Title: Bank of Canada staff propose socializing SHF's non default losses ■
Author: disoriented_llama
Created 2022-11-05 13:23:27 UTC
Permalink: /r/TheGloryHodl/comments/ymttgx/bank_of_canada_staff_propose_socializing_shfs_non/
Url: https://www.reddit.com/gallery/ym8mg0

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management failure at the FMI given the channels of influence available to them. Making participants liable for these losses helps to ensure active engagement in the board and relevant committees of the FMI. Notwithstanding the above, the amount that is allocated could be capped to provide some certainty and transparency to participants.

2. Economic impact

The PFMI explicitly requires FMIs to support financial stability and the public interest (principle 2, key consideration 1). Therefore, NDL allocation schemes should consider the economic impact of distributing losses to FMI participants not involved in the NDL and how that shock could spread through the financial system. Research on how default losses are allocated could help determine the size of losses that can be borne by individual banks without upsetting financial stability. FMIs can leverage their experience in stress testing in combination with this research (Raykov 2022; Huang, Menkveld and Yu 2019). The fact that a loss originated from a non-default source should have no direct bearing on the ability of the remaining FMI participants to absorb the loss. Therefore, this literature could be used to gauge the effect of NDL allocation on financial stability.

3. Incentives

The way FMIs handle default losses suggests that sometimes large losses may need to be shared by members that were not involved. The same could be true of non-default losses. Loss-sharing, in turn, could lead to safe participants effectively subsidizing the risky participant(s) (or FMI) that is the source of the NDL risk. This could create incentives for safe members to take on more risk. For example, members may underinvest in the IT security of their connection with the FMI, or loosen legal and governance processes more generally. However, both these risks are partly mitigated by the fact that IT security and legal processes are areas where it is difficult to underinvest in specific components without undermining the whole. Looser security in one part of a bank's IT system could make other segments equally vulnerable, and relaxed legal processes could create risk in all aspects of a participant's business, not only in its dealings with an FMI. Therefore, the FMI should carefully consider the balance between risk incentives and risk mitigants when implementing an NDL allocation scheme.

4. Regulatory compliance

Plans to allocate losses should comply with any regulations and follow existing guidance, such as the PFMI or CPMI-IOSCO's guidance on FMI resilience and recovery. FMIs should develop in advance those plans, processes and escalation procedures to ensure the timely and efficient allocation of non-default losses. FMIs should also integrate these plans into their existing risk management and business continuity plans. FMIs could draw on tools they have developed and tested for allocating default losses to help ensure their processes for allocating NDLs are feasible.

Due to the importance of process, we discuss it extensively in the next section.

Introduction

The topic of non-default losses in financial market infrastructures (FMIs) has gained international attention over the past several years due to the potential impact of these losses on the financial industry and the lack of a common approach on how to address them. FMIs should have plans to address these losses because their participants rely heavily on the services provided by FMIs and, in some cases, are required to use these services. For instance, many jurisdictions, including Canada, require participants in over-the-counter derivatives markets to centrally clear standardized derivatives. Each jurisdiction typically has a limited number of central counterparties (CCPs). This lack of substitutes combined with the important role FMIs play in the financial system make some FMIs systemically important and justify appropriate regulation to manage risks and to promote fair and open access to their critical services.

Unlike banks, FMIs have considerably smaller balance sheets with limited capital available to absorb non-default losses. The different ownership models for FMIs (e.g., for-profit or user-owned) together with regulations that sometimes limit the fees FMIs can charge increase the need for a coherent approach to address non-default losses. Policy-makers, FMIs and FMI participants in this environment are essentially considering the following key question: who should bear non-default losses?

To help answer this question, we propose four considerations for allocating these losses: fairness, economic impact, incentives and regulatory compliance.

This note is not intended as guidance or policy, but rather presents an alternative view to the existing literature.

Working definition

We define a non-default loss (NDL) as any loss that is not generated by the default of an FMI participant. The literature[1] generally agrees on four categories of non-default losses:

- **Investment losses** include the losses on an FMI's own investments or the investment of participant assets that are held by the FMI (e.g., initial margin or default fund assets).
- **Operational or business losses** include losses resulting from human error, deliberate acts of fraud, technological failure or cyber attacks. Business losses may also include those arising from the failure to implement an important project or strategy.

[1] For examples, see Lewis and McPartland (2017); International Swaps and Derivatives Association (2020); World Federation of Exchanges (2020); Financial Stability Board (2020a)

approaches particularly salient. No specific loss allocation scheme can be prescribed without knowing more about: (i) the type of non-default risk that has materialized (e.g., investment, operational or legal); (ii) who (mis)managed the risk that materialized; (iii) how a given loss allocation might impact the FMI, its participants and overall financial stability following a particular event; and (iv) what incentives this loss allocation creates. This information would allow the decision maker to more optimally allocate the loss. We draw on existing regulatory literature to offer a set of specific considerations that could guide the loss-allocation process.

