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# Position Paper

## Capital Requirements for Proprietary Traders



June 2015

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### FIA EPTA position on capital requirements for proprietary traders

FIA EPTA welcomes the combined review of Regulation (EU) 575/2013 on prudential requirements for credit institutions and investment firms (“Capital Requirements Regulation” or “CRR”) and the application of key provisions to investment firms.<sup>1</sup> We consider the review to be timely and vital to preserving liquidity in European financial markets. We note the European Commission’s mandate to the European Banking Authority (“EBA”) regarding the categorisation of investment firms, adequacy of and changes to categories and assessment of which CRR provisions should apply to investment firms within these categories. We also note the Commission’s reference to material changes to the scope of CRR brought about through application of the recast Directive 2014/65/EU on markets in financial instruments (“Recast Markets in Financial Instruments Directive” or “MiFID 2”).

**FIA EPTA encourages the EBA in its advice to the European Commission to:**

- 1. Update the “local firm” exemption to reflect key market and regulatory changes;**
- 2. Revise market risk calculations to facilitate market making, liquidity provision and requisite hedging activity.**

These suggestions provide for an accessible, risk-based approach commensurate with the business model of proprietary trading firms. We set out supporting arguments in further detail below.

#### **Appropriate requirements for proprietary traders**

FIA EPTA is generally concerned that CRR does not appropriately distinguish between investment firms by activity.

Key provisions in the legislation including those on the application of own funds requirements are predicated on the list of investment services and activities set out in Annex I Section A of Directive 2004/39/EC on markets in financial instruments (“Markets in Financial Instruments Directive” or “MiFID”). This list of investment services and activities is not further defined in MiFID implementing legislation and provides no means for differentiating on the basis of activity of (a) a large investment firm that engages in proprietary trading amongst various other regulated activities with different types of clients, versus (b) a small investment firm that engages solely in proprietary trading.

These investment firms are guaranteed by general clearing members and central counterparties, which greatly limit the effects of a failure within markets. Proprietary trading firms have no clients and no transactions with retail investors, and as such a failure is contained and resolution is straightforward.

Investment firms that engage solely in proprietary trading are fundamentally different to banks: (1) their risk profile deviates significantly as they predominantly operate in “lit” markets (trading platforms such as stock exchanges where the central order book is public), (2) instruments traded by proprietary trading firms are highly liquid, so liquidation risks such as those that arise when banks must dispose of assets in distressed lending portfolios, are highly unlikely to apply, (3) most risks are hedged in real

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<sup>1</sup> The European Principal Traders Association (EPTA) is affiliated with the Futures Industry Association (“FIA”) and is comprised of 26 EU-based proprietary trading firms that deal on own account on trading venues across Europe. FIA EPTA members engage in manual, automated and hybrid methods of trading and are active in a variety of asset classes, such as equities, foreign exchange, commodity derivatives and fixed income. Members of FIA EPTA are a critical source of liquidity in the on-venue markets, allowing those who use the markets to manage their business risks to enter and exit the markets efficiently. We believe that stable, reliable and well-functioning markets increase security and safety and provide the foundations that encourage investor confidence, which is essential to capital allocation.

time, often through different instruments with offsetting risk profiles, and will be mitigated in full once a trade is submitted to clearing and settlement, (4) they are much smaller than banks: their funding profile matches their asset base, (5) asset, funding and risk cycles are much shorter than with banks (days vs. years), (6) no government funds will be made available to bail them in or out in the event of failure, and (7) their failure will only impact the owners of the firm providing for the proprietary capital against which the trading takes place and the clearing organisation and central counterparty guaranteeing the business towards third parties in the market (where risks borne by the latter are mitigated by intra-day margining of the clearing client ('GCM margin approach')).

FIA EPTA believes that investment firms that engage solely in proprietary trading are therefore appropriately and sufficiently regulated by the organisational and risk management requirements of MiFID 2 in combination with the robust operational risk frameworks such firms have in place to manage operational risk and the margining and risk management requirements of such firms' general clearing firms.

