Initial margin

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The IM 'big bang'
Not quite plain sailing

The derivatives notionals have been totted up, in-scope entities determined, and now an estimated 250 firms are scrambling to calculate, exchange and segregate initial margin (IM) on their non-cleared derivatives trades from September 1.

The 'IM big bang' has been a long time in the making and has radically altered in range since inception. Initially intended to catch all entities with outstanding derivatives notional of €8 billion and above, this fifth wave of compliance has been split in two and delayed by a year. It means firms with less than €50 billion of derivatives notional will not be caught in the net until September 2022.

An additional reprieve from global regulators means counterparties with margin exchange amounts below €50 million (or local equivalents) can defer the legal and documentation effort. Acadia – formerly AcadiaSoft – reckons around half of the entities caught in the phase five net will be required to post margin from day one.

By moving some lower-margin in-scope portfolios to so-called 'threshold monitoring', BlackRock has cut its immediate phase five repapering requirement by one-quarter. "It has been certainly of benefit for us and, going into phase six, we see this becoming even more of a benefit," said Mark Persiani, a director for collateral management at BlackRock, on a *Risk.net* webinar in May.

It's a welcome step towards avoiding the kind of regulatory bottleneck that dogged the first wave of compliance. "It will save the industry a large amount of time and cost without distracting from the policy goals," said Ryan Winnett, programme director for uncleared margin rules at Barclays, on the webinar.

With its extended prep time and scaled-down cohort, phase five should be plain sailing. In reality, it's likely to be the usual scramble for the finish line.

For a start, the 120 firms estimated to be exchanging margin on September 1 are nearly double the total number of entities caught in phases one to four combined.

What's more, the 12-month delay granted by regulators in response to Covid-19 disruption was widely squandered. Many firms downed tools on negotiating complex and unwieldy legal documents, risking an all-too familiar 11th-hour rush.

Firms hoping for a rollback of burdensome model governance requirements – which apply to the buy side in Europe but not in the US – have been disappointed by the slow emergence of new regulatory technical standards. Under current European Union rules, all in-scope entities must seek approval from their national competent authority to calculate margin exchange amounts using the industry's standard initial margin model, or Simm.

At this late stage, firms must plan "as if they'll be subject to the full model approval on ongoing governance obligations, pending any alternative guidance from their local supervisory authority," said Craig Pearson, co-founder and director of Margin Tonic, also speaking on the webinar.

There are other outstanding cross-border complications. In the EU, money market funds (MMFs) posted as collateral must be Ucits-compliant. In the US, Ucits MMFs are not eligible collateral for regulatory IM. It means counterparties falling under multiple regimes may not have any MMFs that constitute eligible collateral. It's not necessarily a huge problem for phase five, says Persiani, but soon could be.

"Luckily we don't have portfolios looking to use MMFs, but this will be more of a phase six issue. We have a bit of time to hopefully get the regulators to iron out the kinks in the process."

The 900 or so firms expected to be caught in September 2022 might be best advised to have a backup plan, just in case.

Helen Bartholomew
Editor-at-large, *Risk.net*

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Turning challenges into solutions

With margin requirements a potential drain on financial resources, delivering healthy returns while meeting regulatory obligations is paramount. To help participants optimise more of their risk, Varqa Abyaneh, chief product officer, Quantile, discusses UMR and central clearing, how they impact the margin landscape and how participants can leverage multilateral optimisation to reduce their margin costs

Designed to improve the safety and stability of markets, regulation inevitably increases the cost of trading. Participants are still expected to deliver healthy returns while keeping pace with the evolving regulatory obligations – and, to thrive, must carefully manage their resources.

Ensuring banks meet their minimal capital requirements is no longer the only focus, and the trend of transforming regulatory capital into funding requirements looks set to stay.

The funding challenge
One of the main resource-consuming issues is the cost of funding the margin requirements globally. Without careful management, the requirements can consume critical financial resources and have an adverse effect on the returns of the derivatives book, as well as the pricing and liquidity of the underlying derivatives trades if left unchecked.

From the uncleared margin rules (UMR) to the greater use of central clearing, Quantile investigates the trends and requirements, their impact on the margin landscape, and provides solutions as to how participants can proactively optimise their portfolios to avoid higher costs and minimise the funding drag.

The requirements and current state of play
Since 2016, participants trading non-centrally cleared derivatives including foreign exchange options, non-deliverable forwards, swaptions and hedging trades have been subject to new margin requirements.

IM is one of two types of collateral required to protect participants in the event a counterparty defaults. The other type – variation margin (VM) – is paid daily from one side of the trade portfolio to the other, to reflect the current market value of all trades in the portfolio. IM, however, is held to cover

Varqa Abyaneh

the losses that could arise in the period between the defaulter's last VM payment and the point at which the surviving party is able to hedge or replace the trade.

For cleared trades, IM is normally calculated using an expected shortfall method that aims to protect the central counterparty (CCP) beyond the 99.7% quantile. This calculation usually involves deriving a daily time series of historic market data shocks, typically over the previous 10 years.

For bilateral trades, the margin calculation – the standard initial margin model (Simm) – is a simpler analytic function that involves the calculation of counterparty risk using predefined parameters. This methodology, because of its simplicity and standardisation, enables easier adoption and implementation of the UMR across all counterparties.

From big to bigger
The phased approach of UMR has seen the largest market participants already go live with their IM requirements, and the industry is now moving towards phases five and six, which will increase the number of counterparties involved and the amount of collateral posted. From September 2022, it is estimated upwards of an additional 1,000 entities will be subject to UMR for IM.[1]

There have been material increases in the amount of regulatory IM held, purely driven by new trading activity. For example, 2020 saw a 23% increase in the amount of IM collected by the 20 largest market participants globally, despite no new counterparties coming in-scope.[2] The key driver of this increase was new trading activity around the time the US Federal Reserve Board announced its emergency rate cuts in response to the economic threat associated with the Covid-19 pandemic.

These types of increases, coupled with the new in-scope counterparties, are set to turn funding IM into an even bigger challenge.

The wider margin landscape
The margin landscape is vast, and the regulatory measures impacting uncleared derivatives account for roughly $200 billion of the total margin out

1 Drivers of margin	
Type	$ billions
VM	1,300
Exchange-traded derivatives	486
OTC cleared	353
Simm	218
Source: Isda Margin Survey 2020; FIA	

there[2] – which is close to $1 trillion.[3] Outside of this, participants must post margin for exchange-traded and cleared over-the-counter (OTC) derivatives positions (see figures 1 and 2).

The clearing mandate of 2011 has had a major impact on the margin landscape and driven the numbers to new heights – as seen by LCH SwapClear driving the majority of cleared OTC volumes ($220 billion of $416 billion). Of the $839 billion of total cleared margin, approximately 50% is now driven by cleared OTC derivatives and around 50% by exchange-traded futures (see figure 1). The listed margin is driven by CME Group ($152 billion) and Eurex ($36 billion).[3]

It is clear regulatory IM is a big industry challenge that continues to grow since the introduction of UMR. However, compared with the wider margin landscape, it is part of a much bigger picture.

Flexibility versus fragmentation

Participants have the ability to enter into and hedge risk positions in multiple ways. For example, a dealer wishing to hedge interest rate PV01 can do so by trading cleared interest rate swaps, interest rate futures or uncleared products, such as swaptions, where appropriate.
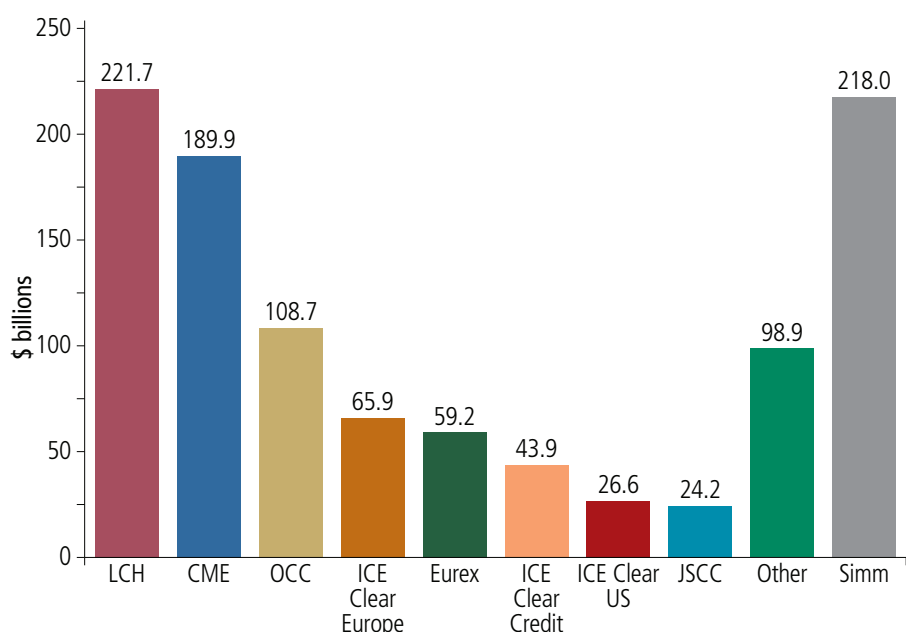
This choice allows for more competitive – and hence tighter – pricing, which is a good thing for the market. However, it also results in the fragmentation of liquidity pools, which increases margin costs. A firm that has zero net risk spread across multiple liquidity pools (bilateral, cleared OTC and exchange traded), will still have to post margin for the risk taken in each liquidity pool. If the risk is bilateral, the firm must post margin based on the bilateral risk against each counterparty due to UMR; if the risk is cleared, then margin must be posted for the risk taken against each CCP independently.

Finding new efficiencies through clearing

The use of central clearing has enabled participants to hold risk more efficiently. Trades executed with multiple counterparties can be cleared to a CCP where the exposures are netted down. This netting, especially against a highly rated/low risk-weight counterparty, means a CCP is an ideal place for banks to net down risk and reduce costs so they can use their capital more efficiently.

However, the increasing use of central clearing in itself is not enough to tackle the margin funding challenge. Not all products can be cleared and not all firms are able to clear at the same CCPs – so it is unlikely a firm will be able to entirely net down its bilateral risk to zero. That said, there is always an optimal solution from a risk and margin perspective for how bilateral risk should be moved to the CCP that adheres to the necessary constraints.

2 Total IM across bilateral and CCPs

Entity	$ billions
LCH	221.7
CME	189.9
OCC	108.7
ICE Clear Europe	65.9
Eurex	59.2
ICE Clear Credit	43.9
ICE Clear US	26.6
JSCC	24.2
Other	98.9
Simm	218.0

Reducing risk through multilateral optimisation

Despite the fragmentation across multiple liquidity pools, UMR have created an opportunity, and an incentive, to innovate new ways to systematically reduce risk and margin costs for both cleared and uncleared portfolios. As participants trade with multiple parties in multiple locations, the key is to approach the issue multilaterally. Multilateral portfolio optimisation creates more opportunities to net down risk in a highly automated and scalable manner, enabling firms – and their counterparties – to benefit from superior risk reduction.

Quantile pioneered multilateral margin optimisation by launching a service in 2017 that reduces counterparty risk and the costs associated with funding IM. Quantile's mission was simple – to help the market tackle the margin challenge as a combined force. Recognising that participants trade across a vast network, Quantile brings that network together to drive new levels of efficiency.

Trade together, optimise together

Quantile's IM optimisation service works by analysing the risk configuration of the entire participating network and proposing a set of new market risk-neutral trades that deliver margin cost reductions without changing net risk positions. The resulting optimisation proposal is validated and accepted by participants, and the execution of new trades is fully automated via electronic trade capture and confirmation platforms, such as MarkitWire and Refinitiv Trade Notification.

The service allows for risk to be moved across different liquidity pools (cleared and OTC), and offers the freedom for participants to constrain the optimisation to suit their requirements. With an extensive network, including all of the G15 banks, the service operates across FX, interest rate and equity asset classes to deliver a material reduction in participants' IM funding costs – often in excess of 50%.

Just getting started

Quantile is determined to make a long-term impact in the derivatives market and help participants optimise more of their risk, irrespective of where they choose to execute or clear.

There is immense capacity to help market participants manage the challenges arising from new regulations through multilateral optimisation services, and Quantile will continue to work closely with market participants to develop the material infrastructure required to navigate these challenges and help the industry reach a healthy, steady state. ■

[1] International Swaps and Derivatives Association's (Isda's) data estimates that, between them, phases five and six will cover 1,090 entities: 315 in phase five and 775 in phase six.
[2] Isda (April 2021), Isda margin survey year-end 2020, https://bit.ly/3zoK8gu
[3] Futures Industry Association (FIA) CCP tracker, Initial margin – Combined, https://bit.ly/3znvB4B

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The EU's IM relief
Too late for phase five firms?

Long-awaited easing of model governance requirements is unlikely to take effect by the deadline of September 1.
By Helen Bartholomew

Plans to relieve European firms caught in the fifth wave of the non-cleared margin rules from cumbersome model governance requirements are unlikely to be in place ahead of the September deadline. The delay means asset managers will have to independently validate and backtest the industry's standard initial margin model (Simm) before using it for margin calculations – a costly exercise that many had hoped to avoid.

A spokesperson for the European Banking Authority confirms that work on drafting a regulatory technical standard (RTS) implementing the relief has been delayed due to the Covid-19 pandemic. The proposal is now expected to be published "within the next couple of months".

John Pucciarelli, head of industry and regulatory strategy at Acadia, sees little chance of the long-awaited relief being finalised before September, when an estimated 250 firms with more than €50 billion in average aggregate notional amounts (AANA) of non-cleared derivatives are due to start exchanging IM on these trades.

"We're still expecting a level of relief," Pucciarelli says. "But no matter when the RTS comes out – whether it's this month or next – we're not expecting it to be in force by September 1 for phase five."

Others agree. "There's quite a prolonged timeline to get rules into effect so it seems unlikely, absent some extraordinary measure, we would see any changes adopted fully by September," says Tara Kruse, global head of infrastructure, data and non-cleared margin at the International Swaps and Derivatives Association (Isda). "At this point, the message to our members is that if they're coming into scope for phase five, they have to prepare based on the current rule set and the governance requirements related to the use of an IM model like the Isda Simm."

Firms subject to the non-cleared margin rules under the European Market Infrastructure Regulation (Emir) must independently calculate margin requirements for their bilateral portfolios and reconcile these amounts with counterparties before posting collateral into segregated custody accounts. Any internal models used for margin calculations, such as Simm, must be validated and approved by regulators and backtested quarterly. Currently, only around 70 in-scope entities have approval to use internal models.

In contrast, US rules set out in the Dodd-Frank Act allow buy-side firms to accept margin calculations from their swap dealers.

The delay in finalising the relief, which would more closely align the requirements in the EU and US, leaves phase five firms that are currently negotiating credit support annexes (CSAs) with their counterparties in a difficult position.

"People are negotiating their CSAs now and they need to understand the consequences of agreeing to a particular situation for IM calculation," says Kruse. "Right now, they don't have the transparency, which is frustrating."

The increased model governance burden may force some European entities to rely on a regulator-set schedule, known as a 'grid', for their IM calculations. This would significantly raise overall margin requirements for non-cleared trades. Analysis from Isda shows margin amounts calculated under a grid-based methodology are, on average, double the amount generated under Simm for phase five portfolios.

"We don't want either party to have to use the grid, because it's prohibitive for them to implement the required governance process," says Kruse.

Caveat vendor

When it arrives, the RTS is expected to address counterparties' responsibilities when using a vendor for margin calculations – a scenario that was not contemplated under the EU rules.

A US-style blanket exemption from governance requirements for smaller entities is understood to be off the table, though some participants expect a green light for firms to designate their dealers as a calculation agent for IM amounts.

"Hopefully, in that regard the RTS will have adequately addressed that scenario so it's very clear

> "I think there will be good uptake [of Simm] by phase five firms, but it's possible the delayed RTS will impact the ability for some firms to use it"
>
> Tara Kruse, Isda

to both parties what happens to model governance in that case and whether there's any impediment that would make either party pause," says Kruse.

Many phase five firms in the EU have already outsourced margin calculations to licensed Simm vendors, such as Acadia, Bloomberg and Cassini. While many offer validation and backtesting services, model governance requirements must be handled in-house and cannot be passed to third-parties.

"Most phase five and six firms are outsourcing sensitivity and Simm calculations to a vendor, meaning those pieces are often not the heaviest lift for them. Simm model governance and backtesting requirements are less well known, but can be very onerous in key jurisdictions," says Chris Watts, director and co-founder of consultancy Margin Tonic. "Firms are leaning on their Simm vendors to support them with services and documentation here. It's about proving to the regulators, both upfront and ongoing, that you produce accurate and reliable numbers via independent validation, backtesting and controls procedures."

EU regulators face a delicate balance in any relaxation of the rules. While governance requirements are seen as excessive for a model that is already embedded in the regime and regularly backtested by firms caught in phases one to four, phase five

represents the first mass take-up of the model by the buy side and the first widescale use of Simm vendors. "Regulators may still demand tight governance and controls, especially for sensitivity calculations, where variability can exist firm-by-firm," Watts adds.

