign currency swaps

7.6 Interest rate swaps or foreign currency swaps with a deferred start should be treated as two notional positions (one long, one short). The paying leg should be treated as a short position in a zero specific risk security with a coupon equal to the fixed rate of the swap. The receiving leg should be treated as a long position in a zero specific risk security, which also has a coupon equal to the fixed rate of the swap.

7.7 The maturities of the notional positions are shown in the following table:

	Paying leg	Receiving leg
Receiving fixed and paying floating	The maturity equals the start date of the swap.	The maturity equals the maturity of the swap.
Paying fixed and receiving floating	The maturity equals the maturity of the swap.	The maturity equals the start date of the swap.

Swaps where only one leg is an interest rate leg

7.8 For the purposes of interest rate risk, a firm should treat a swap (such as an equity swap) with only one interest rate leg as a notional position in a zero-specific-risk security:

(a) with a coupon equal to that on the interest rate leg;

(b) with a maturity equal to the date that the interest rate will be reset; and

(c) which is a long position if the firm is receiving interest payments and short if making interest payments.

Foreign exchange forwards, futures and CFDs

7.9 A firm should treat a foreign currency forward, future, or Contracts for Difference (CFDs) as two notional currency positions as follows:

(a) a long notional position in the currency which the firm has contracted to buy; and

(b) a short notional position in the currency which the firm has contracted to sell.

7.10 The notional positions should have a value equal to either:

(c) the contracted amount of each currency to be exchanged in the case of a forward, future, or CFD held in the non-trading book; or

(d) the present value of the amount of each currency to be exchanged in the case of a forward, future, or CFD held in the trading book.

Foreign currency swaps

7.11 A firm should treat a foreign currency swap as:

(e) a long notional position in the currency in which the firm has contracted to receive interest and principal; and

(f) a short notional position in the currency in which the firm has contracted to pay interest and principal.

7.12 The notional positions should have a value equal to either:

(g) the nominal amount of each currency underlying the swap if it is held in the non-trading book; or

(h) the present value amount of all cash flows in the relevant currency in the case of a swap held in the trading book.

Futures, forwards, and CFDs on a single commodity

7.13 Where a forward, future or CFD settles according to:

(1) the difference between the price set on trade date and that prevailing at contract expiry, then the notional position should:

(a) equal the total quantity underlying the contract; and

(b) have a maturity equal to the expiry date of the contract; and

(i) the difference between the price set on trade date and the average of prices prevailing over a certain period up to contract expiry, then a notional position should be derived for each of the reference dates used in the averaging period to calculate the average price, which:

(a) equals a fractional share of the total quantity underlying the contract; and

(b) has a maturity equal to the relevant reference date.

Buying or selling a single commodity at an average of spot prices prevailing in the future

7.14 Commitments to buy or sell at the average spot price of the commodity prevailing over some period between trade date and maturity should be treated as a combination of:

(1) a position equal to the full amount underlying the contract with a maturity equal to the maturity date of the contract, which should be:

(a) long, where the firm will buy at the average price; or

(b) short, where the firm will sell at the average price; and

(2) a series of notional positions, one for each of the reference dates where the contract price remains unfixed, each of which should:

(a) be long if the position under (1) is short, or short if the position under (1) is long;

(b) equal to a fractional share of the total quantity underlying the contract; and

(c) have a maturity date of the relevant reference date.

8 Qualifying debt instruments

This chapter has been deleted.

9 Expectations relating to internal models

9.1 Article 363 of Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part states that an institution with permission to use internal models to calculate capital is subject to ensuring compliance with:

- the general requirements;
- requirements particular to specific risk modelling; and
- requirements for an internal model for incremental default and migration risk.

9.2 The standards that the PRA expects to be met to consider that an institution is compliant with these requirements are set out below.

High-level standards

9.3 A firm should be able to demonstrate that it meets the risk management standards set out in Article 368 of Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part on a legal entity and business line basis where appropriate. This is particularly important for a subsidiary undertaking in a group subject to matrix management, where the business lines cut across legal entity boundaries.

Categories of position

9.4 A VaR model permission will generally set out the broad classes of position within each risk category within its scope. It may also specify how individual products within one of those broad classes may be brought into or taken out of scope of the VaR model permission. These broad classes of permission are as follows:

(1) Linear products, which comprise securities with linear pay-offs (such as bonds and equities), and derivative products which have linear pay-offs in the underlying risk factor (such as interest rate swaps, forward-rate agreements, and total return swaps).

(2) European, American and Bermudan put and call options (including caps, floors, and swaptions) and investments with these features.