We believe that additional capital requirements add material cost that preclude market making and liquidity provision, in contravention to the legislative intent of MiFID 2, and harm liquidity across European trading venues.

### 1. Proposed solution: update the “local firm” exemption to reflect key market and regulatory changes

FIA EPTA considers that the Article 4(1)(2)(b) and (4) CRR exemption and definition of “local firm” should be updated to reflect key market and regulatory changes, in particular material changes to the scope of CRR brought about through application of MiFID 2.

Firstly, local firm activity as defined under Article 4(1)(4) CRR is excluded from the revised exemptions set out in Article 2(1)(d) and (j) MiFID 2. In effect, local firms under CRR will no longer be exempted from MiFID 2 authorisation and other requirements from 03 January 2017. FIA EPTA supports the strengthened authorisation requirements under MiFID 2, as we believe the conduct of all market participants should be supervised. However, the Article 4(1)(2)(b) and (4) CRR exemption and definition of “local firm” are stand-alone provisions that survive the application of MiFID 2. We consider the investment firm category and local firm exemption to be legally and politically consistent, so that a person may be both an investment firm and a local firm simultaneously. We believe any alternative interpretation would be inconsistent with Article 4(1) CRR and would render the exemption void by the application of MiFID 2.

This general exclusion for investment firms that engage solely in proprietary trading is appropriate because – in addition to the unique characteristics enumerated above – a distinct feature of their regulation is that they are already subject to sufficient capital requirements as imposed by clearing

#### A new problem?

Why is this problem flagged now when these (and similar) rules have been in existence for years? Proprietary trading firms until now have largely operated on the basis of the ‘dealing on own account’ exemption in MiFID Article 2(1)(l) or other exemptions applied by national competent authorities. In such cases, CRR would not currently apply to these firms and will not apply until such exemptions are revised under MiFID 2. Where banks engage in strategies similar to those of proprietary traders and the standardised methodology would produce perverse outcomes, banks would have chosen to apply internal models (CAD- or VAR models), an option that is not readily available to proprietary trading firms given the disproportionate costs and significant lead-time to regulatory approval.

organisations that are liable (towards external parties) for the positions initiated by the investment firm. Between the clearing organisation and the investment firm, stringent contractual arrangements apply mandating the maintenance of sufficiently robust capital measured against a risk position calculated on an intra-day basis.

### **Risk management is appropriately addressed in the GCM margin model**

General clearing members (“GCMs”) are key intermediaries for their clients, which include proprietary trading firms. GCMs provide market access, execution, clearing and settlement services in a heavily regulated global environment. A crucial element of the GCM business model is that GCMs guarantee their clients to all (central) counterparties. As a result, GCMs bear the liabilities and exposures of proprietary trading firms towards third parties. GCMs are willing to do this conditioned on the proprietary trading firm holding sufficient own funds (collateral) to meet the financial obligations of the proprietary firm toward the GCM calculated at least on a daily basis by means of a sophisticated margin model that has been tested throughout the years.

GCMs generate revenue from clients typically on the basis of fixed fee structures. This ensures GCMs’ interests are always aligned with the market; it is not in GCMs’ interest to compromise on risk management, nor do GCMs share in any upside of the trading activities of their clients. GCMs prioritise robust risk management as the most crucial element of their business model.

GCMs operate a strict and comprehensive pre- and post-trade risk management framework. Pre-boarding and on-boarding processes assess and verify the suitability of potential clients through 1) Know-Your-Client (KYC) and Anti-Money-Laundering (AML) validations, 2) credit risk assessments, 3) operational and technical due diligence, 4) senior management and “key staff” competence assessments, and 5) analysis of trading strategies.

Once on-boarded, clients are subject to rigorous, real-time risk management tailored to the size, complexity, type of products and markets traded and type of trading strategies. Risks are quantified by application of a risk model that calculates a margin sum covering market and other risks borne by the GCM as a result of its guarantee, which may be attributable to the portfolio of the relevant proprietary trading firm. This margin sum is calculated on an intra-day basis and quantifies the risk exposures between the GCM and the proprietary trading firm for which the firm must maintain capital.