The delay in lifting the model governance requirements means phase five firms that have already signed licence agreements with Simm vendors may be prevented from using those services if they are unable to secure model approval from regulators before the September 1 deadline.

"I think there will be good uptake [of Simm] by phase five firms, but it's possible the delayed RTS will impact the ability for some firms to use it – at least at the onset," says Kruse.

That prospect is causing real frustration among vendors and their clients, especially since global regulators delayed implementation of phase five by 12 months in response to the disruptions caused by the Covid-19 pandemic.

"There are opportunities to make things better and clarify things. This was one of them," says Acadia's Pucciarelli. "It's frustrating because it would have made things a lot better for the industry as a whole to give some level of clarity for phase five firms under Emir of their obligations to validate and test the model."

SEC mismatch

Separately, Isda and other trade bodies are calling on the US Securities and Exchange Commission to delay its non-cleared margin rules for security-based swaps, due to be implemented in October.

These rules cover a narrow range of instruments, including single-name credit default swaps and some equity derivatives, and will be implemented in a single 'big bang' for all firms. The initial plan was to align the go-live date for the SEC rules with the sixth and final phase of the global IM rules for firms with $8 billion-equivalent in AANA of bilateral derivatives outstanding.

But a global delay to the IM rules, spearheaded by the Basel Committee on Banking Supervision and the International Organization of Securities Commissions, has pushed these two timetables out of sync, meaning phase six firms will be caught by SEC rules before they are required to post IM for other swaps.

"It's a concern for members from a resourcing perspective because they're negotiating CSAs on a global scale and not for the SEC specifically. It would be challenging for security-based swap dealers to bring forward the preparation of documents for SEC counterparties that are phase six for other regulations, especially when they're in the midst of benchmark transition," says Kruse.

The SEC requirements are deemed less onerous as collateral does not need to be segregated, meaning firms can comply via an add-on agreement to existing variation margin CSAs. ■

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MetLife 'anxious' about model approvals delays

A panellist representing US insurer MetLife at the International Swaps and Derivatives Association's AGM says that regulators are unprepared to accept documents where model approval is obligatory. By Helen Bartholomew

Buy-side firms caught in the fifth wave of non-cleared margin rules are growing anxious about their ability to adopt the standard initial margin model (Simm), in jurisdictions where they are subject to model governance requirements, as the pace of approvals has stalled while anticipated relief is yet to materialise.

Some larger phase five firms plan to use internal models to calculate their own IM requirements. These models do not require approval by US regulators, but they need the green light from watchdogs in the European Union, Japan and the UK before they can be used in transactions with banks in those jurisdictions.

However, Tara McCloskey, head of derivatives middle office and operational risk at MetLife, says the US insurer has experienced delays in getting the models approved outside of the US, with some regulators not yet ready to accept documentation.

"In jurisdictions where we have to receive model approval and approval for us to have oversight over the model, and [where we have to] submit our procedures and policies for documentation in regard to collateral management, we've seen a delay in regulators being ready for us to submit that documentation. It seems like the timeline for us to get approval has been compressed," said McCloskey.

"It causes a little bit of anxiety in other regions outside the US so that we're making sure we're ready by September 1," she added.

McClosky was speaking on a panel at the International Swaps and Derivatives Association's (Isda's) AGM, held virtually on May 11.

In the fifth wave of implementation, an estimated 250 companies with more than €50 billion in average aggregate notional amount of non-cleared derivatives – or local equivalents – are to begin exchanging initial margin on their bilateral exposures from September. This was delayed from September 2020 due to disruption caused by the Covid-19 pandemic. This threshold will drop to €8 billion in 2022, capturing an estimated 900 additional firms. Currently, around 70 firms, including a handful of large buy-side entities with more than €750 million derivatives notional, are in-scope.

Companies subject to the rules under the European Market Infrastructure Regulation and its UK equivalent must independently calculate margin exchange amounts for their bilateral portfolios and reconcile these with counterparties before posting collateral into a segregated custody account. The use of internal models such as Simm must be validated and approved by regulators and backtested at quarterly intervals.

US rules set out in the Dodd-Frank Act release the buy side from these cumbersome requirements by placing the regulatory onus on swap dealers. This permits banks to act as calculation agents for their counterparties and determine exchange amounts using Simm, which they have already had approved.

"In the US, we were not subject to [model] approval, and the way we've tried to implement our model here is we're calculating initial margin. We're owning the governance of the model," said McCloskey.

This regulatory split between the US and Europe is being addressed and the EU is widely expected to provide buy-side relief from many of the more prudential-style model governance requirements. Regulatory technical standards currently being drafted by the European Banking Authority are due to be published in the coming weeks, after efforts were delayed by the pandemic.

Tamsin Rolls, assistant general counsel at JP Morgan, expects relief to be forthcoming, though it's not yet clear what form it will take or whether it will be in force by the September go-live date.

"We don't know at the moment how that's going to apply, so we've been lobbying together with Isda to argue that the buy-side client should be exempt from this approval requirement. I think, otherwise, the landscape will become very complex," she said, speaking on the same panel.

Rolls added that the approval process could result in inconsistencies across the EU, and even within individual countries: "You could have three Italian regulators looking at Simm from three different perspectives and coming to different conclusions as to which trades are appropriate to be subjected to Simm."

If the relief is not in place by September, phase five entities could be forced to adopt regulators' standard grid methodology if they are unable to secure their Simm approvals in time. Analysis from Isda shows margin amounts calculated under a grid-based methodology are, on average, double the amount generated under Simm for phase five portfolios. This is largely due to the absence of netting availability in the standard grid method.

Speaking on the same panel, Thijs Aaten, chief financing and risk officer at APG Asset Management Asia, said his firm plans to use Simm exclusively for margin calculations when it is brought into scope later this year.

"I see it as our fiduciary duty to determine that the counterparties of our clients post enough collateral so that the initial margin is sufficient. [And] on the other hand, that our clients are not posting too much initial margin. The question is where all the possible differences come from," he said.

"If you're not using a standard model – the Isda Simm – then the model can cause all kinds of differences. To figure out if it's a model difference, in my view, would be very inefficient. So I'm very much in favour that the entire market uses this one, same model," said Aaten. ∎

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Simm template to be expanded for SA-CCR and FRTB

An improved version of the common risk interchange format will capture risk exposures for all instruments, boosting optimisation potential. **By** Natasha Rega-Jones

The standard industry template used to calculate margin requirements for non-cleared trades is being extended to a wider range of instruments in a bid to improve portfolio optimisation under incoming counterparty credit and market risk≈frameworks.

The International Swaps and Derivatives Association (Isda) is working with core users of its standard initial margin model (Simm) to create a beefed-up version of the common risk interchange format (Crif) it uses to capture the risk sensitivities of in-scope trades.

Dubbed 'Crif-plus', the new file would house data on instruments such as physically settled foreign exchange forwards and grandfathered legacy trades, which fall outside the non-cleared margin regime and are currently excluded from the standard Crif file.

"Crif-plus is an extended version of the Crif format designed to allow people to represent their entire portfolio – not just the trades that fall under scope for Simm – in a way that is common and widely understood," says Nick Steele, head of Barclays' collateral optimisation unit.

By recording every bilateral trade in a portfolio within a single document, including those exempted from the regulatory IM regime, Crif-plus would provide users with a more comprehensive view of their risk exposure and may become "an extremely useful optimisation tool", Steele says.

Portfolio optimisation is set to take on greater importance for global banks in the coming months. While physically delivered FX trades are not subject to the regulatory margin regime, these exposures could become unwieldy under the new, risk-sensitive standardised approach to counterparty credit risk (SA-CCR) and Fundamental Review of the Trading Book (FRTB), which will transform the way banks calculate – and optimise – their market and counterparty credit risk capital requirements.

"Regulators are moving to a much more risk-based set of metrics, so it makes sense to develop something like Crif-plus to be used as a common

> "Crif-plus is an extended version of the Crif format designed to allow people to represent their entire portfolio – not just the trades that fall under scope for Simm"
>
> Nick Steele, Barclays

file format to represent all the risks within a market participant's portfolio," says Steele. "Whether Crif-plus is the final solution for representing that risk, or whether it's just a helping hand, the idea behind it is for banks to be better aided in reducing their risks to each other."

US and UK banks must adopt SA-CCR and FRTB by January 2022, while the changes will be implemented in the European Union in June 2021.

A collateral source at another large dealer is supportive of the project and points to similar benefits. "While we aren't yet using Crif-plus, we can see the optimisation benefits."

One post-trade vendor says it is already "exploring opportunities" associated with Crif-plus and its application alongside SA-CCR and FRTB.

Isda declined to comment on the project.

Isda's risk-based Simm has been adopted by the majority of in-scope firms for calculating exchange amounts under the non-cleared margin rules. Risk sensitivities are a critical input for calculations made under Simm and must be provided in the Crif format. This standard file simplifies entire portfolios of trades into a single set of risk sensitivities.

The Crif file represents trades by various risk factors across nine separate columns, including the asset class risk factor, tenor, currency and amount of each trade. Prior to the first roll-out of the non-cleared IM rules in 2016, these representations varied from institution to institution.

"Historically, market participants have never had a standardised way of representing their portfolios," says Barclays' Steele. "If you were keen to know what someone's portfolio looked like, you'd have to wade through thousands of individual trades."

Rebalancing act

Standardisation in the way risk is represented and reconciled for IM calculations paves the way for greater optimisation. Services offered by vendors such as TriOptima and Quantile allow firms to redistribute exposures between counterparties to maximise offsets and reduce the amount of margin needing to be posted.

These rebalancing services are currently being expanded to asset classes that are not subject to IM rules, such as foreign exchange, with SA-CCR in mind. Instruments exempt from the margin regime include FX forwards, physically settled FX swaps, principal on cross-currency swaps and spot FX. Instruments traded prior to a firm coming in-scope for non-cleared margin rules are also carved out.

Under the current notional-based approach to counterparty credit risk, known as the current exposure method, dealers are incentivised to reduce overall gross notional in their portfolios using compression activities. This is set to change under the more risk-sensitive SA-CCR framework, which favours well-hedged portfolios and penalises directional risk.

In contrast with the IM rules, SA-CCR applies to all exposures in a portfolio, including those which have yet to be standardised. With Crif-plus, dealers see greater opportunities for optimisation providers to expand their services and deliver more savings.

"In a perfect world, I could say to an optimiser that I would like to reduce all of the FX risk I have with other banks and for them to figure out what trades we should do among ourselves to reduce the risk. I could just give them my Crif-plus file for them to see what my current FX risk looks like within a single document," says Barclays' Steele. ∎

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Tensoring dynamic sensitivities and dynamic IM

Mariano Zeron and Ignacio Ruiz use Chebyshev tensors to compute dynamic sensitivities of financial instruments within a Monte Carlo simulation. Dynamic sensitivities are then used to compute dynamic IM as defined by Isda (the standard initial margin model). The technique is benchmarked against the computation of dynamic sensitivities obtained by using pricing functions as found in risk engines. Numerical tests were done on foreign exchange swaps and spread options, where the technique obtains high accuracy at different percentiles of the simulated distributions with substantial computational gains over the benchmark

The sensitivities of portfolios are typically computed by banks every day. These are used for profit-and-loss (P&L) risk management, hedging purposes, value-at-risk calculations and its associated regulatory capital, etc.

Banks typically compute forward portfolio valuations inside Monte Carlo simulations (eg, XVA and internal model method (IMM) capital simulations). However, to our knowledge, none of them compute forward sensitivities. Doing so would bring many advantages: better understanding of expected and tail-event hedging needs; future VAR and market-risk capital; and better management of future initial margin (IM) funding costs and accurate market value added (MVA) amounts, for example. From all these, IM and MVA have gained popularity in recent years due to the introduction of mandatory margining between financial institutions.

There has been a worldwide push for strong collateralisation of over-the-counter derivatives since the 2008 financial crisis. Between variation margin (VM) and IM, there was, up to 2017, more than 1,000 billion dollars in margin. Of these two margins, IM should show the highest growth, potentially surpassing the trillion dollar mark.

As IM requirements translate into funding costs and liquidity risk, it is important to manage these today and in the future. This requires simulating IM inside Monte Carlo simulations. We call simulated IM, dynamic IM (DIM).

Specific uses of DIM include trade pricing (MVA), regulatory capital (IMM and FRTB-CVA[1]), risk management (hedging and tail risk), stress testing and, most likely, accounting MVA. Therefore, sound models for DIM will be central for financial institutions.

To simplify IM reconciliation between counterparties, the industry has adopted the standard IM model (Simm) for interbank IM posting (Isda 2017), based on portfolio sensitivities. However, using risk engine pricing functions to compute sensitivities carries a substantial computational cost. Assuming an average of 10–50 sensitivities per trade, and a typical Monte Carlo simulation with 1,000,000 nodes, the cost of computing DIM has an order of $O(10^7)$. This is prohibitively high in practice.

As function approximators, Chebyshev tensors enjoy strong convergence properties and are evaluated very efficiently. Chebyshev tensors have already been shown to accelerate a wide range of risk calculations (Gaß *et al* 2018; Glau *et al* 2019a; Zeron & Ruiz 2018, 2019). In this article, we use them to

compute dynamic sensitivities within a Monte Carlo simulation and subsequently dynamic Simm. We show computational reductions of up to 97.5% compared with the benchmark, while keeping very high levels of accuracy both at an averaged and tail-event level.

Chebyshev tensors

Chebyshev tensors lie at the heart of the techniques presented in this article. This section briefly describes their main mathematical properties. For further details, we refer the reader to Trefethen (2013) and Zeron & Ruiz (2018).

■ **Chebyshev points and tensors.** Polynomial interpolation has enjoyed a bad reputation for a good part of the twentieth century. Even some textbooks on the subject of function approximation warn against them (see the appendix in Trefethen (2013)). What is often missed is that using the right geometry of points applied to the correct class of function yields optimal approximation properties. The correct geometry of points is given by Chebyshev points.

The Chebyshev points associated with the natural number n are defined as follows:

$$x_j = \mathrm{Re}(z_j) = \tfrac{1}{2}(z_j + z_j^{-1}), \quad 0 \leqslant j \leqslant n$$

where z_j are the $n + 1$ equidistant points on the upper half of the unitary circle:

$$z_j = \mathrm{e}^{\mathrm{i}(\pi j/n)}$$

The extension to higher dimensions is obtained by taking the Cartesian product of one-dimensional Chebyshev grids. An example of a Chebyshev grid of dimension two is shown in figure 1.

A tensor consists of a set of points $x_0, \ldots, x_n$ in Euclidean space along with a set of associated real values $v_0, \ldots, v_n$. When $x_0, \ldots, x_n$ are Chebyshev points, we have a Chebyshev tensor. For the given points $x_0, \ldots, x_n$ and values $v_0, \ldots, v_n$, there is a unique polynomial p_n that interpolates them. If $x_0, \ldots, x_n$ are Chebyshev points, we call p_n the Chebyshev interpolant.

■ **Convergence properties.** Chebyshev tensors have unique convergence properties. When the function is Lipschitz continuous, convergence is guaranteed. If the function is differentiable, convergence is polynomial. The strongest form of convergence is obtained for analytic functions.[2] In this case, convergence is quasi-exponential. This means very few grid points are needed to get high degrees of accuracy.

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[1] *Fundamental Review of the Trading Book-credit valuation adjustment.*

[2] *We remind the reader that a function f is analytic if, for all x in the domain of f, the Taylor expansion at x converges to $f(x)$.*

1 Chebyshev points in dimension two
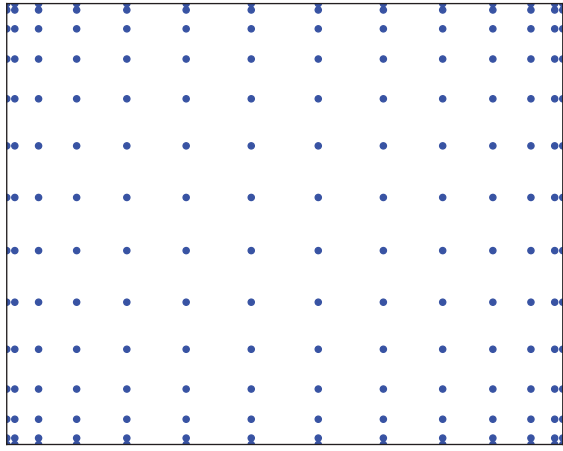
Theorem 1 (Gaß *et al* 2018) *Let f be a d-dimensional analytic function defined on $[-1, 1]^d$. Consider its analytical continuation to a generalised Bernstein ellipse E_ρ, where it satisfies $\| f \|_\infty \leq M$, for some M. Then, there exists a constant $C > 0$, such that:*

$$\| f - p_n \|_\infty \leq C\rho^{-m}$$

where $\rho = \min_{(1 \leq i \leq d)} \rho_i$, and $m = \min_{(1 \leq i \leq d)} m_i$. The collection of values ρ_i define the radius of the generalised Bernstein ellipse E_ρ, and m_i is the size of the Chebyshev grid for dimension i.

