

Basel Committee on Banking Supervision Consultative Document

Fundamental Review of the Trading Book

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International Swaps and Derivatives Association, Inc.

the Global Financial Markets Association

And

The Institute of International Finance, Inc.

Further Response Covering

Diversification and Model Approval

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1. Introduction

This paper examines one of the key issues raised in the Basel Committee on Banking Supervision's (BCBS) Fundamental Review of the Trading Book (FRTB), namely how total risk should be split for purposes of deriving the regulatory capital requirement. We believe this issue cuts across several areas of the FRTB, such as model approval, testing, risk aggregation and diversification.

We argue that there is no single 'cut' of risk which is appropriate for all purposes. Any "one size fits all" approach may lead to a framework with inappropriate incentives and which is not linked to the real risk faced by firms. Instead we propose a capital aggregation method across different dimensions of risk, which we believe to be beneficial to both supervisors and firms.

The interpolation methodology presented in this paper is similar to that proposed in BCBS Working Paper 22¹, as developed by Gordy².

2. Context

In developing this framework we focus on the following issues set out in the Summary of Questions in the FRTB:

"What are commenters' views on the proposed regime to strengthen the relationship between the standardised and internal models-based approaches?"

We understand that the BCBS wishes to align the approach to capital charges between the two frameworks, and in particular to avoid 'cliff effects' where withdrawing model approval has such a severe impact on capital requirements that supervisors are reluctant to enforce it. This is a desirable feature of any capital framework, and we suggest a practical way in which it could be implemented. In fact there are two questions of scope here, which are often conflated – the scope of risks included in the internal model, and the scope of risks excluded from standard rules capital.

"What are commenters' views on the Committee's proposed desk-level approach to achieve a more granular model approval process, including the implementation of this approach for banking book risk positions? Are there alternative classifications that might deliver the same objective?"

We understand the desire to have more granular control and testing of the model approval process, rather than the binary approach of granting internal model approval for all trading assets or none. This kind of control is already applied by several national regulators³, but is

¹Foundations of the Proposed Modified Supervisory Formula Approach, January 2013

²Gordy, Michael (2004). "Model Foundations for the Supervisory Formula Approach"

³ Although not always with trading desk as the dimension, some combination of risk factor, product and IT system may also be used.

not formalised at the BCBS level, creating inconsistencies across jurisdictions, hence formalising this via inclusion in the FRTB is desirable.

“What are commenters’ views on the merits of the desk-based and risk-factor-based aggregation mechanisms to deliver the Committee’s objectives of constraining diversification benefits?”

We understand that supervisors are uncomfortable with the level of diversification currently available within the market risk framework, and wish to constrain it in some way. In this case, however, we think that the BCBS’s proposed solution may not achieve their objective. Our experience of Banking Book/Solvency 2 requirements (where correlation acts like a simple dial to increase/decrease capital) suggests that applying something similar to the Trading Book is less likely to be effective. This is because, while increasing correlation is guaranteed to increase capital for a ‘long only’ portfolio as in the Banking Book or an Insurer, a bank’s Trading Book is different in character and has potentially as many ‘short’ positions as ‘long’. In our view, specifying a conservative and coherent way of aggregating risk for the Trading Book, without building a fully integrated model, is extremely difficult. Specifying correlation *ex post* is likely to lead to unwanted consequences – see, for example, the arguments in the industry response to the FRTB proposals⁴. A better approach, via implementation of the other proposals in the FRTB, is to build a single internal model based calculation, which fully accounts for stressed correlations in market factors and liquidity. Nevertheless, if supervisors are set on imposing an *ex post* constraint on diversification, we believe that certain cuts of risk would be more appropriate than others.

These appear to be quite separate issues – with the model approval procedure and transition from standardised to internal models mainly a question of ‘process’, while hedging and diversification seems to be a question of ‘methodology’. In reality, however, there is a key common question linking these issues – namely, how to disaggregate the total market risk capital into component parts. The impact of this on hedging and diversification is clear, but disaggregation also impacts model approval.

⁴Industry responses available at www.bis.org/publ/bcbs219/cacomments.htm, the papers submitted by ISDA/GFMA/IIF/IBFed, Barclays and Nomura give detailed counter-arguments to applying the ‘regulatory correlation’ approach in the Trading Book.