The GCM margin model will typically cover all asset classes and take into account correlations among different equities, indices, bonds and derivative products, typically by means of a statistical model (principal component analysis). The GCM margin model not only takes price and volatility movements into account, but also other risk factors such as dividend, time and interest. Positions of proprietary trading firms are monitored for credit and margin usage, long premium, liquidity risk, concentration risk, and extreme stress scenarios. Stress calculations are performed on a daily (batch) and intraday basis. Some GCMs use a cash/collateral buffer as an element of pre-margin depending on the scale or nature of the client activity.

Clients are subject to holistic review on a frequent basis to ensure the organisation and strategy remain within agreed limits and activities pose no risk to the firm or the wider market. Moreover, GCMs have real-time monitoring processes in place to safeguard against potential market abuse, trading errors and other operational and compliance issues. MiFID 2 ensures further standardisation and transposition of existing guidelines into primary legislation at EEA level.

It is important to point out that GCMs have developed their margin models over the course of years of experience with proprietary trading firms, and there is no historical precedent of the failure of a proprietary trading firm impacting the market.

Finally, GCMs are themselves subject to stringent capital requirements under the CRDIV/CRR framework, precisely to cover the exposures resulting from providing services on behalf of their clients. This includes, but it is not limited to, rules related to (central) counterparty exposures, leverage and liquidity. Therefore, quantifying capital requirements on the basis of the GCM margin model is a proven, appropriate and sophisticated measure for market and other related risks for proprietary trading firms.

Banks' business models centre on credit risk (i.e. banking book activity); by contrast, proprietary trading firms' business models centre on market risk (i.e. trading book activity). While firms that deal on own account clearly need to manage market risk, the business model of GCMs as described above is designed to do just this on behalf of such firms.

However, market making in cash securities such as equities and exchange-traded funds ("ETFs") has grown exponentially since 2006. As such we consider the restriction of the Article 4(1)(4) definition to hedging in cash markets to be outdated. There is certainly no additional risk in a local firm making markets or providing liquidity in cash securities. We suggest that the EBA consider recommending an amendment to the definition to extend permitted trading activity to all financial instruments per the revised MiFID 2 Annex I Section C list.

Further, we consider that the local firm exemption should be restricted to prevent regulatory arbitrage. In particular, the exemption should exclude investment firms that engage in proprietary trading if such firms also conduct client business or hold/control client assets (such as a bank that conducts market making activities from its proprietary trading arm). The failure of such firms would have effects far beyond the failure of an investment firm that engages solely in proprietary trading. We do not consider it appropriate to exempt such firms from own funds requirements for market risk and other capital provisions. We urge the EBA to recommend a suitable amendment to safeguard the exemption.

FIA EPTA therefore advocates that both the CRR definition and related guidance on the application of the exemption should be updated to reflect material changes to the scope of CRR brought about through application of MiFID 2 as well market developments since the adoption of Directives 2006/48/EC and 2006/49/EC.

## **2. Additional proposed solution: revise market risk calculations to facilitate market making and liquidity provision**

Even if the local exemption applies to proprietary trading firms (as we consider appropriate for these types of firms), the impact of market risk own funds requirements for other entities holding trading book portfolios may also be grossly disproportionate to the market risks they face. We would suggest amending the standard rules to apply capital requirements for the maturity-based calculation of general risk by replacing discrete time bucketing with either a scenario-based approach for interest rate shifts or a correlation table matrix to allow greater offsetting between related contracts. Alternatively, we would suggest Article 95 or 96 investment firms should have an own funds requirement based on the risk-based models used by either GCMs or trading venues.

Without prejudice to the specific solution set out above for investment firms engaged solely in proprietary trading, FIA EPTA believes that the Title IV CRR provisions on own funds requirements for market risk do not properly assess capital requirements in accordance with the firm exposure to market risks. These own funds requirements dissuade traders from making markets and/or providing liquidity generally, in contravention to the legislative intent of MiFID 2, and preclude market making in interest rate and fixed income derivatives in particular.