We refer to Trefethen (2013) and Gaß *et al* (2018) for a thorough treatment of the convergence theorems of Chebyshev tensors.

■ **Pricing functions and Chebyshev tensors.** Pricing functions, outside isolated points, are often analytic. There is growing evidence of this (see Gaß *et al* 2018), and practitioners regularly assume it to be the case, at least implicitly: their use of Taylor expansions to approximate them is an acknowledgement of this.

Non-differentiable points on pricing functions are usually payment dates, barriers and strikes. These are easy to locate, as they are defined by the trade itself. One deals with these points by splitting the domain of approximation along these points. One is left with a collection of subdomains, free of singularities, over which Chebyshev tensors enjoy the properties mentioned in the previous section.

Singular points can also be the result of structured payouts. For example, taking the maximum between continuation and exercise value in American options introduces one. However, the continuation function is free of singularities and carries nearly all the computational cost. Hence, Chebyshev tensors are built for this function.

Note that convergence rates of Chebyshev tensors are determined by the smoothness of the function. How non-linear the trade is does not impact its smoothness. Linear products need fewer Chebyshev points than non-linear ones, but the type of convergence does not change.

Another case to consider is that of pricing functions that rely on simulations. What the authors have observed empirically is that Chebyshev tensors approximate the function up to the level of accuracy provided by the latter. If prices are obtained through Monte Carlo simulations with a noise of $1e^{-3}$,

then the Chebyshev tensor will reach this level of accuracy exponentially, remaining within this noise regardless of added Chebyshev points.

■ **Tensor extension algorithms.** Tensors suffer from the curse of dimensionality. One of the ways to sidestep this problem is through the use of the tensor extension algorithm. We briefly describe it below. Full details can be found in Glau *et al* (2019b) and Steinlechner (2016).

■ **Tensors in a TT format.** The tensor extension algorithm (Glau *et al* 2019b) works with tensors in a TT format. These tensors admit a representation in terms of matrices that makes them memory efficient.

Say $\mathcal{X}$ is a d-dimensional tensor with n grid points per dimension. The memory cost of storing the values on the grid is $\mathcal{O}(n^d)$. The TT tensor, however, can be stored with $\mathcal{O}(dnr^2)$ – what was exponential growth in terms of dimension is now linear.[3]

Apart from the potentially huge memory cost reductions, tensors in a TT format, when defined on Chebyshev points, can be evaluated very efficiently.

■ **Approximation with tensors in TT format.** Say we want to build a tensor $\mathcal{T}$ for a function f. If the dimension d is high, evaluating f on the whole grid becomes impractical due to the curse of dimensionality. If we can approximate $\mathcal{T}$ with a TT tensor $\mathcal{X}$ (much cheaper to store), $\mathcal{X}$ may be used as a proxy for f. This is what the tensor extension algorithms do (see Glau *et al* 2019b).

There are three algorithms covered in Glau *et al* (2019b). The one we use is the sample adaptive algorithm. This builds on the other two.

We start under the assumption that the dimension of $\mathcal{T}$ is too great to evaluate the whole grid with f. Therefore, we restrict our attention to a subgrid $\mathcal{K}$. At each iteration of the algorithm, a candidate $\mathcal{X}$ in TT format is compared with the tensor $\mathcal{T}$ on K. If the error of approximation is low enough, the algorithm stops. In summary, the information of $\mathcal{T}$ on $\mathcal{K}$ is used to generate a tensor $\mathcal{X}$ in a TT format that is a proxy for $\mathcal{T}$.

If the fixed subgrid $\mathcal{K}$ does not yield the needed accuracy, the algorithm increases the size of $\mathcal{K}$. The algorithm stops when either a suitable $\mathcal{X}$ is found or when a pre-established limit on the size of $\mathcal{K}$ is reached.

Note that the algorithm gives no guarantee that a suitable $\mathcal{X}$ is found. However, if the function f is well behaved, one expects good results. The results presented in the 'Numerical tests' section can be taken as empirical evidence that for some pricing functions f, these algorithms can find suitable tensors $\mathcal{X}$ with which to work. Further evidence of this is presented in Glau *et al* (2019b).

Computing dynamic sensitivities with Chebyshev tensors

Consider a risk factor evolution model (RFEM) that generates risk factors in a Monte Carlo simulation. Take, for example, the Hull-White (HW) one-factor model:

$$dr_t = a(b - r_t)\, dt + \sigma\, dW_t \tag{1}$$

It has parameters $\theta = (a, b, \sigma)$ and one stochastic variable W_t. Define the model space as the space spanned by the short rate r. Let the dimension of the model space be k. In this example, $k = 1$. For a two-factor HW model, $k = 2$. For most models, the dimension is the same as the number of stochastic variables. In the context of Monte Carlo simulations for XVA or IMM, k tends to be small.

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[3] *The value r is the size of the matrices.*

Once the parameters θ of the RFEM are calibrated, they remain fixed throughout the simulation. At every node of the simulation, the model space variables (eg, short rate r) fully determine the market risk factors (eg, a full swap rate curve). We call the space of market risk factors the market space, which includes things like interest rates curves, spreads and volatility surfaces. The market space has high dimension, sometimes in the hundreds. Denote the dimension of the market space by n.

Let g be the function that generates market risk factors from model space variables:

$$\overset{\text{model space}}{\mathbb{R}^k} \xrightarrow{\;g\;} \overset{\text{market space}}{\mathbb{R}^n} \tag{2}$$

Functions like g are often analytic and, hence, ideal for Chebyshev tensors.

The following example shows how Chebyshev tensors can be built to compute sensitivities within a Monte Carlo simulation. A foreign exchange swap is used as an example, which is also used to generate results presented later in the article. The method is generic enough that it applies to any other trade type.

■ **Example.** Let the pricing function of an FX swap be f. We want sensitivities of f with respect to swap rates (two different currencies) and the exchange rate. Say there are n risk factors in total.

Each sensitivity – as a function of market risk factors – has a dimension n, where n is typically large enough so that a single tensor cannot be built due to the curse of dimensionality. The dimension of the problem must be reduced. The following approach is the one we propose.

Consider a single time point within the Monte Carlo simulation, where the ith swap rate is s_i. Define the following function φ:

$$\mathbb{R}^k \xrightarrow{\;\tilde{g}\;} \mathbb{R}^n \xrightarrow{\;S_i\;} \mathbb{R}$$
$$\underbrace{\phantom{\mathbb{R}^k \xrightarrow{\;\tilde{g}\;} \mathbb{R}^n \xrightarrow{\;S_i\;} \mathbb{R}}}_{\varphi}$$

where S_i denotes the partial derivative of f with respect to s_i:

$$S_i = \frac{\partial f}{\partial s_i}$$

Note that $\tilde{g}$ is the result of putting together the parameterisations g (eg, (2)) of the RFEMs used to diffuse the market risk factors that correspond to the FX swap. In this example, there are five models: a two-factor model per yield curve (two currencies, two curves per currency) and a one-factor model for the exchange rate. This gives a total of $k = 9$ dimensions.

The function φ is the composition of analytic functions. Therefore, Chebyshev tensors approximate them quasi-exponentially as the size of the grid increases in each dimension. By definition, φ gives the value of the partial derivative of f with respect to s_i at each node of the simulation. This means that the Chebyshev tensor directly approximates the sensitivity.

To build a Chebyshev tensor for φ, do the following. Take the minimum and maximum value of each of the model space variables at the time point in question of the Monte Carlo simulation. These values determine the hyper-rectangle to which φ is restricted. Note that the hyper-rectangle just mentioned is contained in $\mathbb{R}^k$. Next, build a Chebyshev grid on this hyper-rectangle.

Once the hyper-rectangle in $\mathbb{R}^k$ is ready, one must decide how to build the Chebyshev tensor: either directly, by evaluating each grid point, or by using the tensor extension algorithms. If the dimension k of φ is between 1 and 4, one can build a Chebyshev tensor directly. For example, if the trade

is an interest rate swap and each yield curve is modelled using one- or two-factor models, the tensor will have dimension 2 or 4. If k is greater than 4, one ought to consider the use of the tensor extension algorithms.

Remark 1 The description above corresponds to Chebyshev tensors built for each market risk factor at each time point. However, one can also consider the time dimension in the construction of the Chebyshev tensor. In this case, the domain of φ increases in dimension by one. This may be a suitable thing to do in some cases. For example, if the trade has payments as it matures, one should consider the discontinuities that arise, as explained earlier. With many discontinuities there are many tensors to build, and perhaps the time point approach is more direct. With no discontinuities, one can build a single tensor per risk factor, considerably increasing computational gains. This is the case, for example, for the spread option, for which we show results later in this article.

Remark 2 The focus of this article is the dynamic simulation of sensitivities and subsequent DIM. However, the same technique can be applied to pricing functions f instead of sensitivity functions S_i. This generates Chebyshev tensors that efficiently compute portfolio price simulations for the standard XVA or IMM Monte Carlo simulations.

Numerical tests

Dynamic sensitivities were computed using Chebyshev tensors – built using tensor extension algorithms – in two Monte Carlo simulations, each with 10,000 paths and 11 time points into the future, covering the full lifespan of the trades: one for an FX swap, and the other for a European spread option. The objective was to use the sensitivities to compute IM at each scenario of the Monte Carlo simulation and DIM profiles.[4]

The accuracy of the technique is measured with respect to the benchmark. The latter is obtained by computing dynamic sensitivities using the original pricing functions. In the case of the FX swap, sensitivities are obtained through finite differences; in the case of the spread option, the pricing function is based on Monte Carlo simulations, which returns prices and sensitivities at the same time. The time taken using Chebyshev tensors is measured and compared with the time taken to perform the benchmark calculation.

DIM profiles should be computed at netting set level. Our tests only considered two trades. The assumption was that each constituted its own netting set. The technique employed naturally extends to a netting set with multiple trades by applying it trade by trade.

The tests were done in MATLAB, on a standard laptop with i7 cores. Calculations were parallelised whenever possible, in particular for the benchmark calculations, given their high computational cost.

■ **FX swap.** The FX swap was between USD and EUR, at-the-money, and it had five years to maturity. The analytic pricing routine used was the one implemented in the swapbyzero function in MATLAB.

The Isda risk factors affecting the FX swap consist of a collection of swap rates in two currencies and the exchange rate. Each currency has two yield curves, with each curve diffused using a two-factor Gaussian model. The exchange rate was diffused using a geometric Brownian motion.

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[4] *Note that the version of IM computed is Simm, the one proposed by Isda, which is by now a standard in the industry for uncleared derivative transactions.*

2 Percentage relative errors of Chebyshev tensors

(a)

(b)
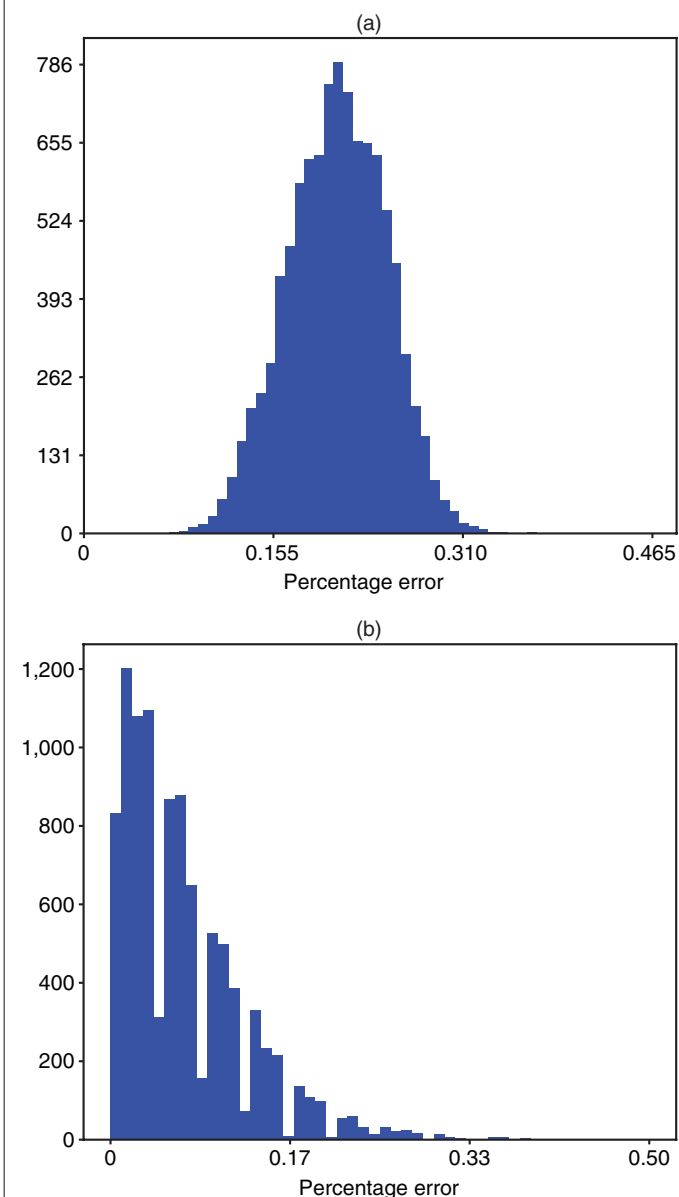
(a) The first swap rate (USD forwarding curve). (b) The USD/EUR exchange rate. Both for the ninth time point of the simulation

3 DIM profiles – expectation and 95% quantiles – for FX swap, with the benchmark and with Chebyshev tensors
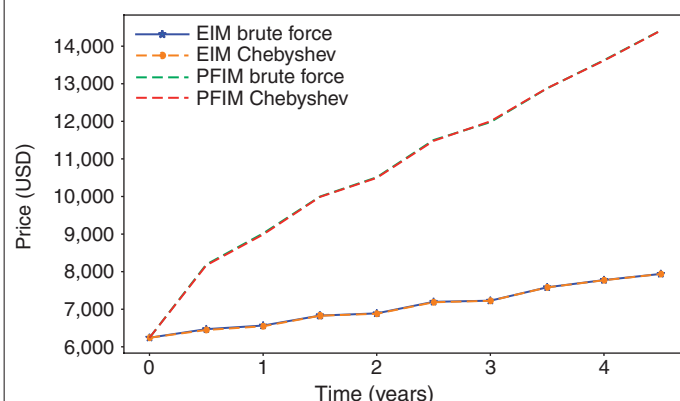
A. Maximum relative percentage errors for market sensitivities, EIM and PFIM (95% quantile) profiles for the FX swap			
FX swap	**Isda sensitivities**	**EIM**	**PFIM**
Maximum relative error	1.5%	0.34%	0.32%

FX swaps have payment dates. These create discontinuities in the pricing function along the time dimension. Therefore, Chebyshev tensors were built per sensitivity and per time point in the simulation (see the section titled 'Computing dynamic sensitivities with Chebyshev tensors').

Given the RFEMs used, the tensors had dimension nine. The grid built had 262,144 points, or four points per dimension. As this takes a long time to build directly, we used the sample adaptive algorithm.

The maximum number of evaluations for the sample adaptive algorithm was set at 1,000. Each run started with 350 points. In most cases, 350 points were enough to reach an accuracy of $5e^{-3}$ and the algorithm never needed more than 500. The time taken for the algorithm to run varied, but it was never beyond one minute: in some cases, it was just seconds. The average time

taken for the Chebyshev tensors to evaluate all scenarios on a time point of the simulation was 15.5 seconds. The corresponding time for the benchmark method was 1,100 seconds (see the 'Discussion of results' section for further details).

Figure 2 shows the errors for the first swap rate (USD forwarding curve) and the errors for the exchange rate. The errors are well under 1%. In fact, the maximum error was always below 1.5% across all the risk factors considered (see table A).

Figure 3 shows the expected IM (EIM) and potential future IM (PFIM) profiles, obtained with the benchmark and with Chebyshev tensors. The errors are all below 0.34% (see figure 3 and table A). Similar results were obtained for other percentiles.

■ **European spread option.** The chosen European spread option had one year to maturity. The pricing routine used was Monte Carlo based with antithetic variates and 1,000 paths. The average evaluation time was 0.5 seconds per sensitivity. Note that this simulation of dynamic sensitivities is an instance of a nested Monte Carlo simulation.

With 1,000 paths, the 95% quantile of the noise of spot sensitivities (ie, the delta) was measured at 8.6% (figure 4). Reducing the noise by half requires (roughly) increasing the number of paths from 1,000 to 10,000. This takes the benchmark computation of dynamic sensitivities, for spot, from 10 hours to several days. The decision was made to stick to 1,000 paths in the pricing function and work with the fact that Chebyshev tensors would be accurate to this noise level.

The situation was worse for the sensitivities of the remaining risk factors. For Vega sensitivities, the 95% quantile of the noise was measured at 32.7%; for swap rates, it was measured at 11.23%. Therefore, only delta dynamic sensitivities are presented.