Principle 2, key consideration 1 of the *Principles for Financial Market Infrastructures* (PFMI) states that, "An FMI should have objectives that place a high priority on the safety and efficiency of the FMI and explicitly support financial stability and other relevant public interest considerations" (CPMI-IOSCO 2012). That means one important consideration should be how allocating losses affects financial stability through the impact on members and the FMI itself. Further, principle 3, key consideration 2 states that "an FMI should provide incentives to participants [. . .] to manage and contain the risks they pose to the FMI." Thus, these incentives should also be considered when setting a process to allocate losses. Moreover, key element 3.3.6 encourages "loss-sharing arrangements proportionate to the exposures brought to the FMI" to contain moral hazard. So the fairness of the allocation should be another important consideration. Finally, FMIs should consider whether their processes to allocate NDLs are operationally and legally feasible, and whether they comply with existing regulation (otherwise, relevant authorities will not approve them). These considerations need to be general enough to be implemented across the variety of FMI business models and legal structures, while also being practical. We believe these four considerations—fairness, economic impact, incentives and regulatory compliance—can guide the development of NDL allocation frameworks. We elaborate on each of these considerations below.

1. Fairness

The literature—though limited—tends to assert that FMIs and their participants should assume financial responsibility for non-default losses according to how much each party contributed to the loss. However, disentangling the responsibility of participants and that of the FMI operator for risk management issues can be difficult. For example, the literature often argues that a CCP should fully cover a loss from a business or operational failure: "A CCP's owners choose and supervise the managers who run the CCP. The managers make decisions that either lead to or prevent business and operational failures." (Lewis and McPartland 2017) This approach seems fair on the surface, but oversimplifies FMI governance arrangements. Participants may influence FMI decisions through seats on the FMI's board of directors, representatives on risk committees and by making representations to FMI management. As such, participants play an important role in guiding the strategic direction of an FMI and providing input into an FMI's risk management functions and material risk decisions.[7] Indeed,

[7] Key element 3.2.8 of the PFMI says, "An FMI's board has multiple roles and responsibilities [. . .] [these responsibilities] should include (a) establishing clear strategic aims for the entity; (b) ensuring effective monitoring

to place the entire fault of an NDL on FMI managers provides little incentive for participants to be actively engaged in risk issues.

Lewis and McPartland (2017) also consider a situation where a connection between a CCP and a participant leads to the CCP suffering a cyber attack or other operational failure. In such a case, they argue that the CCP and the guilty party should share the loss. We agree that this should be the case where possible, but note that it is not always possible to identify the guilty party. In such cases, prematurely singling out the FMI or a participant as being responsible for any losses would be unfair.

Finally, while the FMI's decisions may have contributed to the loss, it could have made those decisions for the benefit of participants. For example, providing cross-border services creates operational, legal and investment risks. While the FMI is ultimately responsible for managing these risks, participants also benefit from the service. Participants pay fees for this benefit, but these fees in total are unlikely to be enough to cover a large NDL. Therefore, it would not be fair for the FMI to bear all of such an NDL.

The FMI and its participants can negotiate how much of the loss each assumes, recognizing that not all participants have equal capacity to absorb losses or equal representation in front of FMI executives (e.g., not all participants are on the board of directors). This issue illustrates again the need for procedural fairness in allocating losses. We recommend that FMIs establish a committee for this purpose. For details, please see **Notes about process**.

With the above examples in mind, we recommend the following to help determine what constitutes a fair allocation of NDLs:

- The decision-making process to allocate losses must be transparent.
- A loss allocation scheme should consider who was responsible for managing the materialized risk and whether the losses resulted from a mismanagement of the risk. Similarly, a scheme to divide up losses should consider who benefited from the risk being taken. For example, some level of risk may be accepted to benefit the FMI, its participants or both.
- The FMI should cover some portion of an NDL, unless the loss stems from illegal activity by another entity or from a truly no-fault incident. That is because the FMI is responsible for all areas of its own business (and thus contributes to the risks and benefits from revenues). However, the FMI's portion can be smaller than that of a participant who has a greater ability to absorb the loss and who derives greater benefit from the FMI's services.
- Because the FMI's risk management decisions have system-wide implications, it is important that participants play a role in ensuring the FMI manages risks effectively. To promote fairness and provide the right incentives, participants should not be automatically precluded from contributing to losses resulting from a strategic or risk

of senior management [. . .] (d) establishing and overseeing the risk-management function and material risk decisions [. . .] (f) ensuring compliance with supervisory and oversight requirements; [. . .] and (h) providing accountability to the owners, participants, and other stakeholders."