At issue are the standardised methodologies mandated under CRR, namely the provisions that account for market risk, especially the maturity based calculation of general risk for fixed income portfolios in Articles 339 to 340 CRR. These methodologies do not account for the typical nature of trading book positions, which are generally hedged on portfolio basis. The market values of these portfolios do not always move on a linear basis with a move in market parameters. The existing standardised methodologies are too simplistic and do not allow for appropriate offsets within portfolios. FIA EPTA therefore encourages the EBA to recommend that the methodologies adopted should be modified based on best practices adopted by general clearing members and central counterparties.

To illustrate, an options market maker will accumulate an extensive, yet balanced and effectively hedged option portfolio. Market makers very rarely close out all their individual positions. Rather, they use various combinations of options, futures and stocks to hedge exposures with different maturities and across their entire book. They carry portfolios that are large in number of individual contracts yet balanced and with risks that net-off to a large extent.

Current CRR rules do not reflect the actual risks related to such portfolios. In some situations, the risks are understated. In others and especially in the case of fixed income options and futures, the capital requirements dramatically overstate the margin requirements calculated by trading venues or GCMs (by a factor of 100), particularly for general market risk requirements pursuant to Article 339 CRR. This article splits out the components of hedged positions into individual positions without allowing for netting of offsetting risk. This results in significant, gross capital requirements for what are in fact risk-reducing positions.

In Annex 1 we set out the following examples that demonstrate our concerns with the own fund requirements for very simple derivative positions:

- Example 1: The own fund requirements assume delta on option portfolios is linear, which is only true for very small movements in the underlying price.
- Example 2&3: The discrete bucketing of own fund requirements for fixed income products can lead to capital requirements that are higher for hedged than riskier positions.
- Example 4: Own fund requirements vary over time for a single position with constant pricing inputs.

## Conclusion

Updating and confirming the 'local firm' definition and exemption as currently contained in the CRR to reflect market and regulatory developments brought about through application of MiFID 2 is an accessible, risk-based approach to capital requirements commensurate with the business model of proprietary trading firms. This approach is also urgently necessary to ensure such firms' are able to fulfil the obligations imposed on market makers as MiFID 2 comes into effect in 2017.

Proprietary trading firms are already subject to meaningful risk management by the clearing organisations that guarantee the exposures of proprietary trading firms to the market. The GCM margin model mitigates the risks borne by proprietary traders to the fullest extent through the application of qualitative (organisational) and quantitative (capitalisation) measures. Moreover, GCMs are themselves subject to stringent capital requirements under the CRDIV/CRR framework, precisely to cover the exposures resulting from providing these services on behalf of their clients. This obviates the need to impose supplemental prudential requirements on proprietary trading firms.

Proprietary trading firms operate businesses that differ significantly from those of banks and common investment firms that interact with external customers. The owners/shareholders of the proprietary trading firms are the almost exclusive stakeholder group of these firms that are exposed to the risks. Proprietary firms do not threaten to damage the interests of external stakeholders as they do not engage with external clients. FIA EPTA strongly urge the maintenance of the exemption for these types of firms as detailed herein, as market failure precipitating the need for additional capital requirements has not been proven.

Without prejudice to the solution acutely needed for proprietary trading firms, the analysis of the impact of CRR on trading book portfolios has helped to highlight the disproportionate standardised market risk requirements that CRR introduces (e.g. option non-delta requirements) for any other types of small and medium sized investment firms (that are not able to make use of internal models). We suggest EBA recommend amending the standard rules to apply capital requirements for the maturity-based calculation of general risk by replacing discrete time bucketing with either a scenario-based approach for interest rate shifts or a correlation table matrix to allow greater offsetting between related contracts, or alternatively, to recommend that Article 95 or 96 investment firms should have an own funds requirement based on the risk-based models used by either GCMs or trading venues.