(3) Asian options, digital options, single barrier options, double barrier options, look back options, forward starting options, compound options and investments with these features.

(4) All other option based products (such as basket options, quantos, outperformance options, timing options, and correlation-based products) and investments with these features.

Data standards

9.5 The PRA expects a firm to ensure that the data series used by its VaR model is reliable. Where a reliable data series is not available, proxies or any other reasonable value-at-risk measurement may be used when the firm can demonstrate that the requirements of Article 367(2)(e) of Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part are met. A firm should be able to

demonstrate that the technique is appropriate and does not materially understate the modelled risks.

9.6 Data may be deemed insufficient if, for example, it contains missing data points, or data points which contain stale data. With regard to less-liquid risk factors or positions, the PRA expects the firm make a conservative assessment of those risks, using a combination of prudent valuation techniques and alternative VaR estimation techniques to ensure there is a sufficient cushion against risk over the close out period, which takes account of the illiquidity of the risk factor or position.

9.7 A firm is expected to update data sets to ensure standards of reliability are maintained in accordance with the frequency set out in its VaR model permission, or more frequently if volatility in market prices or rates necessitates more frequent updating. This is in order to ensure a prudent calculation of the VaR measure.

Aggregating VaR measures

9.8 In determining whether it is appropriate for an institution to use empirical correlations within risk categories and across risk categories within a model, the PRA expects certain features to be observed in assessing whether such an approach is sound and implemented with integrity. In general, the PRA expects a firm to determine the aggregate VaR measure by adding the relevant VaR measure for each category, unless the firm's permission provides for a different method of aggregating VaR measures which is empirically sound.

9.9 The PRA does not expect a firm to use the square root of the sum of the squares approach when aggregating measures across risk categories or within risk categories unless the assumption of zero correlation between these categories is empirically justified. If correlations between risk categories are not empirically justified, the VaR measures for each category should simply be added in order to determine its aggregate VaR measure. However, to the extent that a firm's VaR model permission provides for a different way of aggregating VaR measures:

(i) that method applies instead; and

(ii) if the correlations between risk categories used for that purpose cease to be empirically justified then the firm must notify the appropriate regulator at once.

Testing prior to model validation

9.10 A firm is expected to provide evidence of its ability to comply with the requirements for a VaR model permission. In general, it will be required to demonstrate this by having a back- testing programme in place and should provide three months of back-testing history.

9.11 A period of initial monitoring or live testing is required before a VaR model can be recognised. This will be agreed on a firm by firm basis.

9.12 In assessing the firm's VaR model and risk management, the results of internal model validation procedures used by the firm to assess the VaR model will be taken into account.

Back-testing

9.13 For clarity, the back-testing requirements of Article 366 of Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part should be implemented as follows:

- If the day on which a loss is made is day n, the value-at-risk measure for that day will be calculated on day n-1, or overnight between day n-1 and day n. Profit and loss figures are produced on day n+1, and back-testing also takes place on day n+1. The firm's supervisor should be notified of any overshootings by close of business on day n+2.

- Any overshooting initially counts for the purpose of the calculation of the plus factor even if subsequently the PRA agrees to exclude it. Thus, where the firm experiences an overshooting and already has four or more overshootings for the previous 250 business days, changes to the multiplication factor arising from changes to the plus factor become effective at day n+3.

9.14 A longer time period generally improves the power of back-testing. However a longer time period may not be desirable if the VaR model or market conditions have changed to the extent that historical data are no longer relevant.

9.15 The PRA will review, as part of a firm's VaR model permission application, the processes and documentation relating to the derivation of profit and loss used for back-testing. A firm's documentation should clearly set out the basis for cleaning profit and loss. To the extent that certain profit and loss elements are not updated every day (for example certain reserve calculations) the documentation should clearly set out how such elements are included in the profit and loss series .

Planned extensions and changes to the Internal Model Approach model

9.16 In accordance with Article 363(3) of Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part, the PRA expects a firm to provide and discuss with the PRA details of any significant planned changes to the Internal Model Approach model before those changes are implemented. These must include detailed information about the nature of the change, including an estimate of the impact on capital requirements. The PRA expects firms to submit the pro-forma for all internal model extensions or changes when submitting an application for approval, a pre-notification or post-notification in accordance with Annex 3, Part B of the Market Risk: Internal Model Approach (CRR) Part. For the avoidance of doubt, the assessments of materiality that determine whether a model change is an application, prenotification or post-notification should be carried out without incorporating capital requirements from the RNIV framework. See Chapter 2 for the process around extensions and changes to the RNIV framework. The pro-forma can be found on the Bank's website at www.bankofengland.co.uk/pra/Pages/authorisations/crr/applying.aspx.