If the trade were an American-style option, benchmark computation times would increase by another order of magnitude. Initially, we wanted to test this type of option. However, it was discarded due to the high computational cost

4 Noise distribution for the delta of the spread option obtained from the Monte Carlo-based pricing function

5 Percentage relative errors of Chebyshev tensors for the first spot

The histogram corresponds to the sixth time point in the simulation
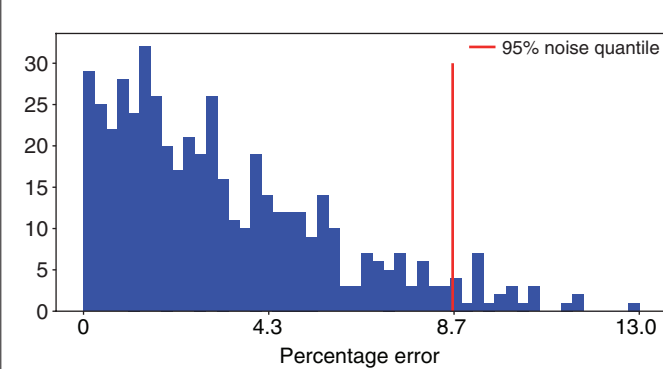
for benchmark metrics. As highlighted earlier in the article, the type of payout does not hinder the properties of the Chebyshev method. With enough computational power, similar results should be obtained for the American version.

No discontinuities are present along the time dimension for this trade. Therefore, the Chebyshev tensors built included time to maturity as a variable (see remark 1) and, hence, only one tensor per market risk factor was built.

The spread option takes two spot underlyings, which have a volatility each, and a yield curve. The underlyings were diffused using the Heston model, which diffuses both spot and volatility stochastically. The yield curve was diffused using an HW one-factor model. The models give a total of five dimensions. Adding time to maturity gives tensors of dimension six.

A total of 46,656 grid points were used (six points per dimension). Once again, the sample adaptive algorithm was employed to obtain a Chebyshev tensor in a TT format that approximates the sensitivities. Only 12,000 random grid points were evaluated. After 2–3 minutes, the algorithm typically reached an error of $5e^{-3}$, which is comparable to the noise level of the pricing function. Once built, the Chebyshev tensors took an average of 11.1 seconds to evaluate the scenarios on each time point. The corresponding time for the benchmark approach was measured at 5,000 seconds.

Figure 5 shows the relative error distributions of the Chebyshev tensor built to compute dynamic sensitivities for one of the spot underlyings at a time point of the simulation. Note that the error measured is within the noise of the delta function (figure 4). Similar results were obtained for other percentiles.

Figure 6 shows equity delta margin profiles, as defined by Simm, at expectation level (EIM) and 95% quantiles (PFIM) obtained with the benchmark and with Chebyshev tensors.

The maximum error for market sensitivities was 10.7%. However, the vast majority of the errors were below 5%. The maximum errors at the level of delta margin profiles were 8.1% and 3.1% for EIM and PFIM, respectively (table B). Given the noise presented in figure 4, the main source of error in the EIM and PFIM seems to come from the noise of the pricing function.

Discussion of results

The small approximation errors in the case of the FX swap (table A) were expected. The pricing function is analytic and the trade is linear; few Chebyshev points are needed to obtain high degrees of accuracy. This is reflected
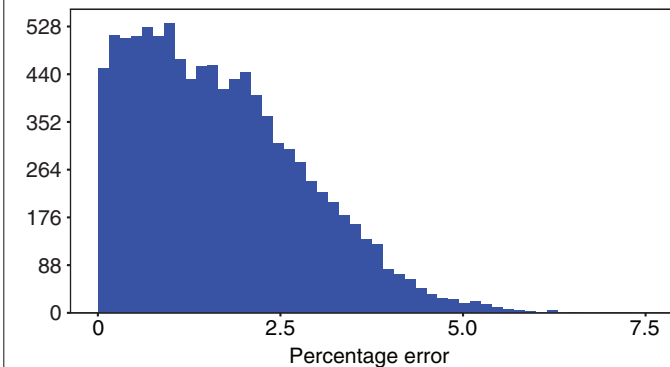
6 Equity delta margin profiles – expectation and 95% quantiles – for a European spread option, with the benchmark and with Chebyshev tensors
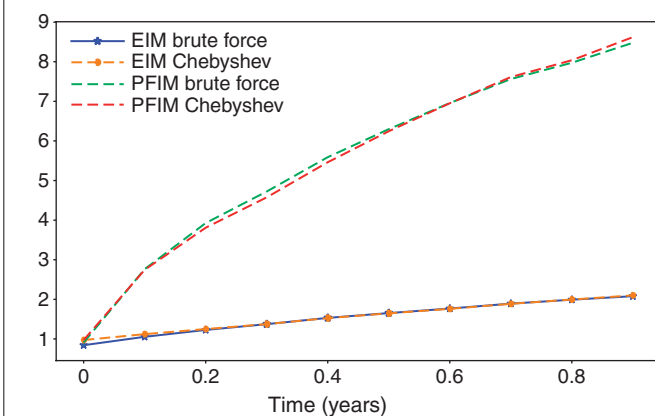
B. Maximum relative percentage error for market sensitivities, EIM and PFIM delta margin profiles for the spread option			
Spread option	Market sensitivities	EIM	PFIM
Maximum relative error	10.7%	8.1%	3.1%

EIM profile corresponds to expected IM, while PFE corresponds to 95% quantile

in both the high accuracy values and the short training times of the sample adaptive algorithm (see table C)

These levels of accuracy allow for hedging simulations and stable MVA pricing along with its hedging. Moreover, the fast calculations allow for fast scenario analysis such as portfolio optimisation routines that minimise future IM funding costs.

The computational savings for the FX swap are summarised in table C. Computing benchmark sensitivities, for a single risk factor, on a single time point, requires 20,000 calls to the pricing function. The sample adaptive algorithm needed between 300 and 500 calls. The training of the algorithm took seconds in most cases. The evaluation of the Chebyshev tensors on 10,000 scenarios took an average of 15.5 seconds. Compared with the cost of the benchmark calculation, for each risk factor and each time point – measured at 1,100 seconds – the training and evaluation times reported for

C. Computational savings obtained by using Chebyshev tensors to compute dynamic sensitivities compared with benchmark					
	BE	T&TE	Average training time	CBET	CS
FX swap	20,000	300–500	< 1 minute	15.5 seconds	97.5%
Spread option	110,00	12,000	2–3 minutes	11.1 seconds	89%–98.9%

'BE' denotes 'benchmark evaluations'. 'T&TE' denotes 'train and test evaluations'. 'CTET' denotes 'Chebyshev tensor evaluation time'. 'CS' denotes 'computational savings'

Chebyshev tensors are negligible. The computational savings are therefore around 97.5%.

The spread option uses a Monte Carlo-based pricer. The accuracy achieved by the Chebyshev tensor built to approximate delta is within the noise reported in figure 4 (see also figure 5 and table B). This translates into similar accuracy levels at the level of delta margin profiles (figure 6, table B).

For the spread option, computing the benchmark dynamic sensitivities for a single risk factor required 110,000 calls to the pricing function (10,000 paths, 11 time points). The sample adaptive algorithm only needed 12,000. The training of the sample adaptive algorithm took between two and three minutes per risk factor. The evaluation of the Chebyshev tensors took (on average, at each time point) 11.1 seconds. Given the cost of the benchmark sensitivities calculation – 83.3 minutes per risk factor per time point – the training and evaluation of Chebyshev tensors is negligible. Therefore, the computational savings for 11 time points are estimated at 89.1%. A typical Monte Carlo simulation consists of 100 time points. Increasing the number of time points in the simulation does not change the building of Chebyshev tensors; note that time to maturity is included as a variable. Therefore, for a Monte Carlo simulation with 100 time points, the computational savings would be 98.9%.

■ **Pre-trade analysis.** Pre-trade analysis, which consists of measuring the impact on the counterparty credit risk metrics of possible incoming trades, has become a much-desired feature of XVA, IMM capital and PFE systems. Given the time constraints of the business and the time it takes to compute sensitivities (or present values) within Monte Carlo simulations, this is normally not possible with benchmark pricing functions.

Chebyshev tensors help accelerate this type of analysis. With 90%+ computational savings, in some cases it is possible to build these on the fly for each possible incoming trade. Otherwise, one should build a Chebyshev tensor that includes, within its domain of approximation, all those parameters that differentiate instances of the same trade-type.

For example, say a spread option must be incorporated into the netting set. By including the strike as part of the Chebyshev tensor, one builds an object capable of approximating a wide range of spread options. As long as the maturity and strike are within the domain of the tensor, this can be used to obtain the sensitivities of all possible spread options within the simulation. Given the speed of evaluation for Chebyshev tensors, this can be done in a short period of time, allowing for adequate pre-trade analysis.

Conclusion

This article shows how to combine Chebyshev tensors with tensor extension algorithms in order to compute dynamic sensitivities and, with these, DIM to a high degree of accuracy and at a low computational cost.

The technique was applied to an FX swap and a European spread option. The benchmark computation for dynamic sensitivities was obtained by calling the pricing function at each node of the simulation. For the FX swap, the maximum relative error for dynamic sensitivities was 1.5%, while for DIM profiles it was 0.34%. For the spread option, the maximum relative error for dynamic deltas was 10.7%, mostly due to the numerical noise of the underlying function being approximated. The maximum relative errors for the corresponding delta margin profiles were 8.1% and 3.1%.

Computational gains stand at 97.5% for the FX swap and between 89% and 98.9% for the spread option (table C).

The Chebyshev method presented earlier in the article can be applied to a wide range of trade types. The key element is the dimension of the tensor to build. In CCR, most of the models used have a dimension that the tensor extension algorithms can handle. Problems can appear in cases such as basket options, where a large number of underlyings are modelled independently. However, for a typical portfolio, we expect the technique to apply for the vast majority of live and newly incoming trades. ■

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Sharpening the tools
Preparation for UMR phase five

A forum of industry leaders discusses the suitability of Simm for phase five firms, how they can optimise portfolios to minimise margin costs and how the lessons learned from previous phases can help them prepare

QUANTILE

Varqa Abyaneh
Chief Product Officer
www.quantile.com

Despite the delay to phase five uncleared margin rules (UMR) implementation, many firms have made little preparatory progress. What implementation priorities should they focus on as the deadline approaches?

Varqa Abyaneh, Quantile: Firms set to go-live in phase five can look to the lessons learned from previous phases when determining their implementation priorities. These priorities broadly fall into three areas: preparation, calculation and optimisation.

First, firms should ensure they have the correct legal documents in place with their counterparties and custodians so margin amounts can be agreed and transferred. Second, they should decide whether to calculate their trade-level risk sensitivities – inputs to the standard initial margin model (Simm) calculation – internally or via a third-party vendor. Implementing a daily reconciliation service, such as Acadia's IM Exposure Manager, can be helpful to streamline and simplify the agreement and transfer of IM amounts once live.

Third, firms need to determine if their portfolio requires proactive risk management to optimise their total uncleared margin requirements. By adopting multilateral portfolio optimisation – such as Quantile's IM optimisation service – firms can reduce their counterparty risk and associated margin funding costs. Firms should perform the relevant onboarding work to ensure they are ready to optimise their portfolios when they go live.

Tom Archer and Kah Yang Chong, LCH: Firms in-scope for phase five should ensure that appropriate documentation – such as credit support annexes (CSAs) – and custodial arrangements are in place with dealer counterparties. Firms should prioritise counterparty relationships likely to meet the $50 million IM threshold. With more than 300 entities coming into scope, they need to be aware that this process creates an operational burden for their dealer counterparties and could take many months to resolve.

To reduce the impact of UMR, these firms should also consider portfolios that can be transferred to clearing. Although it is perhaps a little too late to use this strategy to reduce the average aggregate notional amount (AANA) to below $50 billion before the end of the calculation window, a firm in scope for phase five UMR can reduce the number of impacted counterparty relationships by transferring risk between cleared and uncleared portfolios, either in totality or such that the IM exchange falls below the $50 million threshold.

Sandy McRae, CPP Investments: While it may not be necessary to have 100% readiness on September 1, 2021, firms should ensure they have a plan B on how to continue trading derivatives that are critical until their UMR implementation is complete.

For smaller derivatives books, this can be accomplished by executing trades that don't require the posting of IM – in effect, monitor and stay below thresholds or execute cleared trades/exchange-traded derivatives instead of over the counter (OTC). This can buy firms some time to continue with broader implementation plans.

For more complex trading books that include non-clearable trades, it will be critical to onboard at least one trading counterparty – and add more over time – and secondly, to be able to transfer collateral to a third-party custodian. If you are using a tri-party custodian, I would recommend prioritising onboarding counterparties that are using the same custodian as the process is simpler – for example, eligible collateral schedules will use the same format.

Although prudent for firms to be able to calculate/validate the IM amounts, it may not be required by all firms – depending on jurisdiction and applicable regulation. Some firms may be able to negotiate to have their dealer act as sole calculation agent, thereby relieving their IM calculation requirements. Relying on counterparty calculations can buy firms some time to complete the work required to calculate their own IM amounts.

John O'Donovan, Nationwide Building Society: I think it is helpful to split phase five firms into two separate cohorts – those 'participating' firms that will breach an agreed threshold soon after go-live, and 'monitoring' firms that will proably breach a threshold with one or two counterparties – but not for quite some time. Phase five firms are those between the AANA range of €50 billion–750 billion, which captures a wide range of firms from large to small.

From the large number of firms that need to be compliant for phase five, I expect only 100–200 will be in the participating cohort. The priority for these firms is likely to be the papering of required legal documentation for a few high-volume counterparties. The legal document negotiation progress is extremely slow and this has to be the priority ahead of go-live, so that the front office is not prevented from taking derivative positions. These firms should also be able to compute IM exposure for all of their CSA counterparties to monitor exposure day to day, so they are operationally ready to meet IM margin calls as the IM exposure approaches the informally agreed threshold.

For the monitoring firms, the need to sign up a custodian or paper any legal documents may not be the highest priority. Instead, these firms should still be monitoring exposure with as many of their CSA counterparties as possible, so they have time to get operationally ready. IM exposure can be monitored internally or by monitoring the exposures in Acadia that their counterparties have uploaded.

Neil Murphy
Business Manager
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Neil Murphy, TriOptima: I'm not sure I agree with the generalisation that 'many firms have made little progress'. I think it's more nuanced. It's true that perhaps the one-year delay wasn't used as well as it might have been. But the primary purpose of the delay was to allow firms to manage the risks associated with the increase in volatility, rather than simply provide more time for UMR preparations.

Similarly, we should recognise that regulatory relief also exempts a large proportion of phase five firms from several key UMR steps, including legal documentation and opening of custody accounts while they remain below a threshold of $50 million. While it may appear that many firms are not as advanced in their preparations as their peers at a similar stage in earlier phases, the truth is that many phase five firms have a lighter compliance burden.

The key process all firms must prioritise is IM calculation. Regardless of the size of a firm's IM exposure with each counterparty, this will be required for all portfolios on day one. Early IM calculation is also essential as, without it, firms cannot clearly distinguish between portfolios where they must complete all steps and those where relief can be applied. Associated with this, firms that can run multiple simulations up front might also be able to estimate when they will breach regulatory thresholds for the exchange of collateral, and thus better time some of the associated preparation steps.

Both of these steps are important since they help firms identify priority counterparties to negotiate with, and subsequently agree on the custodians each will use. For firms that do not expect to exceed $50 million thresholds for some time, it can also help them define a longer timeline for full compliance.

The associated key requirement is obviously the choice of how to calculate IM. And, with the number of available Simm calculation providers having greatly increased since 2016, it is becoming even more difficult for phase five firms to justify building their own calculators as dealers did in the first phases.

To what extent will phase five firms rely on margin monitoring services to forestall their preparations? What governance processes are required in following this strategy?
Tom Archer and Kah Yang Chong: Firms in-scope need to carefully monitor their bilateral IM for each counterparty and only set up UMR arrangements with counterparties close to or above the IM threshold. On the face of it, this approach is proportionate; however, the logistics can be complex. It requires daily, active, real-time threshold management across all asset classes and making decisions at the right time to set up UMR arrangements.

As regulations do not extend a grace period to firms that breach the IM threshold, market movements and material risk position changes can quickly increase bilateral IM, while setting up UMR arrangements could take months. This could lead to loss of liquidity access and, ultimately, impact best execution.

Monitoring IM thresholds is also challenging for separately managed accounts, where multiple fund managers are executing on behalf of a single fund. The IM threshold may need to be shared or divided, which could negate any benefits by monitoring margin.

In contrast, alternative approaches, such as voluntary clearing and product substitution, deliver the benefits of counterparty choice, capital savings and operational efficiencies.

Neil Murphy: Regulatory relief that permits phase five and six firms to delay – or even exempt them – from some of the key preparations is welcomed by in-scope firms. While it allows them to potentially delay some of the more time-consuming tasks, firms that want to take this path are still required to perform daily IM calculations and monitoring of exposure.

IM monitoring isn't a 'get out of jail free' card – firms still need to undertake the same IM calculation steps as those that are required to comply. This means selection of the appropriate IM model for each portfolio, identification of the correct in-scope trades and relevant jurisdictions, as well as implementing an IM calculation engine.