## Annex I – Examples

### Example 1: Directional exposure

Derivative market makers provide liquidity by continuously quoting groups of related financial instruments. Option market makers specialise in quoting the volatility surface as a whole. They will transact with investors at a competitive price, take on the risk of the resulting position, manage it and mitigate it by transacting against other investors who have interest in trading contracts in the same volatility surface. After inheriting a position in a certain option contract, the market maker is unlikely to be able to dispose of it by finding an investor with exactly the opposite interest in the same contract. More likely, the market maker will aim to mitigate risks when a natural buyer or seller wants to trade an option with a similar strike or expiry. The book of an options market maker is thus unlikely to be completely flat. Rather than eliminating every single position, the market maker will ensure that position risks net-off, and that the value-at-risk of the portfolio is commensurate with the risk appetite of the trading firm and its GCM.

Derivative portfolios are heavily influenced by the behaviour of the underlying contracts. It is therefore reasonable to assess the effect of a large underlying move on the portfolio value. Paragraph 1 of Article 329 CRR states that “options and warrants on interest rates, debt instruments, equity indices, financial futures, swaps and foreign currencies shall be treated as if they were positions equal in value to the amount of the underlying instrument to which the option refers, multiplied by its delta”. The delta of a portfolio reflects its sensitivity to small fluctuations in the underlying. Entities are required to treat this delta weighed position as an equivalent in the underlying instrument and subject it to the standard calculations outlined in articles of the General Risk (Sub-Section 2).

However, this directional exposure calculation gives rise to a charge that does not adequately reflect the risks – simply because delta is not a constant over the range of the underlying price. For option positions, the delta weighed directional exposure only has meaning over tiny intervals of the underlying price. The derivative of the delta of the option – its gamma – is never zero or less and is often significantly positive. Therefore, the delta of an options position will change significantly as the underlying is stressed.

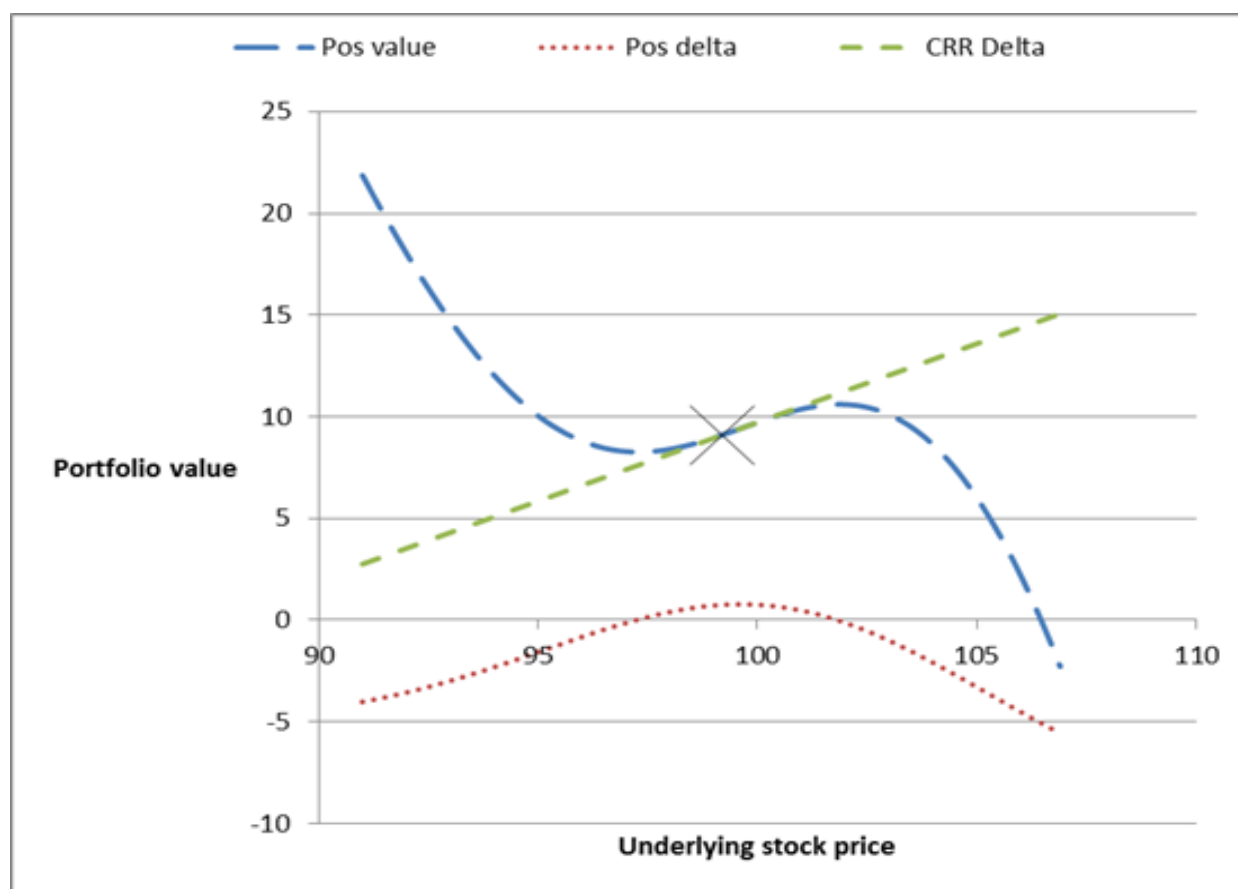
Considering the following example with positions in stock options, valued as of November 2014.