Ten-day VaR and sVaR calculation

9.17 The use of overlapping intervals of ten-day holding periods for the purposes of Article 365 of Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part introduces an autocorrelation into the data that would not exist should truly independent ten-day periods be used. This may give rise to an underestimation of the volatility and the VaR at the 99% confidence level. To obtain clarity on the materiality of the bias, firms should measure the bias arising from the use of overlapping intervals for ten-day VaR and sVaR when compared to using independent intervals as a part of its periodic model validation.

9.18 A firm that scales its one-day VaR and sVaR measures to ten-days should ensure that the upscaled VaR and sVaR measures do not underestimate risk when compared to the corresponding full ten-day VaR and sVaR measures. The firm should perform this analysis as a part of its periodic model validation.

Accuracy of approximate revaluation approaches

9.19 Firms should perform periodic monitoring to demonstrate the accuracy of any approximate revaluation approaches used within its model (eg for firms using sensitivities, revaluation ladders, or spot/vol-matrices), with a particular emphasis on sVaR suitability. This should include a review of any ladders/matrices to ensure that they are extended to accommodate wider shocks associated with the firm's selected 1-year sVaR period. The frequency of the monitoring should be commensurate to the accuracy of the firm's approximate revaluation approach and the materiality of the risks covered .

Trading locations

9.20 In accordance with Annex 3, Part B of the Market Risk: Internal Model Approach (CRR) Part, firms must seek pre-approval from the PRA if they wish to extend the use of their Internal Models Approach (IMA) to a trading desk located in another jurisdiction or time zone that is not listed as a trading location in the existing permission. For clarity the PRA takes the view that a 'trading desk' in this context may be defined as a group of traders or trading accounts that has a well-documented business strategy, a revenue target and clear trading limits. The PRA takes the view that sub-desks that are set up for internal operation purposes only (such as for the booking and transmission of trades to another trading desk with IMA approval) should not be 'trading desks' for this purpose.

10 Stressed VaR calculation

10.1 Article 365 of Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part requires firms that use an internal model for calculating their own funds requirement to calculate at least weekly a sVaR of their current portfolio. When the PRA considers a firm's application to use a sVaR internal model, the PRA would expect the following features to be present prior to permission being granted as indicative that the conditions for granting permission have been met.

Quantile estimator

10.2 The firm should calculate the sVaR measure to be greater than or equal to the average of the second and third worst loss in a twelve-month time series comprising of 250 observations. The PRA expects as a minimum that a corresponding linear weighting scheme should be applied if the firm use a larger number of observations.

Meaning of 'period of significant financial stress relevant to the institution's portfolio'

10.3 Subject to paragraph 10.3A, the firm should ensure that the sVaR period chosen is equivalent to the period that would maximise VaR given the firm's portfolio. There is an expectation that a stressed period should be identified at each legal entity level at which capital is reported. Therefore, group- level sVaR measures should be based on a period that maximises the group-level VaR, whereas entity-level sVaR should be based on a period that maximises VaR for that entity .

10.3A The PRA expects that, to identify their sVaR period, firms should consider an observation period that starts at least from Monday 1 January 2007. The PRA expects that the observation period generally does not need to include the most recent 12 months of historical data immediately preceding the point of calculation, in order to minimise overlaps with VaR. However, firms may include the most recent 12 months in their observation period, where it leads to a more appropriately prudent outcome. Where a firm believes that the observation period for determining the sVaR stress period should exclude more than the most recent 12 months (for example, where the firm uses more than the most recent 12 months to calculate VaR), the firm should contact the PRA setting out, and providing justification for, its rationale.

Antithetic data

10.4 The PRA expects firms to consider whether the use of antithetic data in the calculation of the sVaR measure is appropriate to the firm's portfolio. A justification for using or not using antithetic data should be provided to the PRA.

Absolute and relative shifts

10.5 The PRA expects firms to be able to justify on an ongoing basis the rationale for the choice of risk factor shift methodologies (eg absolute or relative shifts). In particular, the consistency of the assumed risk factor dynamics with those observed in practice should be evidenced for both VaR and sVaR as a part of the firm's periodic model validation.

10.6 The following information is expected to be submitted quarterly:

- analysis to support the equivalence of the firm's current approach to a VaR-maximising approach on an ongoing basis;
- the rationale behind the selection of key major risk factors used to find the period of significant financial stress (where relevant);
- summary of ongoing internal monitoring of stressed period selection with respect to current portfolio; and
- the firm's 10-day 99% standalone VaR and sVaR by asset class.