Regulators in some jurisdictions require firms to request approval for use of an internal model to calculate IM, which may be required regardless of whether they are monitoring or exchanging collateral. Fortunately, for firms looking to defer some of the steps, no additional approvals are required to take advantage of regulatory relief. However, many dealers are agreeing 'rules of the road' up front with phase five firms, whereby both parties agree on any steps if exposure exceeds any agreed 'soft limits'. This not only means monitoring may still require documentation, albeit of a more informal stature, but also provides an opportunity for both parties to compare and align their IM exposure so there are no unexpected surprises – for example, where one party calculates the soft limit is exceeded while the other thinks no action is necessary.

John O'Donovan: Larger phase five firms will probably be able to monitor their IM exposure internally to ensure they have legal documentation in place for the correct counterparties.

The smaller phase five firms can really benefit from new Acadia services for monitoring the exposures of their counterparties. This depends how co-operative the large phase one to three firms are with threshold monitoring – will they really want to upload a common risk interchange format (Crif) file for 1,000 smaller phase five firms each day?

What governance processes are required in following this strategy?
John O'Donovan: Our front-office, legal and operations teams meet bi-weekly to discuss monitoring positions, legal documentation and operational setup with tri-party custodians. This is an important governance forum to ensure the legal team is speaking with the correct counterparties and to flag any operational issues. In this forum we like to show a snapshot of the IM exposure with our counterparties from September 1, 2020 to date. This shows the participants how counterparty IM exposures are increasing and which are getting close to a likely threshold value.
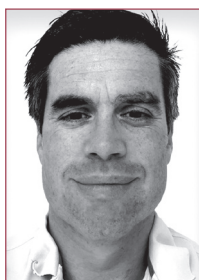
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How suitable is Simm for phase five clients?

Tom Archer and Kah Yang Chong: The regulations mandate two alternative methods of calculating IM: the schedule-based grid approach and an internal model-based approach, such as Simm. The former has the benefit of simplicity and ease of implementation. However, firms should be aware that the schedule approach tends to generate IM many times greater than the model-based approach. Simm has become the industry standard, and asymmetry in the calculation method is impractical. Therefore, firms should prepare for increased transactional costs if they opt for the schedule-based approach.

Although more complex than the grid method, Simm is relatively simple and predictable compared with other proprietary IM models. Furthermore, a wide range of commercial vendors offer solutions that manage the Simm calculation and reconciliation. Firms can therefore outsource much of the operational burden, although independent model validation and backtesting requirements are still in effect in Europe – and proposals for relief may not be in place before the September 2021 deadline.

Use of clearing relieves clients of the requirement to calculate IM themselves, thereby reducing the operational burden. Additionally, central counterparty (CCP) margin models provide opportunities for netting efficiencies across counterparties that cannot be achieved bilaterally. This may also cut both the amount and procyclicality of payments.

Sandy McRae: Having a standard method is essential to be able to reconcile IM with counterparties.

What is missing from Simm is an adjustment for the credit rating of the counterparties. All firms post the same IM regardless of their creditworthiness, with the same IM being posted for an entity with a lower credit rating as an entity with a AAA credit rating.

Neil Murphy: The use of Simm is near ubiquitous across phase one to four firms. For the majority of firms – particularly those with very large IM exposure – the model is preferred given its reflection of offsetting positions and tendency for most portfolios to result in lower IM exposure. Plus, over four years, it can be seen to have performed well, particularly during 2020's period of high volatility. Phase five firms now have a large choice of vendor Simm offerings, which should reduce barriers to its adoption and allow firms to benefit from potentially lower exposure.

That said, for some firms, the Simm model may not be the default choice as it has been in earlier phases. The portfolios of many phase five firms don't reflect the same diversity as dealers and many tend to be directional. In these circumstances, the perceived Simm benefits of lower IM exposure may not be as great and, in some cases, the standardised margin schedule method may even result in lower exposure. Added to this, with the additional complexity of Simm calculation and upfront regulatory approval for use of such an internal model required in certain jurisdictions, the use of Simm just won't add up for some phase five firms.

Many phase five firms are also taking a 'wait and see' approach, choosing to begin with the simpler schedule approach, and are only looking to consider Simm at a later stage. Cases where use of the schedule method is sufficient to remain within the remit of the regulatory relief are particularly attractive to firms monitoring IM only.

John O'Donovan: Phase five clients are probably facing off with the same 40–50 broker firms from phase one to four. These large broker firms are all using Simm where possible, and it makes sense for phase five firms to develop the capability to run a Simm or outsource this process.

Varqa Abyaneh: The suitability of Simm can be split into two categories – suitability from an implementation perspective, and suitability as a measure that adequately captures the key risks.

Simm has been highly successful in enabling in-scope firms to adopt the UMR quickly and easily. The standardisation of the risk inputs via the Crif – pioneered by the International Swaps and Derivatives Association (Isda) – aids reconciliation between counterparties and, in turn, increases efficiency. Simm is also simple to calculate, as it is an analytic function of Crif, which doesn't revert to numerical methods or historical simulations.
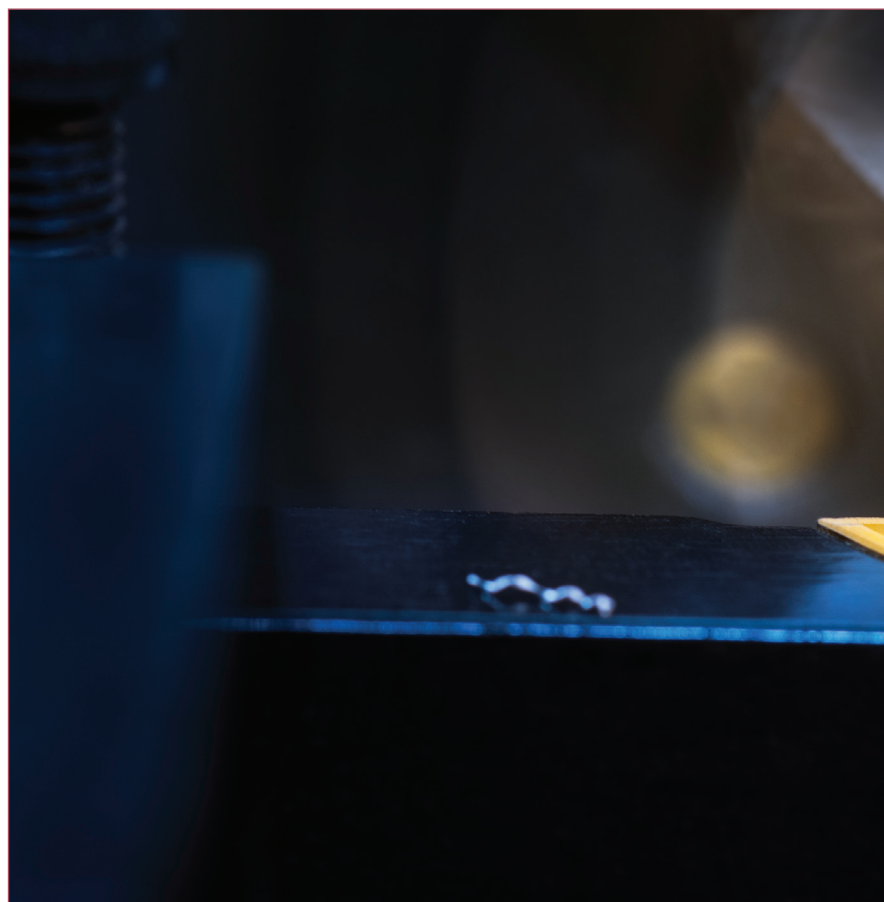
However, given the extent of UMR and the breadth of trades in-scope, it is unlikely that a single standardised model can accurately capture all risks from all trade types. This is of particular importance where counterparties consider replacing their existing IM calculation method with Simm, for example, for trading between hedge funds and dealer banks.

Simm, while robust and well governed, may not be suitable to replace existing exposure models used by derivatives counterparties to calculate appropriate margin levels outside the fulfilment of regulatory requirements. As an example, risks arising from physical foreign exchange principal exchanges, such as in cross-currency swaps and FX forwards, as well as from equity options, are excluded from the Simm calculation in most jurisdictions, yet included in typical in-house exposure calculations. However, Simm does allow the voluntary inclusion of such risk factors. Whether or not the industry will accept this as overriding their own models for exchanging voluntary IM or margin levels over and above the regulatory requirement when facing higher-risk counterparties remains to be seen.

How can phase five firms optimise portfolios to minimise margin costs?
Tom Archer and Kah Yang Chong: Voluntary clearing of derivatives presents a great opportunity for clients to optimise their portfolios and achieve savings in two ways. First, the consolidation of positions across multiple counterparties to a single CCP allows for maximum netting opportunities. Second, the LCH IM model has a lower margin period of risk versus Isda's Simm, which could result in lower margin for diversified and directional positions.

LCH recently undertook a cost comparison that examined a number of portfolios across a diverse set of participants, including dealers, hedge funds and asset managers. In the FX space, analysis suggests clearing may result in large IM savings versus bilateral trading – up to 70% in some cases.

Once firms start to clear, they reap other benefits as well. For example, operational, credit risk and liquidity considerations may also tip the balance in favour of clearing. A streamlined operational model with a single counterparty – under the LCH rulebook, where there are no valuation disputes and a strong network effect – could provide a solid foundation that enables counterparties to prefer selecting clearing rather than bilateral counterparties.

Neil Murphy: Firms seeking to minimise margin costs may consider two distinct paths. Under the first approach, in-scope organisations can seek to stay under the IM threshold in place in most jurisdictions (typically $50 million, although this may be lower in some instances) for as long as possible, removing the need to post IM collateral. For example, firms may prioritise trading with counterparties where exposure is below the threshold, or the impact of any new trade does not cause exposure to rise above the threshold, hence delaying any requirement to exchange collateral. Clients using our triCalculate service are able to use the 'what-if' capability to assess the impact of new trades on each portfolio, and thus make decisions on where to book new positions.

However, once an IM threshold is breached, the second approach is for firms to minimise margin costs by reducing overall IM exposure, thus limiting the amount of collateral they are required to post. To reduce exposure, firms can add offsetting positions unilaterally; however, this rather piecemeal approach is inefficient and doesn't look at a firm's portfolios holistically. Instead, by applying a multilateral approach such as that provided by triBalance, firms can leverage powerful algorithms that are able to propose risk-reducing trades that allow a firm to remain market risk neutral while reducing overall IM exposure, and hence costs.
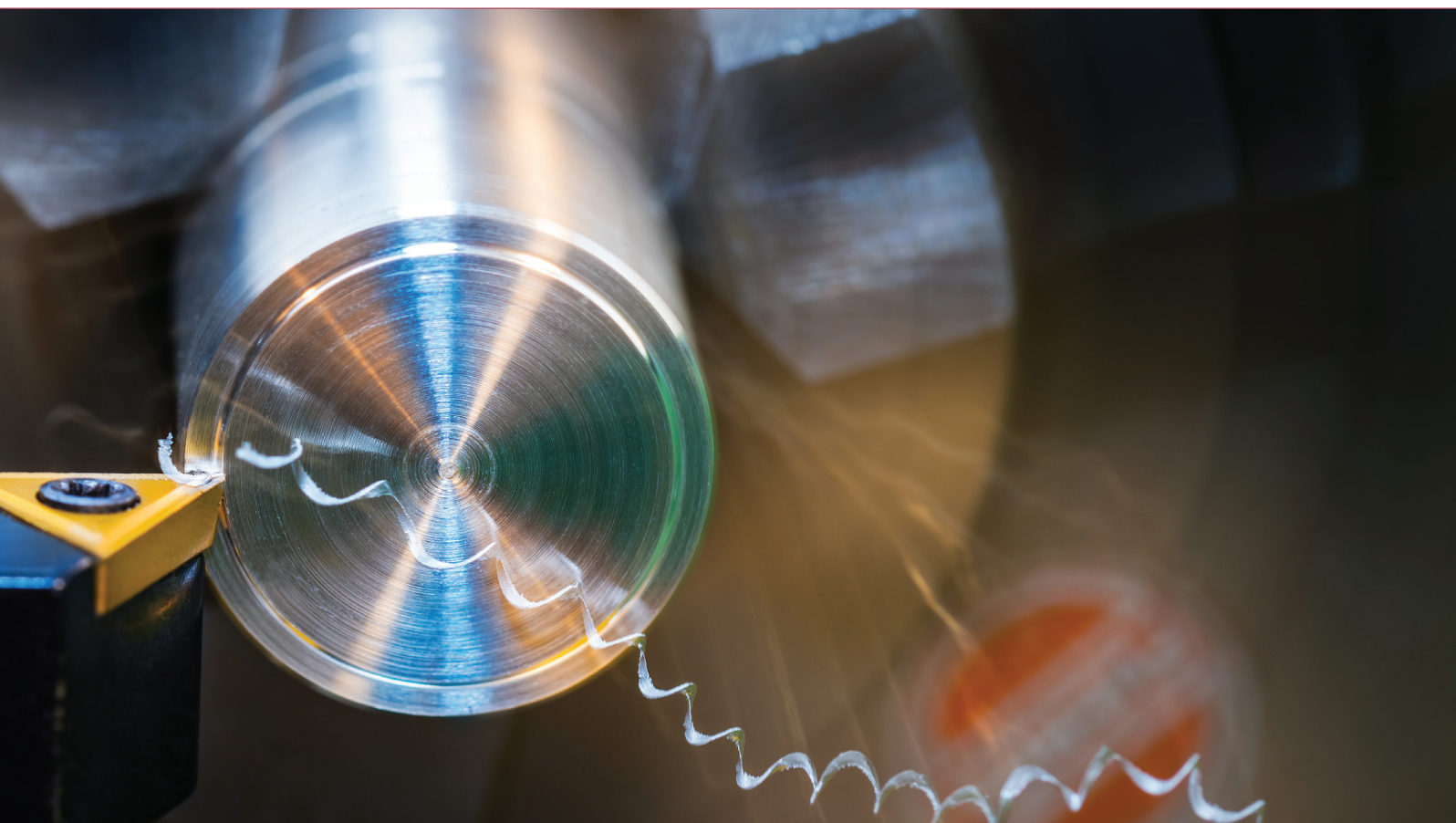
Once firms are required to exchange collateral, one final tool to help minimise costs is automation of the margin workflow. By reducing the manual touchpoints associated with the margin call process, firms can reduce the operational cost per call. Firms should prioritise the following steps: electronic messaging for the call exchange, automated margin workflow, and connectivity to multiple custodian and triparty agents. Fixing the problem at source will reduce not only IM margin costs, but variation margin costs too.

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Sandy McRae: Consider consolidating activity so you have fewer counterparties. Given that Simm is a portfolio-based model, consolidating your portfolios can reduce your overall posting requirements. It has the ancillary benefit of reducing your onboarding requirements, from a technology, operations and legal documentation perspective.

Varqa Abyaneh: UMR has created an opportunity for innovation to systematically reduce risk and margin costs for cleared and uncleared portfolios. As participants trade with multiple counterparties in multiple markets, the key is to approach the issue from a scalable, multilateral perspective. Multilateral portfolio optimisation creates more opportunities to net down risk, enabling firms – and their counterparties – to benefit from superior risk reduction and reduced margin costs.

Quantile's IM optimisation service already supports all of the G15 banks and many other market participants to reduce their costs associated with funding IM. It works by analysing counterparty risk and proposing a set of new market risk-neutral trades that deliver margin cost reductions without changing net risk positions.

The service offers regular optimisation 'runs' for uncleared and cleared FX and interest rate asset classes, plus uncleared equities. By offering optimisation for both cleared and uncleared products, Quantile connects liquidity pools and generates increased capital and margin benefits for clients.

John O'Donovan: They should enter into as many bilateral derivatives contracts as possible before go-live. After go-live, the challenge for Nationwide is to try to clear every derivative, bar cross-currency swaps, bond forwards and inflation swaps.

What can phase five firms learn from the experience of previous phases?
Neil Murphy: Beginning preparations early, and learning from those who have already been through prior phases, is essential for phase five and six firms. In addition, one key lesson stands out, which is that firms should adopt industry standards and market expertise. Right across phases one to four we see standards being leveraged in terms of IM calculation and the wide adoption of Isda's Simm model, use of a common messaging protocol for IM call exchange (MarginSphere) and use of a single platform for IM sensitivity reconciliation (Acadia's IM Exposure Manager). We have also seen increased use of triResolve for alignment of portfolios, which provides wider benefits outside of IM compliance. By leveraging these standards, firms can not only shortcut some of their decision-making, but also improve operational flows and benefit from industry best practice.

Use of industry-standard tools will benefit firms through improved connectivity – to their counterparties, to custodians, across systems, and so on – and automation. Combined, this approach will ensure maximum straight-through processing, reduce complexity and help deliver improvements outside of the IM process.