3. Possible risk classifications, and their strengths and weaknesses

There are thus four applications which require a cut of risk within the regulatory capital framework:

- Model scope – i.e. determining which types of risk may be included in the internal model⁵ part of regulatory capital.
- Model Approval – i.e. starting with standardised rules, model approval determines which types of risk may have a charge waived and treated within models. This has generally been assumed to coincide with the prior category, but as we show below, there are practical advantages to avoiding this assumption (i.e. allowing some types of risk to be in the internal model, even where they have not been ‘approved’ and hence must also remain under standardized capital charges).
- Model Testing – i.e. the level of granularity at which the model’s performance is tested. As poor model performance will naturally lead to the supervisor wishing to consider partial or full withdrawal of model approval, this should naturally link to the prior application.
- Constraining diversification – i.e. the portfolio classification at which ‘diversification benefit’ is to be measured and constrained.

What are the potential ways in which we could cut risk? There are three cuts which spring to mind, each with strengths and weaknesses:

- By Desk – i.e. measure risk according to the firm’s own business unit structure, whether at a very granular level (e.g. ‘Americas Precious Metals’, ‘Japan Exotic Interest Rate Derivatives’) or at an asset class/geographic level (e.g. ‘Global Commodities’, ‘Asia Fixed Income’). This approach seems to be favoured by the BCBS, see section 4.2 of the FRTB, and is widely used by firms for risk reporting and risk management, as it aligns with their reporting of profit and loss (P&L) and portfolio management strategy.

The main weakness of using this approach for regulatory capital is that the definition of a desk is subjective: hence it seems very difficult for supervisors to legislate in a way which effectively supervises a firm’s internal sub-division of total risk by desk. In particular, if the total level of capital held by a firm came to depend strongly on the subjective allocation of that portfolio to desks (rather than the composition of the portfolio itself), that would be undesirable; a firm would be incentivized to restructure its internal reporting, purely to achieve a capital reduction. Also, the desk-based approach does not seem well suited to specifying regulatory correlations or ‘diversification factors’, as the correlation structure

⁵The precise form of this model – e.g. whether Value-at-Risk (VaR) or Expected Shortfall (ES), based on parametric simulation or historical data, etc, is of course another important topic for FRTB, but out of scope for this paper, hence we shall refer to ‘internal model based capital’ generically.

between desks will depend on the portfolio composition, and hence change materially over time making it very difficult to calibrate the correlation parameters meaningfully.

- By Risk Factor – i.e. measure risk according to the type of market risk factor driving the potential P&L, whether at a very granular level (e.g. ‘Dividend Risk’, ‘Interest Rate Implied Volatility’) or at an asset class level (e.g. ‘Equity’, ‘Commodity’). This classification is used by firms as another internal metric, and (at the asset class level) is part of the 10-K/20-F disclosures on VaR required by the US Securities and Exchange Commission. In terms of regulatory capital, this approach has the advantages of being well aligned to how firms manage and report risk internally and also reasonably objective. Moreover, the correlations between risk factors – since these are driven by external market events as opposed to the composition of the firm’s portfolio – are likely to be more stable than between desks or products. It should be noted however that where firms use full revaluation of non-linear products in VaR then the product itself should be allowed to be deemed a risk factor. It would not make sense to force a firm to disaggregate P/L into more granular risk factors where cross gamma would not be properly accounted for.

- To the extent that the firm believes that it can model default and migration risk (i.e. the risks currently covered by the Incremental Risk Charge) jointly with market risks (i.e. the risk covered by VaR and Stressed VaR), this could be seen as another risk factor, with some (less than 100%) correlation to other risks.

The key disadvantage of such an approach is that it may not align well to how regulators wish to control model approval (since a given risk type may contain both vanilla risks which the regulators are willing to approve, and exotic risks which they are not). Also, a given product may have exposure to multiple risk factors, which would make it difficult to decide if that trade is ‘model approved’ or not, and hence eligible to be removed from standardised rules⁶. Finally, model performance at the risk factor level is not enough to guarantee capture of risk-driven P&L e.g. a model that captures stock-price risk only will not perform well for an event driven arbitrage desk such as Equities Merger & Acquisition, or in general for P&L driven by basis risks such as CDS-Bond basis trading.