11 Requirement to have an internal IRC model

11.1 Article 372 of Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part requires firms that use an internal model for calculating own funds requirements for specific risk of traded debt instruments to also have an internal incremental default and migration risk (IRC) model in place. This model should capture the default and migration risk of its trading book positions that are incremental to the risks captured by its VaR model.

11.2 When the PRA considers a firm's application to use an IRC internal model, the PRA expects that the following matters would be included as demonstrating compliance with the standards set in Article 372 of Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part.

Basis risks for migration

11.3 The PRA expects the IRC model to capitalise pre-default basis risk. In this respect, the model should reflect that in periods of stress the basis could widen substantially. Firms should disclose to the PRA their material basis risks that are incremental to those already captured in existing market risk capital measures (VaR-based and others). This must take actual close-out periods during periods of illiquidity into account.

Price/spread change model

11.4 The price/spread change model used to capture the profit and loss impact of migration should calibrate spread changes to long-term averages of differences between spreads for relevant ratings. These should either be conditioned on actual rating events, or using the entire history of spreads regardless of migration. Point-in-time estimates are not considered acceptable, unless they can be shown to be as conservative as using long-term averages.

Dependence of the recovery rate on the economic cycle

11.5 To achieve a soundness standard comparable to those under the IRB approach, LGD estimates should reflect the economic cycle. The PRA therefore expects firms to incorporate dependence of the recovery rate on the economic cycle into the IRC model. Should the firm use a conservative parameterisation to comply with the IRB standard of the use of downturn estimates, evidence of this will be required to be submitted in quarterly reporting to the PRA, bearing in mind that for trading portfolios, which contain long and short positions, downturn estimates would not in all cases be a conservative choice.

12 Annual SMF attestation of market risk internal models

12.1 The PRA expects an appropriate individual in a Senior Management Function (SMF) role to provide to the PRA on an annual basis written attestation that the firm's internal approaches for which it has received a permission comply with the requirements in Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part, and any applicable market risk supervisory statements.

12.2 Firms should agree the appropriate SMF for providing this attestation with the PRA, noting that the PRA would not expect to agree more than 2 SMFs to cover all the firm's market risk internal models as described in Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part.

12.3 Where a firm is unable to provide an attestation under paragraph 12.1 or at any time has ceased to comply with the requirements in Annex 3, Part A of the Market Risk: Internal Model Approach (CRR) Part, then the firm is expected to notify the PRA of that fact pursuant to Fundamental Rule 7 of the PRA Rulebook for CRR firms and to do one of the following:

- present the PRA with a credible plan for a timely return to compliance; or
- demonstrate to the satisfaction of the PRA that the effect of non-compliance is immaterial.

13 Alternative definitions of sensitivities in the advanced standardised approach

13.1 In assessing a firm's application for permission to use alternative definitions of sensitivities for calculating the own funds requirements of a trading book position under Article 325t(5) of the Market Risk: Advanced Standardised Approach (CRR) Part, the PRA expects firms to:

- provide justification that the resulting sensitivities are appropriate for calculating the own funds requirements of a trading book position; and
- document the circumstances or scenarios under which the results of the alternative definitions of sensitivities might materially differ from those in the PRA rulebook. Firms should have an appropriate process to ensure that if and when those scenarios occur, the resulting sensitivity-based method calculation does not understate risk (when compared to the use of the standard definitions). Firms should periodically update this analysis.

14 Determination of the value of a CIU and its underlying investments for the purpose of Articles 104(2)(f), 104(2)(h), and 325j(1)(a)

14.1 Firms are required to determine the 'value' of a CIU and its underlying investments to apply the thresholds in Articles 104(2)(f), 104(2)(h), and 325j(1)(a). For many standard CIUs, the PRA considers Net Asset Value (NAV) would be an appropriate measure for the CIU and the respective valuations included in the NAV would be appropriate for its underlying investments. However, the PRA expects this determination of value to consider whether there are features of the CIU, such as leverage, derivatives that are used for purposes other than hedging, or synthetic positions, that would mean that the NAV or the related valuation of the underlying investments would not be an appropriate measure to reflect the proportion of the overall market risk of the CIU that a collection of underlying investments contribute. In cases where such features exist, firms should instead apply an alternative approach to determine the CIU and its underlying investments' value for the purpose of applying the thresholds in Articles 104(2)(f), 104(2)(h), and 325j(1)(a). Firms should be able to demonstrate to supervisors, upon request, that the alternative approach appropriately reflects the CIU and underlying investments' value, taking into account its market risk profile.