Expiry	Quantity	Contract Price	Position value	Contract Delta	Position Delta
Dec 14 95 Put	5	0.31	1.53	(13.4)%	-67.2
Dec 14 100 Call	10	1.48	14.81	46.8%	467.7
Dec 14 104 Call	(20)	0.35	(7.01)	(16.2)%	-323.1
TOTAL	-	-	9.33	-	77.4

Time to expiry: 1 month; Underlying price: 99.5; Interest rate: 1%; Volatility: 18%.

The graph below shows how the value of the portfolio changes over a stress range of 8% of the underlying up and down:

### Example 1: Directional exposure (continued)



This example clearly highlights a serious shortcoming: to cover directional risk, CRR requires entities to perform stress calculations on a delta equivalent position in the underlying instrument and not on the derivative portfolio itself. The “CRR Delta” in the graph is in fact a straight line that represents changes in the value of that delta equivalent portfolio. The graph makes clear that the CRR Delta synchs with the value of the actual option portfolio only over a very narrow range of the underlying stock price – between 98.5 and 101.5 ( i.e. a move of -1% and +1%). Over the range of the 8% up/down shock advocated by CRR 342, the value of the portfolio (denoted as “Pos. value”) diverges from it radically. In fact, in this example, the CRR Delta line bears little relation to the actual exposure of the option portfolio. This is due to the fact that the delta of an options portfolio (“Pos. delta”, equal to the slope of “Pos. value”) is not at all constant over the stress window.

Given the extreme stress scenarios that the regulation intends to account for in the case of General Risk and because delta is not a constant, the first step of the CRR methodology for options does not accurately reflect the underlying risk.



### Example 2: Bucketing methodology falls short for interest rate future or option portfolios

For directional exposure, both the duration method and maturity method fall short. Both methodologies spell out a series of steps intended to give credit for positions that are exposed to neighbouring terms of the yield curve. The offsetting logic relies on assets and liabilities being allocated to particular bands/zones that reflect their remaining maturity. When opposing exposures occur in the same band or zone they can be offset to a considerable extent. However, these methodologies fall short when applied to positions in options or futures.

The perverse results of this discrete bucketing can be demonstrated below where the own funds capital requirement for a calendar spread which is considerably less risky than an outright interest rate position results in a higher capital charge, opposite to standard risk assessments by GCMS, clearers and investment firms.

### Example A: outright futures position (valued on 13.11.2014)

Long one 3 Month Euribor Future maturing March 2015

Article 328.1 of CRR requires the future contract to be “treated as a combination of a borrowing maturing on the delivery date of the futures contract and a holding of an asset with maturity date equal to that of the instrument or notional position underlying the futures contract,” producing the following cash flows in accordance with Table 2 of Article 339:

Notional cash	Date	Zone   Maturity band	Weighting	Assumed interest rate change
(1,000,000)	March '15	One   3 (>3 <6months)	0.4 (%)	1 (%)
1,000,000	June '15	One   4 (>6 <12months)	0.7 (%)	1 (%)

- Band 3 short exposure = 4,000 (= 1m x 0.4%)
- Band 4 long exposure = 7,000 (= 1m x 0.7%)
- Band 3 & 4 matched = 4,000
- Band 4 unmatched = 3,000
- CRR 339(9) capital requirement = €4,600 (4,000 x 40% = 1,600 + 3,000 x 100% = 3,000)

For this outright position the ICE Span margin model requires a margin of €235.