Sandy McRae: The dealers can provide valuable insights on the background of UMR, IM estimates on client portfolios, details of their implementation/testing and legal documentation processes. As CPP Investments moved into its own implementation as part of phase five, we faced different challenges than in the previous phases, which will be lessons for phase six:
- The significant number of phase five entities (compared with previous phases) has impacted negotiation and onboarding timelines compared with earlier phases. Start early – there are probably more phase six entities than those in the first five phases combined.
- Phases one to four were mostly large banks/dealers that developed in-house systems, while many phase five firms are using third-party vendors. This adds time to due diligence, negotiations and development work with third-party vendors.
- The scope of the collateral you will be looking to use, in addition to your operational capabilities, will drive the decision on whether to use a tri-party or third-party platform. Most, if not all, phase one to four entities utilised tri-party platforms, but there was more of a mix among phase five entities. Deciding between platforms and custodians takes time as you have to do the due diligence, and select and complete onboarding. Keep in mind that custodians are also struggling to keep up with the increased demand, so the earlier you start, the better.

Tom Archer and Kah Yang Chong: Delays in setting up custodial arrangements marred the first wave of IM implementation in 2016, with many banks reportedly unable to face a number of their counterparties on day one of the new regime. With a significantly greater number of counterparties in scope for phase five, the potential for similar disruption is as great, if not greater. Firms should therefore ensure they are pushing implementation as much as possible ahead of the September 2021 deadline, prioritising those counterparty relationships that are likely to meet the IM threshold.

Firms should also consider clearing as a way to alleviate the UMR burden as some firms in previous phases have done. There has been a general increase in the volume of cleared derivatives driven by the initial phases of UMR, with LCH's ForexClear non-deliverable forward (NDF) clearing service being a prime example of this. CCPs continue to extend their range of cleared products and are venturing into areas not traditionally associated with clearing, such as OTC equity swaps, giving the market a choice and the ability to optimise resources.

Varqa Abyaneh: One of the key lessons learned from earlier phases is how quickly the margin numbers can grow. Once a firm is live, trading activity will see them quickly go from having no in-scope trades, and therefore no margin, to having a growing number of in-scope trades with associated margin costs. Phase five firms should prioritise how to manage these increasing margin numbers and costs – and implement a solution before they place a strain on critical resources.

In 2020, new trading activity in response to the emergency US Federal Reserve Board rate cuts increased the margin required for in-scope firms by around 20% – despite no new firms coming into scope. The *Isda margin survey year-end 2020* reveals that uncleared margin has been rising for the past few years, and with phase five increasing the number of counterparties involved and the amount of collateral posted, there is growing demand for margin optimisation services.

In response, Quantile has increased the frequency of its IM optimisation runs. Our client network has grown by 37% in the past year and our service offers material IM reduction – often in excess of 50% – across FX, interest rates and equities.

John O'Donovan
Murex Business Analyst
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John O'Donovan: Not as much as you would expect. The 38 phase one to three firms had to paper all their agreements ahead of time and likely breach their thresholds almost immediately so the concept of threshold monitoring did not exist. These phase one to three firms had to set up Swift for just three custodians: Clearstream, Euroclear and BNY Mellon. It is likely they were already direct members of some of these and had Swift messaging in place.

Phase one to three firms could probably be more helpful with smaller firms by explaining the day-to-day process to them. But, due to the high number of phase five and six firms, this might not be practical.

How have vendors sharpened their IM tools, tech and services in recent months in preparation for phase five?
John O'Donovan: Acadia has been very good since the beginning. I don't know where we would be without its industry knowledge and advice, as well as quick roll-out of new process and tools for phase five and six firms, such as the threshold monitoring tool. Acadia also acted as an intermediary to share contact details of a point of contact from the phase one to four firms.

Some phase one to three brokers developed IM solutions for phase five and six firms. But I found the solutions to be overly complex and the costs too high for the needs of phase five and six firms, which are not likely to breach thresholds immediately. I don't think they have understood the needs of small firms very well.

The Depository Trust & Clearing Corporation's Margin Transit Utility tool has also moved quickly to offer a very affordable UMR solution that integrates seamlessly to Acadia's MarginManager. Tri-party custodians have not been as responsive or flexible; however, Clearstream and Euroclear did offer special non-direct membership for UMR.

Neil Murphy: It is not only phase five and six firms that benefit from the one-year delay in the rules, but vendors too. Used well, the additional time should have provided scope for further build out of services, as well as improved scalability to support increases in client numbers.

From TriOptima's perspective, with our holistic UMR offering in production since 2016 and adopted by firms across all prior phases, the time has been used to build new features with smaller phase five and six firms in mind, rather than to play catch-up. From a calculation perspective, this includes support for additional exotic products, something particularly important to the growing number of funds in-scope. With an increased focus on IM monitoring, we've also introduced new capability to allow firms to automatically monitor their own, or counterparty, exposure versus soft limits. This lighter approach provides a simple way to manage a firm's IM exposure while providing transparency, and an automated way to identify when a firm should start additional preparation steps, such as IM CSA documentation.

For many phase five and six firms, integration to custodian platforms is not automated to the same level as large firms. This poses a further problem with the introduction of UMR, as firms will now need to connect not only to a wider range of custodians, but also tri-party agents. To that end, TriOptima has added Swift settlement connectivity to its triResolve Margin service. This offers connectivity to all four tri-party agents and a broad range of custodians, allowing firms to instruct movements and view real-time settlement status and collateral allocations across agents.

With so many firms due in-scope in 2021/22, scalability is critical. It's not realistic for firms to spend six to 12 months working with multiple vendors. TriOptima has spent a lot of time ensuring clients can adopt our services quickly. Ahead of phases five and six, we have onboarded a large number of clients, with some going live more than a year early. By selecting and onboarding with vendors early, firms can focus their time on the multitude of other items on their UMR 'to-do' lists.

Sandy McRae: Our vendors have been getting ready for September in parallel with the phase five firms. Each month there are additional capabilities in their systems with teams working at 110% to meet the September 2021 deadline. I expect there will be further enhancements after the basic functionality is completed for the go-live date.

Tom Archer and Kah Yang Chong: As costs relating to UMR compliance have become clearer over the past few years, many providers have launched new products and services to help firms navigate the ever-changing landscape. This includes services around operational and legal setup, and creating margin efficiencies through optimisation.

Voluntary clearing is a key component of clients' UMR preparation toolkits. A streamlined setup coupled with inherent margin optimisation puts firms in a great position to deal with UMR. At LCH, we are constantly enhancing our products to better serve our customers.

In FX, LCH recently launched clearing of non-deliverable options, added seven new currency pair NDFs and extended the maximum maturity of trades to five years for certain NDF currency pairs. LCH EquityClear also plans to launch clearing of OTC equity swaps – contracts for difference – in the near future. This will allow our customers to gain further margin efficiencies and increase their clearable product netting set.

Varqa Abyaneh: As more counterparties come in-scope, vendors across the industry are streamlining their solutions and increasing their focus on automation. Quantile's services were built for performance, and we use advanced cloud technology to quickly scale to deliver our optimisation service in line with market demand. Recent product developments include expanding our service to optimise eight new cleared currency pairs at LCH ForexClear, as well as new runs to support cleared interest rates at LCH SwapClear. Quantile also releases weekly enhancements to its portal, algorithms and onboarding process to ensure the service continues to meet the requirements of firms in all phases.

An innovation to specifically support phase five firms is the ability to optimise across multiple clearing brokers and prime brokers, and maximise the efficient utilisation of thresholds. We also intend to make available additional analytical and margin calculation tools to facilitate effective risk management of total IM postings. ∎

>> The panellists' responses to our questionnaire are in a personal capacity, and the views expressed herein do not necessarily reflect or represent the views of their employing institutions

Non-cleared margin logjam looms after squandered delay

Fewer than half of phase five firms have submitted the necessary documentation to open custody accounts. By Helen Bartholomew

Buy-side firms could struggle to meet the already delayed deadline for complying with the fifth wave of the non-cleared margin rules after many of them wasted a 12-month extension granted by regulators in response to the Covid-19 pandemic.

Firms with more than €50 billion equivalent in average aggregate notional amount (AANA) of over-the-counter derivatives will be required to start exchanging IM with counterparties from September 1, if they exceed the minimum exchange threshold of €50 million per counterparty relationship.

To comply, firms must sign new collateral agreements and open segregated custody accounts for posting and receiving margin. But many of the roughly 250 phase five entities put their preparations on hold when regulators agreed to delay implementation last April and some have yet to even begin work on a process that can take several months.

The year-long extension has been "a double-edged sword", says Sean Lynn, director of collateral product development at BNY Mellon.

"It gave us a lot more time to be a little more thoughtful and we used the postponement to fine-tune certain elements of our offering. The challenge was that some clients started to lose a little of their focus at the end of last year, with some of the key decision-makers pivoting to work on other projects, so we had to work to ensure that clients kept their focus," Lynn says.

Fewer than 20% of phase five clients planning to open segregated margin accounts at BNY Mellon met the custodian's end-of-February deadline for submitting manually negotiated documents, such as account control agreements and eligible collateral schedules.

Firms using BNY Mellon's electronic tool to negotiate collateral schedules have until the end of March to submit final documentation. Those that miss the deadline may not have their accounts set up in time to post and receive margin when the rules take effect.

Rival custodian Euroclear says it has completed documentation and account openings for almost half of its anticipated phase five clients and set a May 28 deadline for the remainder. "We decided to keep the gates open and continued to onboard new clients on the tri-party setup, but it's not like they were queueing three times around the building," says Gosta Feige, director of product solutions sales, collateral management at Euroclear. "Now, we're re-engaging with community onboarding."

Delays in setting up tri-party custody accounts marred the first wave of IM implementation in 2016, with banks unable to face up to 50% of their counterparties on day one of the new regime. With 10 times as many entities in-scope for phase five, some fear a repeat of that chaos.

"We're in a worse position now compared to any phase because there are so many more firms. A few took advantage and got on with it, but a lot of people ground their programmes down," says a margin specialist at one European bank.

Chris Watts, director and co-founder of consultancy Margin Tonic, feels the same. "We've ended up in a place that all of us wanted to avoid, which is those 12 months not being used efficiently by a majority of firms," he says. "People needed time to adjust and reprioritise after Covid hit but there's a general frustration that some counterparts sat on this, and those queues we've been talking about for the last two years are going to end up forming over the next six months as a result."

Blame game

Some phase five firms are blaming their counterparties for the delays. UK building society Nationwide saw its negotiations grind to a halt in September as momentum slowed among some dealers.

"We tried to continue with the original goal but some firms weren't as focused," says John O'Donovan, who heads Nationwide's margin compliance project. "We decided to put our pens down and will pick up negotiations with nine of our counterparties this month. Hopefully we'll have at least some of them signed by September."

Of its 25 active counterparties, the UK lender expects to breach the €50 million exchange threshold with only a handful in the first six months. About 10 will take around a year to breach the threshold while the remainder may avoid repapering altogether.
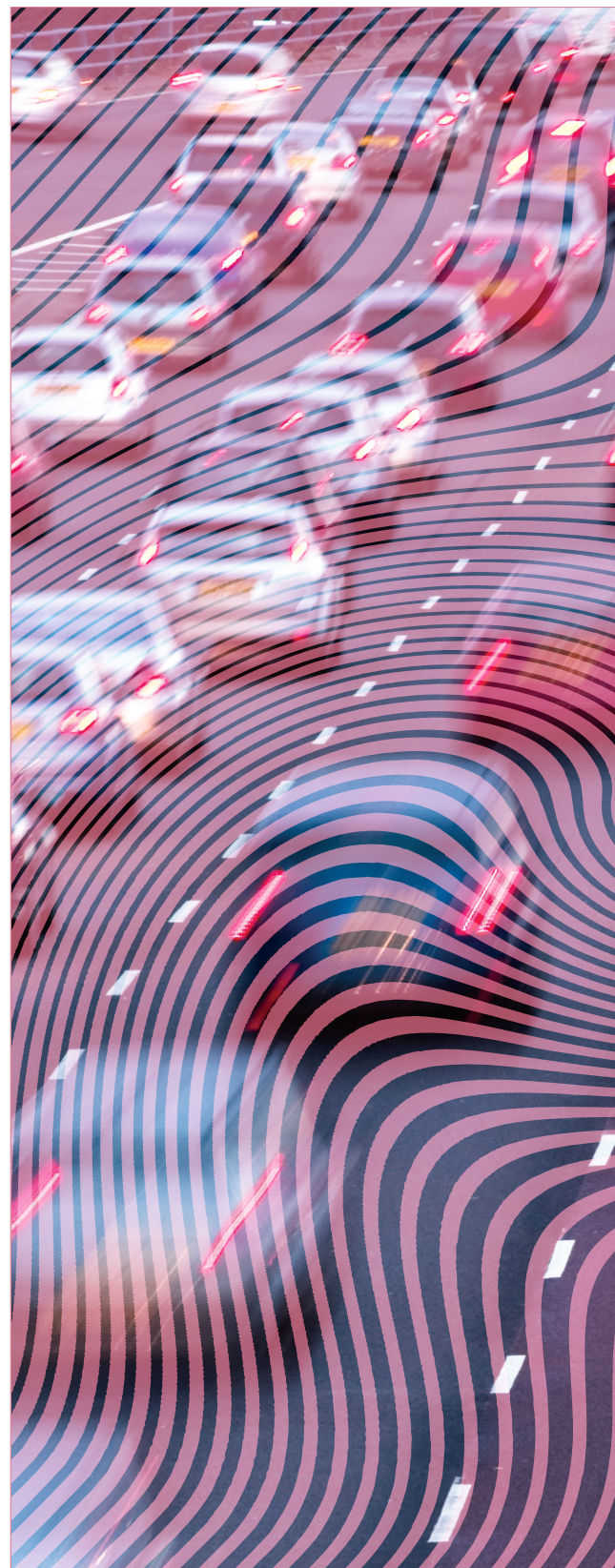
Acadia estimates that around 120 firms will be required to begin posting margin from day one of the new phase taking effect. The remainder will have to monitor margin amounts for each counterparty against the €50 million exchange threshold. This can be done using new services offered by vendors, but take-up has been slow. The bank margin specialist reckons only 20% of its phase five clients will rely on margin monitoring.

Some firms may be waiting until the end of the AANA calculation period for determining whether a firm is in-scope, which runs from March to May, to begin documentation and account setup. John Pucciarelli, head of industry and regulatory strategy at Acadia, says that would be a mistake.

"Hopefully people understand there could be a queue and are already negotiating documents. If phase five firms haven't had those conversations, they need to have them now," he says. "If you wait until you do your AANA calculation, it might be too late."

Breathing space

The extra preparation time afforded by regulators has not gone entirely to waste. While negotiations over documentation largely ground to a halt in mid-2020, vendors and custodians have used the time to improve tools intended to ease the compliance burden for a buy side-heavy class of 2021.

"One positive from the one-year delay is that the market infrastructure players and vendors have had more time to extend services and streamline their onboarding processes. As a result, they should now be better equipped to support the tidal wave of clients due in phases five and six," says Margin Tonic's Watts.

More than 75 users have signed up for Acadia's margin monitoring service since it soft-launched last September. Pucciarelli says the extra lead time has been helpful in fending off a potential crunch.

"The delay was a benefit and was necessary in terms of the pandemic, but it's all about how you use it. I think our soft launch ensures that there isn't a crunch come September. The numbers we see in people signing up is definitely helpful and we're going to be doing the same for phase six because it's worked well."

Currently, just four of Nationwide's 25 counterparties are uploading files to the service. But O'Donovan says it has still provided valuable insight into the way exposures build across different counterparties and product types.

"You learn from looking at the numbers what the main contributors are and can get a feel for the IM exposure," says O'Donovan. "Our margin has definitely grown faster than we expected, but it depends on the netting effect of the trades. If your trades are all in the same direction it will always build up a lot quicker than you'd expect for a netted set. The real challenge is papering with the right counterparties because, on a yearly basis, your relationships with firms change."

Euroclear used the delay to iron out its new restricted admission model, which allows collateral receivers to avoid lengthy know-your-customer checks. While some buy-side firms have signed as

direct Euroclear members, most are gaining access via a pledgee-representative model, which sees buy-side firms sponsored into the tri-party environment by third-party custody banks. The pledge-only model provides a third option with lower onboarding requirements for firms that only receive collateral.

"Getting this restricted admission model round and sound as it is now is definitely an outcome of the leeway of the last 12 months. We probably would have developed something similar, but we've been able to take time to develop something more sophisticated. That's been an advantage for us," says Feige.

The extension also allowed BNY Mellon to refine its fully outsourced service, which handles all stages of compliance, from margin calculations under the industry's standard initial margin model (Simm) to collateral administration. A critical development saw the custodian work with Acadia to create an adaptor, which completes the unwieldy task of translating trade data files into Acadia's preferred standard, known as ORE XML, for calculating Simm sensitivities.

"We figured out early on that we needed to help clients translate flat files into a format that is compatible with Acadia's system, because the platforms many clients are using to value derivatives don't natively spit out XML files," says BNY Mellon's Lynn.

Around a quarter of BNY's phase five clients have opted for this so-called Simm-to-seg service, which packages Acadia's IM exposure manager service with the adaptor functionality and Swift messaging for the mobilisation of assets.

"Instead of five different vendor relationships, as a collateral administrator we present just one relationship and one point to go to," says Dominick Falco, head of collateral segregation at BNY Mellon. "It's a one-stop solution, in addition to just the basic segregated collateral accounts."

