



WHITE PAPER

Exposure Monitoring in a Fully Margined World

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It is widely accepted that the introduction of bilateral margining requirements for non-cleared over-the-counter (OTC) derivatives will lead to a substantial reduction in counterparty risk.

In a perfectly margined world, variation margin (VM) and initial margin (IM) should cover both current and potential future exposure with a high degree of confidence. In this case, under certain provisos, one may argue that exposure is reduced to zero.

The prospect of eliminating counterparty exposure through margining raises important questions for credit risk policy makers.

Is counterparty risk truly eliminated?

What other types of risk does margining give rise to?

What sort of limits and controls should be placed on margined trading activities?

Is A Post-Margin Reform World Free Of Counterparty Risk?

At the outset, it should be noted that not all products and not all counterparties are subject to the Margin Reform rules, hence an initial observation is that counterparty risk is not going to disappear from financial markets. Banks will still need to be able to measure and control counterparty exposures in the traditional manner on a significant portion of their derivatives portfolio, be it on exempt counterparties (e.g., corporate clients, smaller financial institutions, etc.), exempt products (e.g., physically settled FX), and even on CCP exposures (because initial margining is unilaterally in favour of the CCP), etc. Moreover, legacy trades in existing netting sets are not necessarily migrated to new netting sets post-margin reform, in which case the transfer of credit risk into margined agreements could take years or decades to play out.

For a fully margined counterparty portfolio, theoretically, if initial margins, potential future exposure and collateral values are calculated using the same confidence level and the same time horizon (e.g., a 10-day VaR), then net exposure should indeed always be zero. However, there are some important exceptions to this premise:

- The presence of trade cash flows payable by the bank will generate spikes in the collateralised exposure profile¹, because of the time gap between the trade cash flows (which we assume are paid promptly) and the margin payments returned to the bank (which may take longer). As the bank makes a trade payment, the market value of the transaction increases, triggering a call for additional variation margin. However, that call will only be made on the next day, and it may take a couple of days for the margin payment to be received. In some cases, such as coupon payments, the amounts are small but frequent; with terminal payments on cross-currency swaps or options, the figures can be huge. The problem here is two-fold:
 - Initial margin methodologies, being a type of VaR, do not consider trade cash flows, or “spikes,” within the risk horizon, i.e., during the Margin Period of Risk (MPOR).
 - The operational process of calling for VM does not allow for the simultaneous settlement of trade cashflows and margin payments within a single day. The provisions of CSA agreements would need to be changed so that a party would be allowed to net settle/offset any trade cash flows against the anticipated margin call resulting from that trade flow.

¹ This topic will be the subject of a separate FIS whitepaper.

- Initial margins and collateral haircuts are *contractual* requirements, which may in turn be dictated by regulations such as the Margin Reform rules. Any shortfall or disconnect between these and internal risk measurement policies will expose the bank to residual counterparty exposure. Here are some examples:
 - ISDA's Standardised Initial Margin Model (SIMM) is a simplistic and by no means perfectly accurate metric; there could be cases where the SIMM understates the IM requirement compared to what a 10-day VaR would calculate². The 10-day VaR is a more accurate reflection of the future exposure and is closer to the PFE methodology.
 - The Margin Reform rules prescribe that no FX haircut needs to be applied to cash variation margin collateral. However, a prudent exposure measurement policy may dictate that such haircuts are necessary, or that a PFE engine should simulate the FX collateral position, opening up additional exposure.
 - The (10-day) MPOR assumption may not be viewed as sufficiently conservative by a prudent counterparty risk manager, and in fact capital regulations demand a higher MPOR in certain situations.
- The bilateral initial margin rules specifically exclude some deal types from being used in the calculation of the margin requirement, for example physically settled FX, FX settlement of cross-currency swaps and equity options are all currently excluded. This means the margin will be calculated on a smaller deal set to the set which is at risk, usually (but not necessarily) resulting in a lower margin being posted than required to eliminate the exposure.
- The setting of initial margins does not take into account the possible correlations between a counterparty's probability of default, the exposure values, and the collateral values. Any degree of wrong-way-risk (i.e., negative correlation between exposure and collateral values, or positive correlation between default probability and exposure), which often goes undetected in traditional exposure measures, would exacerbate residual counterparty risk. A best practice PFE simulation should in fact reflect the additional exposure resulting from wrong-way risk.