### Example B: calendar spread futures position (valued on 13.11.2014)

Long one 3 Month Euribor Future maturing March 2015

Short one 3 Month Euribor Future maturing June 2015

Notional cash	Date	Zone   Maturity band	Weighting	Assumed interest rate change
(1,000,000)	March '15	One   3 (>3 <6months)	0.4 (%)	1 (%)
2,000,000	June '15	One   4 (>6 <12months)	0.7 (%)	1 (%)
(1,000,000)	Sep '15	One   4 (>6 <12months)	0.7 (%)	1 (%)

### Example 2: Bucketing methodology falls short (continued)

- Band 3 short exposure = 4,000 (= 1m x 0.4%)
- Band 4 long exposure = 14,000 (= 2m x 0.7%)
- Band 4 short exposure = 7,000 (= 7m x 0.7%)
- Band 4 matched exposure = 7,000
- Band 4 unmatched exposure = 7,000
- Band 3 & 4 matched exposure = 4,000
- Band 4 unmatched exposure = 3,000
- CRR 339(9) capital requirement = €5,300 (Band 4 matched 7,000 x 10% = 700 + Band 3 and 4 matched 4,000 x 40% = 1,600 + Band 4 unmatched 3,000 x 100% = 3,000)

For this calendar spread position the ICE Span margin model requires a margin of €92.

The market risk for the calendar spread is less than the outright position, reflected by the reduced margin requirement from €235 to €92. However, risk the CRR regulatory capital requirement increases from €4,600 to €5,300.

The CRR standardised approach is risk insensitive to the point regulatory capital is negatively correlated with changes in market risk i.e. regulatory capital increases when market risk reduces.

Moreover, the regulatory capital requirement is a magnitude of 20 – 60 times greater than the margin requirement.

### Example 3: Duration method applied to two different calendar spread positions (valued on 13.11.2014)

The duration method not only returns a capital charge that is unreasonable – up to 100 times larger than that of the widely accepted ICE Span margin model – but also results in a capital charge 20 times larger for the second position of the two, which practitioners would consistently deem to have less risk than the first.

#### Example: calendar spread futures position

March 2015 – June 2015

June 2015 – Sep 2015

The spreads straddle 3 months each but the latter contains contracts of longer maturity and thus will tend to experience less volatility (in relative terms, its maturities are closer to each other). Therefore it would be expected that the second position would require less capital.

The ICE Span margin calculation yields the following charges:

March 15 – June 15: EUR 102

June 15 – Sep 15: EUR 85

Notional cash	Date	Zone	Modified Duration	Assumed interest rate change (in %)	Duration weighted position
(1,000,000)	March '15	1	0.46	1	4,564
2,000,000	June '15	1	0.71	1	-14,111
(1,000,000)	Sept. '15	1	0.96	1	9,547