Despite the rush of developments, some say a crunch is inevitable. "Thankfully, there's engagement now because people can see the deadline. We'll get there, but it will be a mess for the next few months," says the bank margin specialist. ∎

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> "The delay was a benefit and was necessary in terms of the pandemic, but it's all about how you use it"
> John Pucciarelli, Acadia

Acadia brings IM standards in-house

Acadia's aquisition of Dublin-based risk analytics and software partner Quaternion will help its data standardisation efforts and cut outsourcing risk in its standard initial margin model calculation service. By Helen Bartholomew

Acadia has brought a critical data standardisation component of its regulatory IM service in-house after acquiring Dublin-based risk analytics and software partner Quaternion.

The deal, which eases reliance on an increasingly critical third-party vendor, brings within the margin utility's purview an open-source standard for trade data, ORE XML. Sponsored and developed by Quaternion, this framework could be adopted by dozens of buy-side firms for IM calculations and was recently shown to be interoperable with the Common Domain Model (CDM) – an industry-wide project aimed at standardising derivatives data to cut costs and complexity through the trade lifecycle.

In the first instance, the integration aims to streamline a data standardisation effort that has bewildered many buy-side firms as they prepare to comply with the implementation of the fifth phase of IM rules on September 1.

In-scope entities must calculate and input risk sensitivities for their portfolios into the industry's standard initial margin model (Simm) – a process requiring trade data to be standardised.

Acadia is the dominant provider of buy-side risk-sensitivity calculations via IM Risk Generator. Its system requires trades to be delivered in ORE XML format, with Quaternion providing a standardisation service.

There is no change in cost structure following the February 4 integration – clients will continue to pay extra for the standardisation service – yet Acadia's chief product officer, Fred Dassori, says the process will create efficiencies and new opportunities.

"Clients are just dealing with one company. So while it was a joint effort to bring clients on board, now our clients are dealing only with Acadia. We expect it will further streamline that onboarding process and the relationship with existing clients," says Dassori.

"One of our goals has been to make this affordable so cost isn't a big barrier to entry for clients that need the service. There's no change to the cost of the service, and what it allows us to do is to jointly innovate," he adds.

Rivals such as Bloomberg offer all-in Simm calculation services, which include standardisation. Some alternatives come with a higher price tag, however, said to be more than double the up-to-$50,000 per annum likely to be paid by most Acadia clients for the basic service.

Others see the tie-up as an important step in reducing reliance on third-party vendors for delivery of a critical element of the firm's core Simm calculation product. "From a corporate perspective, you've got to manage your risk, and make sure that a third party doesn't terminate the contract and go somewhere else," says a source at another margin optimisation firm.

Outsourcing and third-party risk was ranked fourth by bank risk managers in *Risk.net*'s Top 10 Op Risks survey for 2020, with many citing concerns around a radiating pool of fourth- and fifth-party risk as vendors themselves increasingly rely on a wider set of providers.

In addition to IM risk-sensitivity calculations, Acadia already partners with Quaternion for its IM backtesting and credit support annex valuation services. The tech vendor will now operate as a new division of Acadia while retaining offices in Ireland and Germany.

CDM interoperability

Achieving data standardisation for over-the-counter derivatives is a major ambition for industry participants. Some standards already exist – for example, Financial Products Markup Language – but have not been widely adopted on the buy side.

ORE XML is an open-source version of Extensible Markup Language. Converting trades into this format requires them to be broken down into components and mapped to a series of data fields. These range from around 10 for a vanilla data swap to hundreds for a complex instrument such as a collateralised debt obligation. Mapping an entire portfolio can take weeks.

Acadia has 120 clients – around half of the phase five buy-side cohort – already signed up for its IM services, potentially cementing ORE XML as one of the most widely used OTC data standards for the buy side.

This could give the format a head start in the industry-wide common data standards initiative. Led by the International Swaps and Derivatives Association, the CDM project aims to slash pre- and post-trade lifecycle costs and complexity for OTC derivatives.

> "The proof-of-concept shows CDM could feed ORE or ORE could feed CDM"
>
> Donal Gallagher, Quaternion

Far from embarking on a battle for data supremacy, Quaternion chief executive and co-founder Donal Gallagher says the two are complementary since a November proof-of-concept using vanilla interest rate swaps demonstrated how ORE can integrate with CDM.

"I can see in time the two being interoperable. Clients won't need to choose if they're going to use CDM or if it's already feeding CDM because they end up entirely interoperable. The proof-of-concept shows CDM could feed ORE or ORE could feed CDM," says Gallagher.

Beyond IM

The scope of the tie-up could be wide-reaching, sources say, enabling Acadia to offer risk analytics services to its extensive client network. This could see the firm compete more directly with risk-as-a-service providers such as IHS Markit.

"If you're collecting and cleaning up a lot of trade data, you have the toolset to offer other services on top with the same datasets you're already consuming," says the margin source away from the two firms. "It's not like Acadia has any market share in that at the moment, but it's a growth area where they can leverage what they already do."

Quaternion's Gallagher is eyeing an array of opportunities in new risk calculation standards, including the Standard Approach to Counterparty Credit Risk and the Fundamental Review of the Trading Book.

"This combination of Acadia's position as a central trusted computation agent with all the technology and data protection around that, together with Quaternion's quantitative abilities, creates a unique opportunity to bring new risk services to the market in a centralised, accessible way, particularly with the standardisation of risk that's been in the pipeline for quite some time and is now hitting the road," says Gallagher.

"There's virtually no limit to what you can do in terms of centralised calculations of risk, and once you calculate it, that opens further opportunities for optimisation of all sorts of things not currently imaginable," he says. ∎

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UK funds fall out of love with sterling swaps

Lower yields, Libor transition and margin rules help make gilt repo the desired hedging tool for liability-driven investment funds.
By Natasha Rega-Jones

Liability-driven investors in the UK are abandoning interest rate swaps in favour of gilt repo for hedging, and forthcoming changes in financial markets look set to cement that shift.

Yields on gilts are higher than rates available on long-dated sterling swaps. As lending switches from Libor to replacement benchmarks, this difference is likely to become more pronounced. New rules requiring hundreds of buy-side firms to post margin on non-cleared derivatives for the first time may also discourage the use of swaps, experts suggest.

"All of these factors have combined to make swaps a less loved instrument," says Rosa Fenwick, liability-driven investment (LDI) portfolio manager at BMO Global Asset Management, a Canadian investment firm.

One of the biggest risks to institutional investors such as pension funds and life insurers is that a change in interest rates will affect their ability to meet their liabilities. To hedge this risk, firms invest in assets that pay a fixed rate. In the UK, hedging tools include gilts, interest rate swaps, gilt repo and gilt total return swaps.

Gilts are the simplest hedge, but they tie up large sums of cash that could otherwise be used for more yield-enhancing assets like equities. So liability-driven investors often prefer to use unfunded alternatives. In a gilt repo, or repurchase agreement, an LDI fund borrows money from an investment bank and uses a gilt they already own as security for the 'loan' – with the fund essentially selling its gilt to the bank while agreeing to buy back an equivalent at a set price on a particular date and price in the future. The fund uses the cash received to buy more gilts to repo out until it reaches the desired level of leverage – though in reality that process can be done in one transaction.

As the repo price is fixed at the outset of the transaction, the LDI fund only has an economic exposure to the price of the underlying gilt – with an increase or decrease in the market value of the gilt equating to a profit or loss for the fund.

While LDI funds in the UK typically use a mixture of swaps and gilt repo to hedge their liabilities, it is gilt repo that has become the dominant hedging instrument of choice over the past few years.

Fenwick at BMO says the split between gilt repo and swaps within LDI funds is 75:25. Andrew Berman, head of institutional clients group for UK and Ireland at Deutsche Bank, puts the ratio at 80:20.

This wasn't always the case. Swaps used to comprise the majority of the hedging mix for LDI funds, experts say. Prior to the 2008 financial crisis, gilt yields were 20–30 basis points below the swap curve at the 30-year point. But a glut of government bond issuance post-2008 pushed up gilt yields, making them higher than fixed rates on sterling Libor swaps. As of April 1, gilt yields were nearly 15bp higher than the 30-year swap rate.

"2008 was a big turning point," says David Jamieson, market strategist at Insight Investment, a BNY Mellon-owned asset manager. "When

governments started issuing bonds, gilts became a hell of a lot cheaper than swaps and so LDIs started favouring gilts on repo over swaps to hedge their liabilities."

This trend has been exacerbated by the interest rate swap market's transition from Libor to the UK's successor risk-free rate – Sonia, or sterling overnight index average. From April 1, UK regulators have ordered that no new sterling Libor lending should take place, and that swap markets should shift to Sonia in advance of Libor's extinction at the end of the year.

The 30-year Sonia swap rate is 27bp tighter than its sterling Libor equivalent. This means the difference between the fixed rate on a 30-year Sonia swap and 30-year gilt yields is 41bp, as of April 1.

"The transition from Libor to Sonia has made it even more compelling for pension funds to use gilt repo because of the yield difference," says Jamieson.

1 30-year swap rates and gilt yield

Legend:
- 30-year Sonia swaps
- 30-year sterling Libor swaps
- 30-year gilt yields

Source: Bloomberg

Many institutional investors have also changed the rate at which their liabilities are discounted, following sharp losses after the 2008 financial crisis. Firms have opted to use a discount rate based on higher gilt yields rather than swaps. Market participants say that using gilt repo means the interest rate hedges are more aligned with the discount rate, mitigating any mismatch that would otherwise have required extra hedging.

Collateral damage

A further driving force behind UK LDI funds' greater use of gilt repo hedging is an impending change in derivatives market regulation. Pension funds and life insurers will soon have to post IM when using interest rate swaps to hedge their liabilities under the UK's version of the European Market Infrastructure Regulation (Emir).

From September 1, the fifth phase of non-cleared margin rules will require firms with more than €50 billion equivalent in average aggregate notional amount (AANA) of over-the-counter derivatives to start exchanging IM with counterparties. This also assumes they exceed the minimum exchange threshold of €50 million per counterparty relationship. In September 2022, the sixth and final phase of the rules will see firms come into scope if they have an AANA equivalent to more than €8 billion.

The margin rules are partly designed to encourage firms to voluntarily clear their trades. However, swaps clearing brings its own costs and complexities for institutional investors.

"Through the use of central clearing you retain the same risk positions but there is a cost to pay to the clearing member for their service – they are facing the clearing house, providing default fund contributions, posting collateral, and are also holding risk on their balance sheet on your behalf," says Fenwick at BMO.

The alternative for LDI funds is not to use swaps, and rely on gilt repo for hedging their liabilities.

Similarly, Emir clearing obligation rules could soon see UK pension funds having to clear OTC interest rate swap contracts through a central counterparty if they exceed a threshold of €3 billion in gross notional value. Firms are currently exempt from the rules until June 2023, with the UK Treasury able to extend the date further. But the looming obligation could provide an incentive for UK pension funds to use gilt repo hedging and so avoid having to clear interest rate swaps.

QE too

The introduction of quantitative easing measures in March 2020 has also helped strengthen the appeal of gilt repo. Following the coronavirus pandemic, governments injected billions into markets by buying back vast quantities of government bonds. This infusion of liquidity has helped to compress gilt repo bid/offer spreads, making gilt repo an even cheaper hedging instrument over swaps. But this boost of liquidity is unlikely to last indefinitely. As economies recover from the shock of the pandemic, central banks are predicted to scale back their bond-buying programmes. A reduction in government cash may lead to a rise in financing costs for gilt repo, strengthening the case for using swaps for hedging.

The pandemic also prompted the UK banking regulator to prevent the country's investment banks from paying dividends to shareholders during 2020. Withheld payments are estimated at nearly £8 billion ($11 billion), and gilt repo has been a key outlet for banks to put this pile of unused cash to work. With economic restrictions beginning to ease in December, banks may be less keen to facilitate gilt repo transactions as they'll be able to use their money for other purposes – potentially causing LDIs to shift back to interest rate swaps.[1]

"Repo is somewhere for banks to park cash and receive a suboptimal return on balance sheet until better opportunities come along," says Berman at Deutsche Bank. "I wonder whether other opportunities to deploy cash could at some point make banks less excited about lending their balance sheet for repo to UK pension funds."

One of the downsides of using gilt repo is that the instrument only tends to stretch to around nine months' maturity, so it needs to be rolled repeatedly through the life of the trade. By contrast, swaps last for 30 or more years. LDI funds can run into problems rolling over their gilt repo hedges during times of crisis when banks typically charge more for such transactions, like in March 2020.

While the cost of a three-month repo transaction in early 2020 was around Sonia plus 15bp, by March that cost had skyrocketed to Sonia plus 80bp. As a result, Insight now transacts over 20% of its gilt repo business with non-bank market-makers – such as clearing houses and corporate treasurers – up from 0% in 2016.

"Everyone should have part of their repo in non-banks in order to minimise that roll risk," says Jamieson.

Indeed, "counterparty diversification partly resulting from new entrants to the gilt repo market" – such as non-bank market-makers – was cited as a key structural factor for increased repo market stability by the Bank of England (BoE) in 2017.[2]

However, it's the inherent roll risk associated with gilt repo transactions that sees Jamieson advising clients against using gilt repo to hedge 100% of their liabilities – despite the fact that some of his clients do so. Instead, LDIs should find a balance between their use of gilt repo and interest rate swaps.

"If you did a new repo transaction today, in a year's time you don't know what rate you'll be rolling the repo at, and you don't know if there'll be enough banks with enough balance sheet to offer you the repo. So that's an extra risk that you have in repo that you don't have with a swap, which is why I always encourage clients to find a balance between gilt repo and swaps," he says. ■

Previously published on Risk.net

[1] *BoE (December 2020),* Prudential Regulation Authority statement on capital distributions by large UK banks, *https://bit.ly/2RYdX6M*
[2] *BoE (July 2021), Minutes – Money markets committee, https://bit.ly/3iGhJwg*

TOTAL RETURN SWAPS: PROS AND CONS

One of the three unfunded ways that LDIs can gain exposure to gilts in order to hedge interest rate risk – alongside interest rate swaps and gilt repo – is with total return swaps.

A total return swap typically sees a pension fund or life insurer agree to exchange a floating rate cashflow, such as Sonia plus or minus a spread, in return for the total return of a gilt. Just like owning the physical gilt, the LDI fund will experience changes in the payments it receives based on the relative value of the gilt.

One of the benefits for LDIs using total return swaps over gilt repo is the fact that the tenor for total return swaps goes up to five years, while gilt repo typically only

goes up to one year. The longer maturity of the swaps helps LDIs reduce their roll risk when hedging.

However, total return swaps are not as efficient as gilt repo for netting. Total return swaps can only facilitate balance sheet netting when the same bond or underlying is involved in a transaction in the opposite direction. For gilt repo, netting can occur so long as the trade in the opposite direction involves the same counterparty – regardless of what the underlying is.

The netting benefits give a further incentive for LDI funds to prefer gilt repo as their hedging instrument.

Optimisation firms prepare for SA-CCR boom

Flush with new cash, vendors ready their rebalancing services ahead of risk-sensitive leverage framework. By Helen Bartholomew

The once monopolistic market for portfolio optimisation is entering a fresh era of competition and investment, as a new leverage regime nudges dealers to adopt next-gen rebalancing services in place of traditional rates compression.

In January, Quantile Technologies – one of the earliest rivals to first-mover TriOptima in rates compression – secured a $51 million investment from US private equity firm, Spectrum Equity. The same month, IHS Markit pumped $113 million into a new joint venture with CME, uniting trade processing facility MarkitServ with the Chicago exchange's post-trade optimisation services including TriOptima.

Large banks are also eyeing lucrative growth opportunities. In October, Citi, JP Morgan and State Street completed a strategic investment of $11 million in Capitolis, a three-year-old fintech that operates a peer-to-peer model for financial resource optimisation.

Need to know

- Optimisation providers are the target of new investment, with Quantile securing a $51m cash injection and CME and IHS Markit financing a joint venture to house TriOptima. Capitolis has also received a multi-million dollar investment from three dealers.
- Tech vendors are betting on a boost in demand for their rebalancing services due to changes in the leverage framework under the standardised approach to counterparty credit risk, or SA-CCR.
- This new risk-based calculation is set to lessen banks' focus on gross notional reduction via compression, which was critical under the outgoing current exposure method.
- The regime is also likely to shift banks' attention from lowering exposure of interest rate swaps to optimising FX portfolios.
- Tools designed for IM optimisation are being redeployed for SA-CCR-focused FX rebalancing.

Naturally, tech vendors and their investors are bullish about the prospects for portfolio rebalancing services.

"Optimisation in general is a good business model, where you are the trusted third party in the middle creating value for customers," says Michael Farrell, a managing director at Spectrum Equity, who has taken a seat on Quantile's board. "As regulations change there will be new opportunities." Spectrum has sounded out other optimisation providers for potential investment, Farrell says.