- Product Type – i.e. measure risk according to the specific product, usually defined in a very granular way, for example ‘Cross Currency Swap’ or ‘Equity Variance Swap’. This is sometimes used by regulators in constraining model approval scope, but would generally not be used by firms in their own risk reporting. The key advantage of this approach is that it is relatively objective, and aligns naturally with the view regulators may wish to take on model approval scope – simple, well-understood products can be approved (avoiding potentially excessive standardised capital charges on these high volume products) while complex products can remain outside of the model scope.

The main disadvantage of this approach is that it does not correspond at all well to the economic drivers of P&L, and hence to the way firms actually manage and report risk. In particular, firms often hedge exotic products with simpler products, and applying model

⁶If the standardised rules were revised such that charges were applied by risk factor and not by product.

scope on this basis is likely to create large ‘split hedges’, where one side of a structure is in the model and the other is not. This is a problem because it means that regulatory capital no longer tracks economic risk, undermining the relevance of model testing required by the supervisor⁷. There is also the operational burden for firms (and supervisors) to maintain a regulatory cut of the risk model(s), which has no use in risk reporting or risk management.

Thus there are four possible applications of the risk dimension, and three possible approaches – so twelve options in all! While it may be possible to draft capital formulas to give a highly general framework permitting the use of any permutation, our view is there is a natural cut of risk for different purposes, and this should be embedded in the capital framework:

- Model Scope – here we argue that the model scope should correspond as closely as possible to the P&L as incurred and managed by the firm, and should hence be aligned to desk, as defined by the firm internally. That is, when computing model based capital the firm should nominate for each desk whether it is in-scope or out-of-scope of the model – products held in “in-scope” desks would be *eligible* for removal from standardised capital, whereas all products held in “out-of-scope” desks should take standardised capital charges.
- Model Approval – the natural scope for model approval is along product lines (as is in fact applied by a number of regulators already), as these can be identified objectively and tend to correspond to ‘riskiness’ from the regulatory perspective. Products which are ‘approved’ for internal modelling should be *eligible* for removal from standardized rules, but only actually be removed from standardized if they are held in a desk which the bank has chosen to be ‘in-scope’, as described above. Unapproved products would take a standardized capital charge, regardless of whether the desk is in-scope or not.
- Model Testing – this should be aligned to Model Scope, for the obvious reason that only desks which are in-scope for internal models are relevant for testing, but also because this is the dimension along which banks measure and manage P&L. As discussed above, aligning the model testing to actual P&L (as opposed to P&L on a subset of ‘approved products’) also has the benefit of truly testing the models ability to capture the risk taken by a given desk, as opposed to a possibly skewed risk profile on approved products only.
- Constraining Diversification – as discussed above, we believe that specifying correlation *ex post* (as opposed to ensuring the model itself correctly reflects stressed correlations) will not achieve a conservative risk metric for Trading Book portfolios. However, the natural cut for controlling diversification is by risk factor, since this is the dimension at which there is *potentially* a stable correlation which could be measured and applied by the regulator. Moreover, we avoid the total capital depending heavily on number and size of desks which are used to measure capital, which would be the case under a desk-based diversification calculation, and instead compute capital across (relatively) objectively defined risk factor

⁷For example, the key P&L driver and economic risk in a portfolio may be basis risk between an exotic product and a vanilla. But, if only the vanilla product is included in the model and P&L used for testing, then the ability of the firm’s risk model to capture this risk would not be tested.

types. Note that the risk factors referred to here are broad risk categories such as interest rates, equity, currency etc.⁸

4. Combining into a single framework

We have tried to show that there is a ‘natural’ dimension of risk for different applications. At first glance, this seems to be a step backward, showing that no single cut of risk can address all relevant applications. We believe, however, that the different approaches can be combined into a single capital framework, which by aligning the application with the natural cut, enables regulatory capital to be aligned with risk taking. This is operationally efficient, and avoids unwanted outcomes or inappropriate incentives which could arise from an inappropriately specified approach.