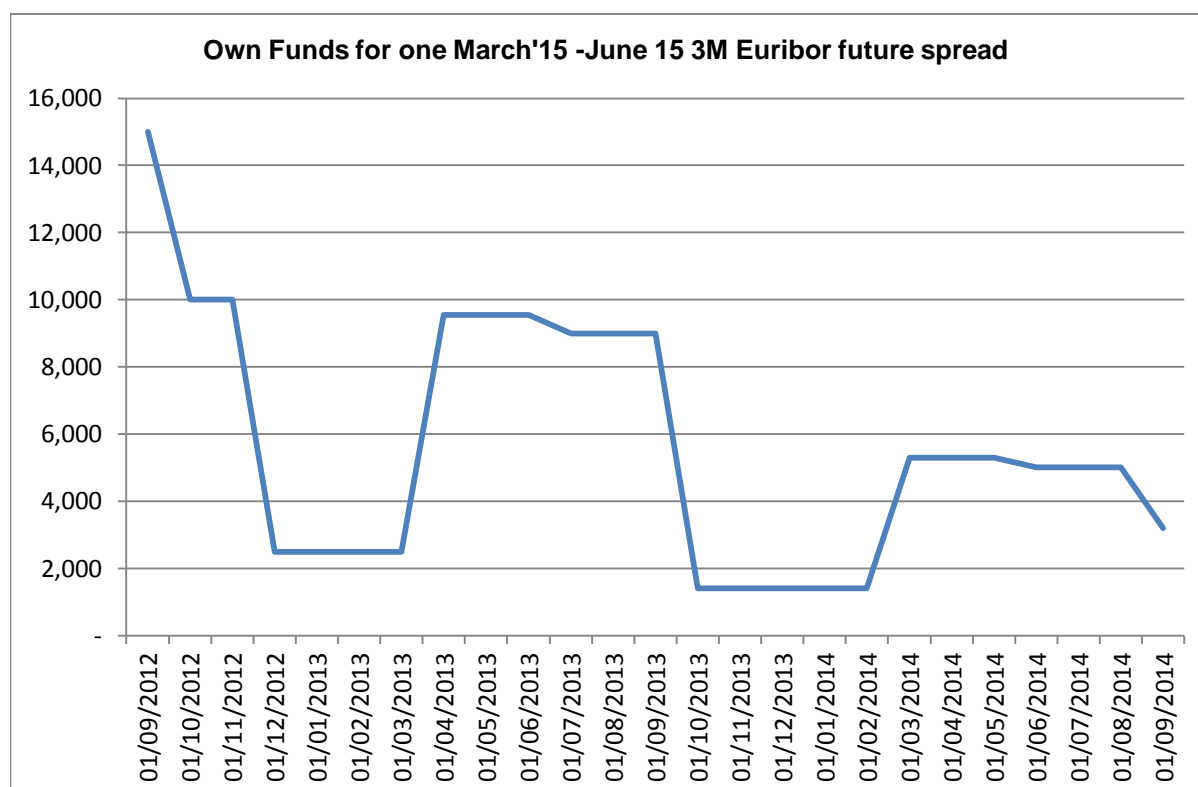
- The longs can be matched entirely against the shorts
  - Capital charge of EUR 282 (=14,111\*2%)(CRR 340(7))

Notional cash	Date	Zone	Modified Duration	Assumed interest rate change (in %)	Duration weighted pos
(1,000,000)	June '15	1	0.71	1	7,056
2,000,000	Sept. '15	1	0.96	1	-19,094
(1,000,000)	Dec. '15	2	1.20	0.85	10,230

- Band 1 matched exposure = 7,056
  - Capital charge of EUR 141 (=7,056\*2%)
- Band 1 & 2 matched exposure = 10,230
  - Capital charge of EUR 4,092 (=10,230\*40%)
- Band 1 unmatched exposure= 1,808
  - Capital charge at 100%
- Total capital charge of EUR 6,041

#### Example 4: Variations of capital charge over time

As the components of a calendar spread fall in and out of maturity bands and zones, the capital charge fluctuates dramatically. The duration method produces a similar pattern of fluctuations. It would mean the capital charge will vary close to threefold overnight, seasonally, for the same position, as show in the graph below. Clearly, this has no bearing on the directional risks that the requirement is meant to reflect.



#### Summary of problems:

The main issues resulting from applying the available methodologies to positions in interest rate derivatives are:

- 'Riskier' positions return lower capital charges than positions that clearly bear less risk;
- Charges are disproportionately high compared to value-at-risk outcomes as well as exchange margin;
- Charges for a given position can be extremely volatile and unstable over time.

#### Solutions:

- Any offsetting mechanism made available for the purposes of directional exposure should also be available for non-linear exposure;
- Scenario approach should be extended to cover directional exposure and made accessible for small firms;
- Discrete time bucketing should be replaced by a correlation matrix calculated on the basis of a continuous function of time to maturity.