Behind the latest wave of corporate activity is a sea-change in the way banks must calculate their leverage exposure under the standardised approach to counterparty credit risk, or SA-CCR. Due to be phased in for US and European banks in the coming months, the risk-sensitive framework replaces the notional-based current exposure method (CEM) for leverage ratio and risk-weighted asset (RWA) calculations.

In broad terms, SA-CCR makes more allowances for well-hedged portfolios, while penalising directional risk. The new rules are expected to have a varying effect on large banks' businesses. Some desks will benefit from lower RWAs and risk capital, others will not. Working out the overall capital impact across an individual bank is a tricky task, let alone trying to optimise portfolios to mitigate the effect of the new regime.

Here, tech vendors are hoping to provide an answer. Their services roll up a bank's exposure across a particular asset class and suggest new, offsetting trades that can reduce risk under the new SA-CCR framework. Lower risk means lower capital.

"SA-CCR is a good opportunity for the market to align capital, funding and risk metrics, which are starting to come together with common methodologies," says Andrew Williams, chief executive and co-founder of Quantile.

Capital measures were historically calculated on a notional basis while credit valuation adjustments and other counterparty measures were calculated on a risk basis. "With SA-CCR, that alignment of incentives pushes things in the right direction, which is active risk management," Williams adds.

Vendors of all sizes are taking a punt that portfolio optimisation will become a prerequisite for dealers and, potentially, buy-side firms too.

"There's a lot of research going into SA-CCR. All the big consulting firms, technology companies, calculation companies, the banks and funds are investing. It will be a major change to bank capital, derivatives management, risk management and funding," says David Bachelier, managing director of Capitalab, the BGC-owned optimisation provider.

It's not only SA-CCR driving opportunities, according to Gil Mandelzis, founder and chief executive of Capitolis. Regulatory changes over the last decade have not yet been fully digested, he says. "When you look at the future of markets and

take a long view of optimisation in its various forms, we're still at day zero."

Divergent regulatory timelines around the world have created different binding constraints for individual institutions, creating pockets of inefficiency. Proponents of optimisation believe the technique can help flatten out these wrinkles.

"Some banks have lent too much, others have too many derivatives, while some have too much correlation exposure. There's no levelling system for firms to buy what they're short of and get rid of stuff that's constraining them," says a securities services head at a large bank.

The head believes that, in the future, execution will be decoupled from capital optimisation and risk management. In other words, a dealer will be able to trade alternative products and transform the risk into a different format via post-trade optimisation.

For example, a bank may wish to trade an over-the-counter swap but finds a cheaper listed version of the swap. The bank trades the listed version, then transforms the risk back into OTC format.

SA-CCR makes this decoupling all the more relevant, says Quantile's Williams.

"Risk builds up in multiple locations, which is inefficient from a capital and margin perspective," he says. "Assuming dealers continue to trade in all of these markets, it requires a post-trade service to be able to clean that up and do the rebalancing in a highly automated and efficient way."

Gross to net

SA-CCR is already effective in jurisdictions including Australia, Canada and parts of the Middle East. US and UK banks must adopt the new regime for their leverage and RWA calculations by January 2022. The changes will be implemented across the European Union in June 2021 as part of the second capital requirements regulation, or CRR II.

Bank of America became the first global systemically important bank (G-Sib) to voluntarily switch to SA-CCR in June 2020, a move that cut leverage exposure by $66 billion and reduced RWAs by $15 billion. Yet there's reluctance by others to follow suit as savings may not be universal.

Some participants say RWAs will increase for many firms, largely due to Basel III's output floor, which caps capital savings delivered by internal models. The capital output produced by internal models must be no lower than 72.5% of the output from the standardised approaches, once the rules are fully phased in.

The problem is exacerbated for US banks because of the so-called Collins floor, which forces banks to apply the higher of the two capital outputs from internal models and regulator-set approaches.

"At the moment some banks are leverage-constrained, some are gross notional-constrained and some are RWA-constrained. Once SA-CCR is live for leverage exposure and in-scope for RWA calculations via the output floor, the impact of this new regulation is only going to increase," says Bachelier.
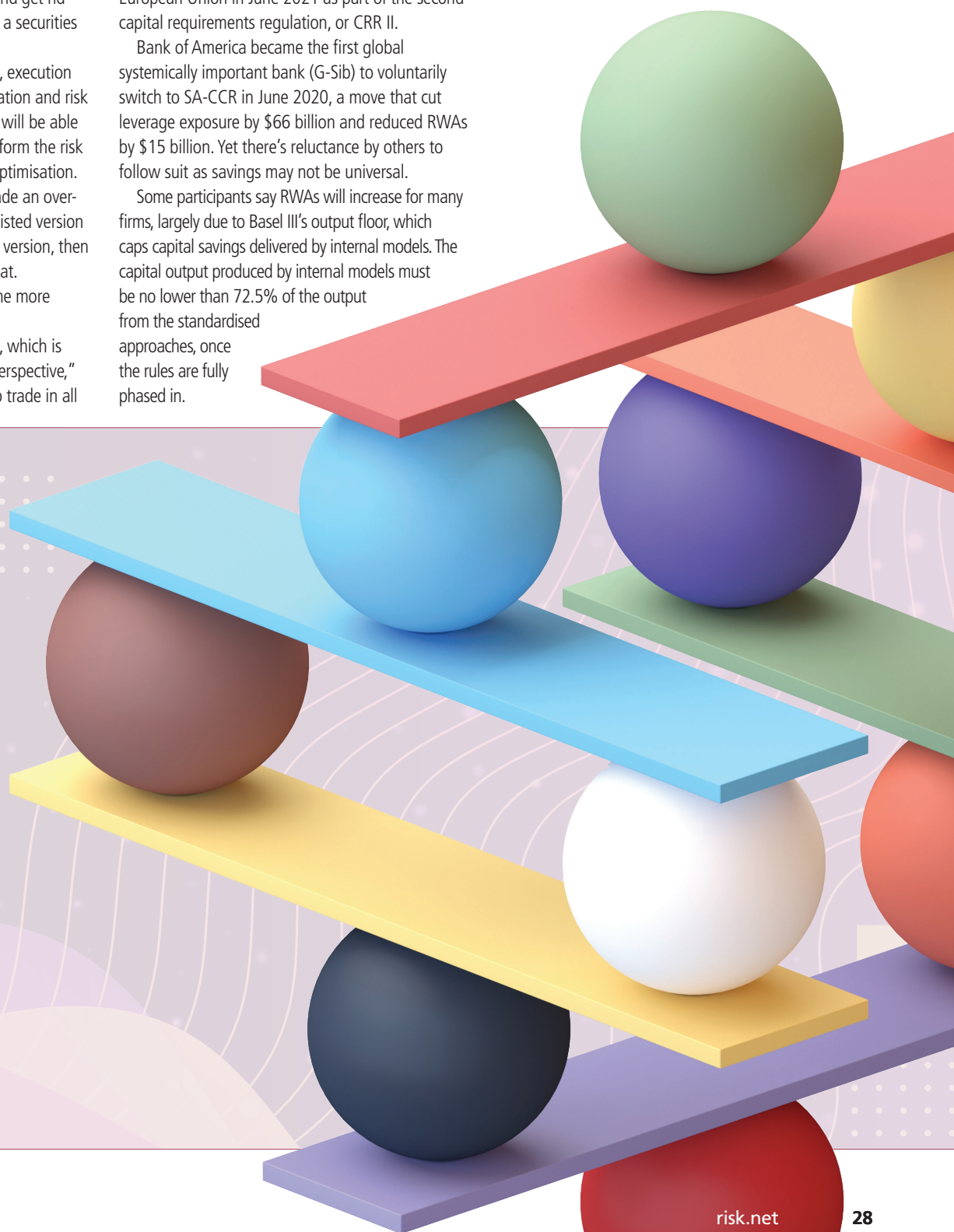
By taking into account netting across portfolios, SA-CCR switches the focus from gross notional to net notional. Vendors argue this will raise the profile of risk rebalancing services, which redistribute trades among counterparties.

SA-CCR is also likely to shift the focus on asset classes from notional-heavy interest rate swaps to other instruments such as physically delivered foreign exchange.

"What was a very expensive business to run – interest rate swaps with massive notionals – is now less expensive in some cases and the cost may grow in FX, which is the first target for many banks to look at. It's a big change because for the last 15 years people have been compressing swaps, but as swaps clear, they're going to be less expensive," says Bachelier.

Swaps compression, which has eliminated $2 quadrillion of legacy exposures in the last 15 years, will continue as a critical activity for many large dealers since gross notional remains the primary metric for calculating G-Sib scores.

Dual motivation

Existing IM rebalancing tools are the first port of call for most SA-CCR optimisation efforts. These must be updated with new algorithms and an expanded product set. For example, physically settled FX and the principal on cross-currency swaps are exempt from regulatory IM, while legacy trades remain out of scope. In contrast, SA-CCR applies to all trades.

Since October, TriOptima has offered combined IM and SA-CCR optimisation in FX cycles on its four-year-old triBalance platform. Combining these two objectives is important as IM optimisation typically results in new trades, which themselves are subject to SA-CCR.

"It's a bit like whack-a-mole in that you optimise on one thing and something else pops up somewhere else. So you've got to take everything into account all the time, which is part of the complexity," says Phil Junod, head of triReduce and triBalance.

Capitalab has also added SA-CCR-based outcomes to its FX compression service, for which it recently partnered with settlement provider CLS.

FX-focused optimisation vendor LMRKTS completed its first cycle devised for the new framework in June 2020, enabling clients in both SA-CCR and CEM regimes to optimise simultaneously.

Guy Rowcliffe, global head of optimisation services at CME, agrees that optimising for CEM and SA-CCR within a multilateral pool is the most efficient approach. TriBalance FX optimises for gross notional, net notional or SA-CCR RWA in a single cycle.

"A client can change its objectives over time," he says. "A systemically important bank might have a different objective in the first three quarters of the year and a gross notional objective in the last quarter, so it's not even static within an individual client."

Capitolis plans to launch its first cycle aimed at the new regime in the "near-term", but is yet to decide if combining CEM and SA-CCR clients is the best approach.

"You can do that, but you're probably not going to get to the maximum possible optimisation if the two sides are different. We'll have to see if you need to do two or one that optimises for both. There's going to be a lot of experimentation," says Mandelzis.

The service is not necessarily limited to dealers. Some see scope for buy-side participation in optimisation activities, potentially opening up a new customer base. Client businesses tend to be more directional than notional-heavy interdealer activities, meaning they could be more capital intensive under SA-CCR. It's a pinch buy-side firms could feel indirectly through higher costs.

"We'd expect the prime brokerage books facing buy-side clients to have a greater degree of directionality than the interdealer books. As a result, there's a strong likelihood buy-side clients who see their costs go up dramatically might think it time to consider joining these types of optimisations," says Hilary Park, chief executive of LMRKTS.

Buy-side interest in optimisation has been bubbling under the surface since the largest hedge funds became subject to non-cleared margin rules. IM optimisation tools, which redistribute exposures between counterparties to reduce margin under the industry's standard initial margin model (Simm), form the foundation of SA-CCR-focused services and could act as a gateway for buy-side participation, Park adds.

Staffing up

In anticipation of more demand for its services, Quantile is planning to double its 60-strong workforce in "a short space of time". The $51 million investment will accelerate product development, starting with SA-CCR focused products, which launch this year. Projects for 2022 include funding optimisation services, which aim to reduce volatility in variation margin, as well as settlement and market risk optimisation.

CME's optimisation joint venture with IHS Markit is due to launch in the second half of the year, pending regulatory approval. Executives claim the tie-up will provide greater efficiency in existing services and enable the firm to expand asset class coverage.

Capitolis grew its workforce from 55 to 90 in 2020 and expects that number to double again by the end of this year. Primarily a show of support from its largest Wall Street clients, the capital injection takes total investment in the firm to more than $80 million since its 2017 launch.

In contrast with other providers, Capitolis focuses solely on bilateral relationships. The firm has optimised more than $8 trillion of exposures across 50 clients via a range of services including novation and credit switching, which allows FX prime brokers to access credit from a broader universe of bank and non-bank firms.

It's part of a wider plan to bring the peer-to-peer model to Wall Street, according to Mandelzis. "When we look at the financial institutions within global capital markets, from a balance sheet perspective, we see a massively suboptimised industry and we expect that one day, everybody is going to optimise everything with everybody else, all the time." ∎

Previously published on Risk.net

ALL ABOUT THE DATA

Before banks embark on capital-reducing trading strategies, some say ample savings can be made with robust data management practices. CEM, part of the outgoing regime, requires rudimentary data on asset class and notional. Under SA-CCR, exposure-at-default (EAD) calculations require much more granular information. Technology vendor Murex includes more than 150 fields in its SA-CCR calculator, including trade details, collateral, hedging sets and counterparty information.

"If you're doing SA-CCR right, that goes a long way to reducing the EAD on its own. For example if you ignore the amortisation schedule this will result in unnecessarily large add-ons," says Brendan Sheehan, consultant at Murex.

In a real-life instance, the vendor helped a Middle East bank client – already subject to the new framework – to reduce RWAs by around $1.8 billion, resulting in a capital release of more than $250 million.

Part of the service involves running "what-if" reports, which allocate netting set level EAD data back to the trade level. These calculations help to determine the overall capital requirement for a specific trade before it is booked.

"In this regard, trade-level EAD reports are really useful for clients as it acts as a proxy for the cost of capital," says Sheehan.

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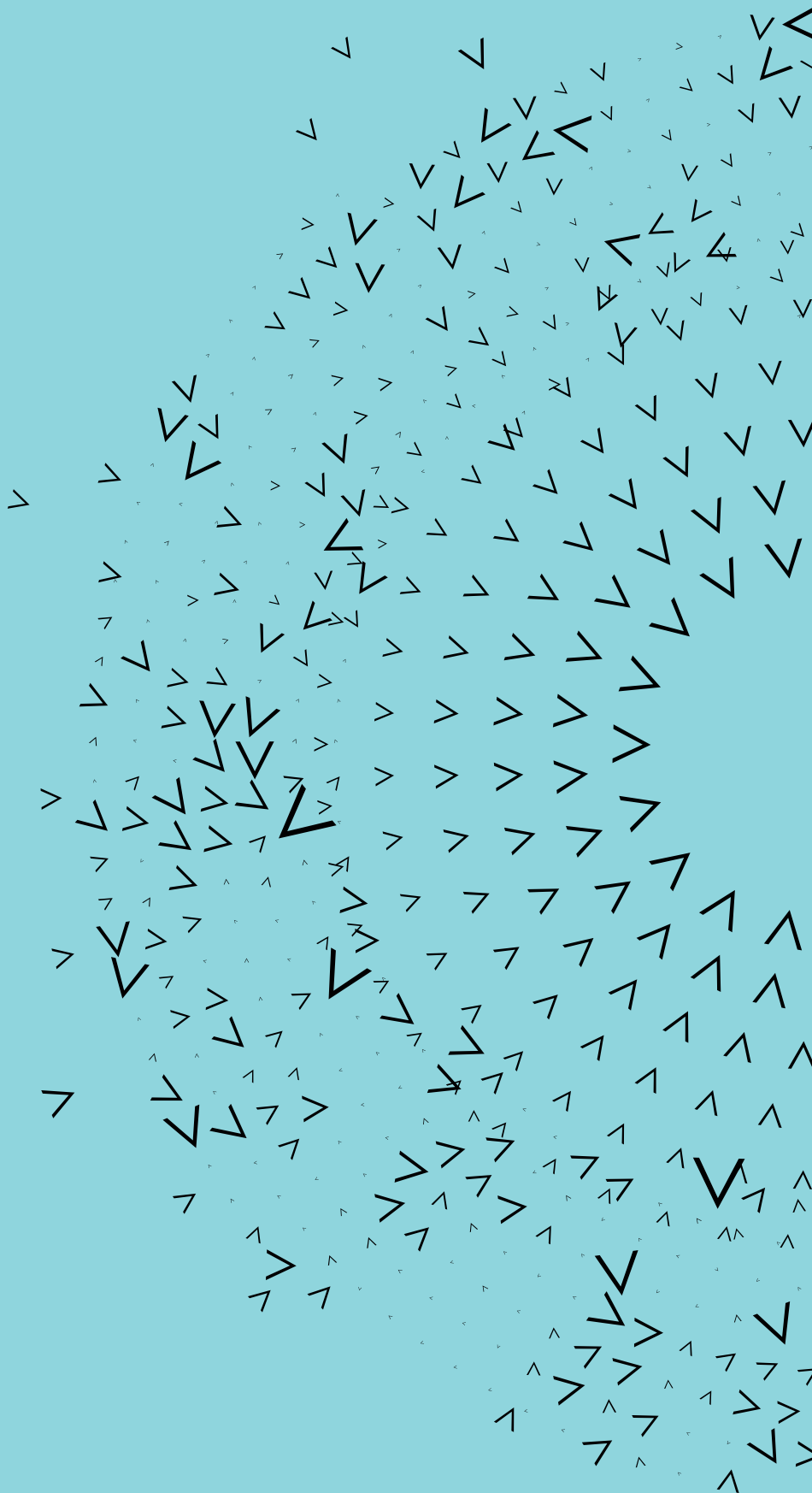
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