Taking each component in turn:

Model-based capital for desks which *the firm* defines and selects for inclusion in internal models capital should be capitalized as the weighted sum of a fully diversified internal models number and the sum of individual components by risk factor, i.e.

$$\begin{aligned} \text{Capital}(\text{Internal Models}) = & \alpha M(\text{In-scope Desks, All Products, All Factors}) \\ & + (1-\alpha) \sum_{\substack{i \in \text{Risk} \\ \text{Factor} \\ \text{Categories}}} M(\text{In-scope Desks, All Products, } i) \end{aligned} \quad (1)$$

where α is a parameter between 0 and 1 determined based on the quality of the firm’s model of diversification⁹ (with higher α corresponding to a better model) and $M(x, y, i)$ denotes the internal models capital charge for risk factor i on desks x and products y . We view this as being strongly preferable to having directly specified correlations (as proposed in Annex 6 of the FRTB), for the reasons outlined above. Notice that equation (1) computes internal model-based capital on *all* products on in-scope desks, whether they are approved or not, and hence aligns to the actual P&L incurred – a key benefit, since we retain the link between model-based capital and actual risk taking.

Any trades for which the firm has not received regulatory approval on that product, or which are on a desk nominated as ‘out-of-scope’ by the firm, should naturally receive a full standard rules capital charge, i.e.

$$\begin{aligned} \text{Capital}(\text{Standard Rules}) = & S(\text{Out-of-scope Desks, All Products}) \\ & + S(\text{In-scope Desks, Unapproved Products}), \end{aligned} \quad (2)$$

where $S(x,y)$ denotes the standard rules capital charge on desks x and products y .

⁸ Some firms model many thousands of granular risk factors which are not appropriate for this purpose.

⁹ As opposed to the performance of the model on specific desks, see equation (3) below.

Clearly, there is a double count here on unapproved products on in-scope desks, which are counted towards capital in both (1) and (2), but we see this as tolerable to retain the link between model-based capital and economic risk.

Lastly, we have the penalty function for desks which are nominated as in-scope by the firm, but found to perform poorly in backtesting. As argued above, the natural cut of risk in this case is by desk, and only desks which are in the scope of the internal model would be subject to testing. Here we propose a factor $\beta(j)$ be assigned to each in-scope desk, based on the desk-level performance¹⁰ of the internal model, as assessed by backtesting and similar methods, with the penalty capital set as:

$$Capital(\text{Backtesting Penalty}) = \sum_{\substack{j \in \text{In-scope} \\ \text{Desks}}} \text{Penalty}(j) \times \beta(j) \quad (3)$$

The details of how exactly to specify $\beta(j)$ and $\text{Penalty}(j)$ are out of scope, but should smoothly transition from $\beta(j) = 0$ in the case of ideal (or over-conservative) model performance, to $\beta(j) = 1$ in the case of very poor (i.e. underestimation of risk) model performance. This enables areas where the model performs poorly to smoothly transition to a punitive capital charge, without the ‘cliff effect’ of immediate model approval withdrawal seen in the existing framework. Importantly, $\beta(j)$ would match the model scope (i.e. all of the trades on an in-scope desk, not just approved products) so would be a true test of how well the internal model matches actual P&L, not the P&L on a subset of approved (and usually vanilla) products. Since a non-zero value of $\beta(j)$ may lead to a punitive penalty add-on, model testing to derive beta should be based on all sources of capital for desk j , including any capital add-ons from ‘non-modellable risk factors’ proposed in the FRTB.

We continue to argue though that, applying the penalty in the form of a surcharge also seems more appropriate than the current backtesting penalty factor, which penalizes poor model performance by increasing the ‘3 multiplier’ on VaR and Stress VaR, i.e. as model performance deteriorates, *more* weight is placed on the internal model in driving the capital requirement, a strange outcome. Moreover, if the penalty term was based on an automatic fall-back to standard rules in the case of poor model-performance, this could eliminate the need for a blanket standard rules-based floor or surcharge, as discussed in the FRTB.