² There is a requirement to backtest SIMM versus VaR, which is where any shortcomings of the margining methodology should be captured.



What Other Risks Arise When Trading On A Fully Margined Basis?

Collateralisation may well reduce or eliminate counterparty credit risk, but it does introduce other risks that the bank needs to be aware of:

- Liquidity Risk:** The new Margin Reform rules may place a serious strain on liquidity at financial institutions. This could be exacerbated in the event of any market disruption, when a bank may face cumulative large initial margin calls from multiple counterparties and CCPs simultaneously. A financial institution's inability to source the necessary liquid assets to honour such margin calls could cause its own demise.
- Systemic Risk:** The above-mentioned liquidity risk may not stop at a single counterparty. It may have a knock-on effect to other market participants, including CCPs. Because of the international nature of the CCP clearing members, it is possible that a single counterparty default would have impact on multiple CCPs simultaneously. The creditworthiness of a CCP is intrinsically linked to that of its clearing members. And because clearing members' creditworthiness is highly correlated, the default of a CM could cascade into the default of other CMs and eventually lead to the demise of the CCP – or even multiple CCPs.
- Operational Risk:** The operational process of monitoring margined exposures and (re)calling margin in a timely manner is not without risks. If those processes fail for whatever reason (system failure, human error, etc.) the bank could incur significant unforeseen counterparty exposures that may result in losses upon default of the counterparty.
- Legal Risk:** Collateral agreements and related documentation (e.g., netting agreements, custody agreements, etc.) may be open to legal challenge. Like the enforceability of netting, collateral perfection may not be as water-tight as the bank may wish to believe. Custody arrangements are meant to ensure that collateral is bankruptcy-remote from the default of either party (or even the custodian), but this may depend on the legal strength of the custody agreements (and possibly the integrity of the custodian, which could be viewed as another type of risk). Banks routinely obtain legal opinions on the enforceability of netting and title to collateral, but these legal opinions do not provide a 100 percent confidence in all jurisdictions. Further, nothing around margin reform has yet been tested in court.



- **Market Risk/Residual Counterparty Risk:** Here we are referring to the possible deterioration of the market value of collateral held. The market will cater to this risk by the application of contractual haircuts that should normally be calculated using the same conservative method as the measurement of exposure and margins (e.g., 10-day 99 percent VaR). Ideally, this risk should be co-simulated as part of the potential future exposure (PFE³). However, any inadequacy of contractual haircuts could expose the bank to residual counterparty risk. Also, as mentioned above, any degree of wrong-way risk (i.e., negative correlation between exposure and collateral values) would exacerbate that residual counterparty risk further.
- **Close-out Period Risk:** The traditional 10-day MPOR may well be tested in stressed market conditions. Hence, it is quite possible that the initial margin held to cover “close-out period” exposure may turn out to be inadequate in the next financial crisis.

Apart from the above *risks*, there is also an undeniable cost resulting from margining, namely the cost of funding the necessary collateral assets.

What Controls Should Be Put In Place To Limit Margin Trading?

Due to the above risks, it is clear that counterparty risk managers will not want to allow unlimited volumes of margin trading to be conducted, even if the exposure recorded under traditional metrics is always zero or close to zero.

One, therefore, needs to think of new ways of measuring margined exposures against limits.

1. **Improve the PFE calculation** to expose some of the hidden risks embedded in margined trading.
 - a. Increase the MPOR used in exposure and collateral simulation, to a time-horizon that should realistically be experienced in times of stress.
 - b. Ensure that the measurement of collateralised exposures includes the “settlement spikes” occurring between trade flows and margin payments. This is real exposure that needs to be controlled.
 - c. Take a rigorous and conservative approach to wrong-way risk between collateral, underlying portfolio and counterparty creditworthiness.
 - d. For more advanced simulation: introduce a stochastic element to the effectiveness of collateral, reflecting the probability that:

- i. Netting may not be enforceable
- ii. Title to collateral may not be established
- iii. Operational failures may occur

This could be a simple weighting of the collateral mitigation effect (i.e., the difference between collateralised and non-collateralised exposure), or a combination of “adverse event” and weight, where “weight” would represent the probability of that adverse event occurring, or, conversely, the level of confidence one has in the effectiveness of collateral in light of possible adverse events. The latter approach could be modelled as a type of recovery rate for collateral.