Now, combining (1), (2) and (3), we have total capital for Market Risk as

$$Capital = \alpha M(\text{In-scope Desks, All Products, All Factors}) \quad (4)$$

$$+ (1-\alpha) \sum_{\substack{i \in \text{Risk} \\ \text{Factor} \\ \text{Categories}}} M(\text{In-scope Desks, All Products, } i)$$

$$+ \sum_{\substack{j \in \text{In-scope} \\ \text{Desks}}} \text{Penalty}(j) \times \beta(j)$$

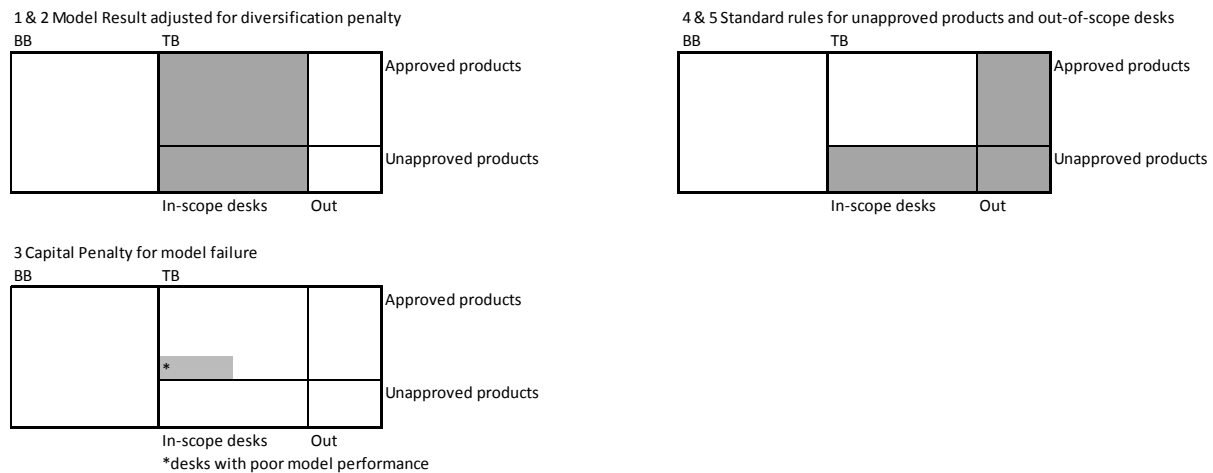
¹⁰Out of scope desks could be thought of as ‘automatically failing’, and hence have $\beta(i) = 1$ and $\text{penalty}(j)$ is equal to standard rules capital.

$$+ S(\text{Out-of-scope Desks, All Products}) + S(\text{In-scope Desks, Unapproved Products})$$

Note that Equation (4) implicitly assumes that standard rules capital is additive between out-of-scope desks, approved products on in-scope desks, and unapproved products on in-scope desks, i.e. that no netting is available between desks and products under the standard rules framework. This would likely be the case (or at least, very close to it) under the existing standard rules framework, but may no longer hold if standard rules are revised along the lines set out in FRTB, especially the ‘fuller risk factor approach’. In this case, the last terms in equation (4) should be interpreted as the combined capital charge across the relevant desks and products, incorporating netting, to the extent that it is permitted under revised standardised rules.

The proposed capital model is illustrated in Figure 1 which represents trading positions in a Venn diagram. BB stands for Banking Book and TB for Trading Book. The scope of each of the terms in Equation (4) is indicating by shading.

Figure 1



5. Incentives created, and potential objections

The most controversial aspect of the above proposal is that we advocate that model scope (and hence testing) should be determined by the firm, with only light supervision along the lines of a ‘reasonableness test’ (i.e. the desk structure as used for model scope is in line with that used for internal reporting). Supervisors may be reluctant to allow such flexibility in the framework, but we believe that this should not be a major concern, since the incentives created by the approach are desirable:

- If the firm nominated an excessive number of desks as ‘in-scope’, even where its model performs poorly or most products are unapproved, then model based capital will be relatively high, while the unapproved/poorly performing desks will still be subject to standardized capital charges/penalty. Hence the bank’s capital usage will be suboptimal, and it is incentivized to remove areas of poor model performance from the list of ‘in-scope’ desks.

- If the firm nominates too few desks as in-scope, even where its model performs well and products are approved, then these desks will be subject to punitive standard rules capital charges/penalty. Hence the bank's capital usage will be suboptimal, and it is incentivized to include areas of good model performance in the list of 'in-scope' desks.

One potential objection to the suggested approach is that the firm will be incentivized to simply declare that it wishes to have a single Trading Desk, and control model scope at that level, which would have the benefit of enabling it to remove all approved products from standardised capital rules. We argue that this would fail a 'reasonableness test', and so be immediately disallowed, and is also quite a high risk approach – while the 'whole firm' model performs well, capital would certainly be low, but if performance starts to deteriorate (due to large losses on a specific desk, for example) the beta surcharge in equation (3) would apply to *all* assets in the Trading Book, even in areas where the model is still performing well. Whereas, if the bank adopted a more granular classification of desks, the consequences of a model failure in one particular area would be more contained. Of course, if the model performance became poor across a wide range of desks, capital would rise sharply regardless of how granular a classification was applied, as one would expect.

If, however, supervisors are still concerned that a firm might adopt an 'all-or-nothing' approach by nominating a very small number of desks for model scope and testing, an additional hard constraint on the number of desks could be included by requiring that no single 'desk' as designated by a firm should ever represent more than some fixed percentage of total standard rules capital on the whole Trading Portfolio. However this may be prohibitive for firms with a narrow area of business, who may legitimately wish to include only one or two desks in the model. Since the total capital charge depends only weakly on the definition and scope of desks (via the backtesting results), we think it is preferable for firms to have some flexibility in this area (whilst still tightly limiting the *products* which can be removed from standard rules capital).

Another potential objection may be that, by including unapproved products which are hedged by approved products, the firm may have an inappropriately low internal models capital charge (even though the unapproved products would of course also take standard charges as well). We argue that it is highly desirable that the internal model capital is based on the whole portfolio for each desk, so that it directly affects business strategy because model testing meaningfully reflects the actual risk taken by the firm, instead of that on a skewed set of 'approved trades'. Moreover, if the internal model on unapproved positions was excessively simplistic, and this led to understated internal models based capital, this would lead to poor backtesting performance, and hence increased capital on the whole portfolio via equation (3).

A final objection to the above proposal of which we are aware, is that by applying standard rules on unapproved products but not approved products, we are still subject to the 'split hedges' issue, to the extent that standard rules permit the recognition of some hedging and diversification of capital across products. In our experience, however, the offsetting available in standard rules (at least in their current form) is highly restrictive, and in any case this issue also exists in the current 'partial approval' framework as implemented by some regulators. As discussed above, if the standard rules framework is revised to permit more netting, the last three terms of the above formula should be read as permitting netting across the three categories where these apply.

6. Summary

We have outlined three plausible dimensions along which portfolio risk may be split, and four potential applications within a regulatory capital framework, and argued that there is a natural link between the two:

- Split by Desk – aligned to P&L and bank’s internal risk management, hence the natural fit for internal model scope and testing.
- Split by Risk Factor Categories – aligned to diversification benefit, and hence the natural fit for measuring (and constraining) hedging and diversification.
- Split by Product – aligned to regulatory concerns, and hence the natural fit for model approval, i.e. removal of a trade from standardized capital charges.

On this basis, we advocate setting market risk capital according to the following formula:

$$\begin{aligned} \text{Capital} = & \alpha M(\text{In-scope Desks, All Products, All Factors}) \\ & + (1-\alpha) \sum_{\substack{i \in \text{Risk} \\ \text{Factor} \\ \text{Categories}}} M(\text{In-scope Desks, All Products, } i) \\ & + \sum_{\substack{j \in \text{In-scope} \\ \text{Desks}}} \text{Penalty}(j) \times \beta(j) \\ & + S(\text{Out-of-scope Desks, All Products}) + S(\text{In-scope Desks, Unapproved Products}) \end{aligned}$$

We see the key benefits of this approach as:

1. Efficient to supervise – scope of regulatory approval driven by objective product-based cuts, no need for regulators to define a ‘desk’.
2. Efficient to run – scope of internal model-based capital aligns to firms’ internal management, no need to maintain separate ‘regulator approved’ business cut.
3. Maintains relevance of internal model capital - model-based regulatory capital covers actual risk and P&L incurred by firms.
4. Meaningful impact of backtesting failure – if a model performs poorly the firm smoothly moves on to a penal capital charge. Neither a ‘cliff effect’ from total removal of model-based capital, nor an insignificant VaR multiplier increase.
5. Granular assessment – the model is tested at a detailed level, with testing covering the full scope of positions held by the bank, not an arbitrary subset.