As we are now considering unexpected/exceptional events, exposure measurement could be changed to being an Expected Shortfall measure, which captures such tail events. Incidentally, this would bring the methodology in line with the newly proposed market risk regulatory framework (Fundamental Review of the Trading Book). That said, it may be that the effects we are talking about here are so rare that they would not even occur regularly in a Monte Carlo simulation of five to ten thousand scenarios. This would mean the Expected Shortfall would be quite “noisy”, capturing these spikes sometimes only. This reinforces the need for stress testing – see point 3 below.

2. **Model liquidity** risk incurred by the bank (possibly the largest risk resulting from the margin reform and central clearing initiatives). To do this, there needs to be a firm-wide or even group-wide, scenario consistent calculation of forward cashflow obligations, including from deals and initial margins at a minimum. The funding and liquidity cost of initial margins (including potential future initial margins) should be captured as part of the XVA (MVA = Margin Value Adjustment) metrics that are charged to risk takers at deal inception.
3. **Stress Testing:**

Stress testing forms a vital piece of this puzzle.

 - a. Take the “unmargined” exposure as the control metric, i.e., ignore initial margin altogether in the exposure calculation.
 - b. Implement a battery of stress tests to capture legal, systemic and operational risks where stresses include scenarios for systemic events, limited legal enforceability, operational errors, etc.

³ The modelling of simulated PFE under margin will be the subject of a separate paper.

4. Use capital metrics:

Use a standardised measure like SA-CCR, which even with over-collateralisation is non-negligible (due to the “Multiplier Floor” of 5 percent).

The standardised regulatory capital EAD calculation, including under the Leverage Ratio, will not permit over-collateralised exposures to fall to zero. Hence, a strict application of a capital valuation adjustment (KVA), or hard limits based on RWA or capital consumption, will naturally constrain volumes of margin trading.

This table summarises the risks and how they can be managed:

<i>Risk</i>	<i>Liquidity Simulation</i>	<i>Monte Carlo Simulation PFE</i>	<i>Stress Tests & Unmargined Exposure</i>	<i>Capital Metrics</i>
<i>Liquidity Risk</i>	Simulation of liquidity outcomes – either stress tests or Monte Carlo simulation	-	-	
<i>Systemic Risk</i>		Advanced – use expected shortfall	Yes	
<i>Operational Risk</i>		Advanced – use expected shortfall	Yes	
<i>Legal Risk</i>		Advanced – use expected shortfall	Yes	
<i>Market Risk/ Residual CR</i>		Yes, ensuring appropriate correlations		Yes
<i>Close-out Period Risk</i>		Yes, extend MPOR	Yes	Yes

Conclusion

In this paper, we have shown that the bilateral margining of non-cleared OTC derivatives does not necessarily eliminate counterparty risk. It also introduces other types of risk, such as liquidity, operational and legal risk. It is therefore important that banks' risk departments continue to monitor and control the volumes of margined trading activities under meaningful limits. Even if there would be no additional risk, there is a serious cost in funding the additional collateral requirements. To understand the trade-offs of reducing counterparty risk versus increasing liquidity risk, credit risk managers will need to work more closely with groups outside of the credit risk silo. To this effect, traditional exposure measurement methodologies may well need to be re-thought in light of the unique characteristics of margin trading.

The good news is that a best practice risk management system should have all the necessary tools to accurately measure and control margined exposures, even under a full margining regime. These tools should include:

- A PFE calculation engine that can:
 - Quantify the spikes in collateralised exposure profiles
 - Calculate the wrong-way risk embedded in collateralised exposures
 - Compute Expected Shortfall
 - Apply a wide array of stress tests
 - Calculate internal and regulatory exposures in parallel.
- Internal measurement policies that are not necessarily wedded to the regulatory edicts. Internal methods **can** be more conservative than what regulators prescribe. It is indeed crucial that banks have a counterparty risk system that can calculate regulatory and internal exposures independently and in parallel.
- Inception pricing (XVA) metrics and risk measures that account for all the costs and risks (credit, capital, liquidity and funding) involved in margined trading.



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