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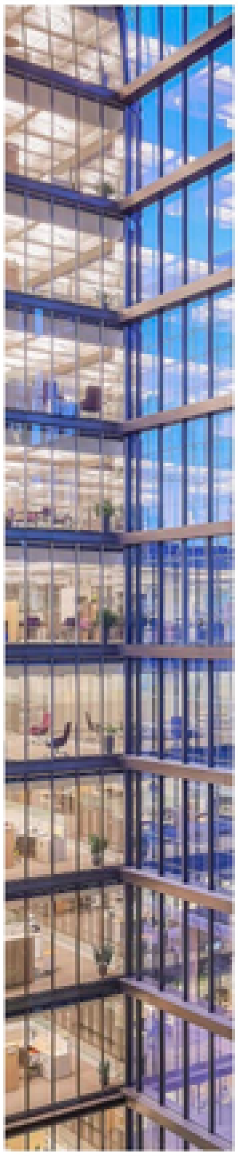
Staff Analytical Note/Note analytique du personnel—2022-16

Last updated: November 3, 2022



Considerations for the allocation of non-default losses by financial market infrastructures

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DOI: https://doi.org/10.34989/san-2022-16 | **ISSN** 2369-9639

costlier court challenges. Our main point is that proper incentives should exist to balance expediency and due process.

Of course, a sound governance structure, appropriate representation and voting rules are key to ensuring the credibility of an NDR committee given the kinds of decisions it could make. To ensure the NDR committee functions as intended, the FMI and its participants must ensure the operational capability to convene it in a timely fashion. The operations of the committee should be tested regularly through simulations and table-top exercises.

Finally, we need to consider how NDL allocation relates to FMI resolution, which is carried out by a resolution authority when an FMI is no longer viable. An FMI could be placed into resolution if the resolution authority believes an NDL could cause the FMI to become non-viable. In such a case, the resolution authority would likely first exhaust the tools in the rulebook when allocating losses to avoid compensation claims.[9] We believe an NDR committee as described above could help a resolution authority coordinate with the affected parties (i.e., the FMI and its participants) to recoup the costs incurred by the authority to absorb an NDL. In cases where a resolution authority finds it impractical or undesirable to use the NDR committee, the FMI's rulebook can include a special clause ceding the committee's powers to the authority. Indeed, such a clause can provide an incentive for the FMI and its participants to allocate losses to avoid pushing the FMI into resolution.[10]

Conclusion

Non-default losses present a challenge in the contemporary FMI landscape since, unlike default losses, there are no internationally agreed-upon standards for dealing with them and individual FMIs have different practices. At the same time, the growing digitalization of the financial system has increased the potential for operational risks, especially cyber risks, to produce large non-default losses.

We contribute to the literature by offering specific options to allocate non-default losses based on fairness, safety, incentives and regulatory compliance. We also stress the importance of having feasible processes and governance around NDL allocation. We suggest that a non-default risk committee could develop an NDL allocation framework and that NDL allocation tools could evolve organically from existing tools for addressing default losses. We believe the process to allocate losses should be flexible to adapt to the different legal structures and business models of FMIs.

[9] Canadian FMI resolution authorities have broad powers under the *Payment Clearing and Settlement Act* (PCSA) to decide how to operate an FMI that is placed in resolution. These powers include, but are not limited to, taking over management of an FMI and/or replacing the management and related governance structures as needed to stabilize the FMI. Actions outside the FMI's rulebook are permitted under section 11.11 of the PCSA but may expose the resolution authority to legal claims under the principle of no creditor worse off.

[10] Resolution authorities are also responsible for providing appropriate incentives. Participants should view any resolution regime as less desirable than the status quo so they are not tempted to push all losses to the FMI and cause it to fail.

Notes about process

The process of allocating an NDL requires a balance between three competing priorities:

- sufficient flexibility to adapt the process to the type of NDL
- legal certainty about the rules of the loss-allocation process
- finality of the loss allocation

The regulatory literature on FMIs, and CPMI-IOSCO's (2017) guidance for FMI recovery plans in particular, makes it clear that loss allocation is a recovery tool for situations where pre-funded resources are no longer available. The logical suggestion is that the NDL allocation process should operate as a natural extension of an FMI's existing allocation process required for default losses, as per the CPMI-IOSCO recovery guidance.[8] FMIs manage default losses either with or without consultation with FMI members. Some FMIs, such as the London Clearing House, explicitly use member input. Addressing NDLs with a governance structure that includes members makes practical sense. Using tools like those for default losses has the benefits of being familiar to participants and complying with existing regulations, meaning their use is less likely to raise legal or other questions. However, because FMIs need more information to determine what makes for a fair NDL allocation, any decision-making body would require sufficient representation from the FMI's participants to ensure the interests of the FMI and the participants are properly aligned. A "non-default risk committee" could be established for this purpose.

The non-default risk (NDR) committee's primary tasks should be to develop a robust framework for allocating NDLs guided by the above considerations and to advise an FMI on how to manage non-default risks. These tasks would include developing NDL allocation rules that apply to each loss source and consider an FMI's legal structure and business model. If an NDL occurred, the committee would determine the source of the loss and divide up losses based on the rules in the framework. We expect that discretion will not be needed in most cases, but there should be flexibility for cases where the committee cannot immediately attribute responsibility for the loss.

Proper incentives should exist to foster agreement within the committee about how to allocate losses. If agreement cannot be achieved, the power to make a decision could shift toward a single decision maker whose ruling is binding, such as a regulatory body, a committee of different regulators or an independent, external arbitrator. The FMI could also foster agreement by offering a pre-set menu of allocation options based on the FMI's rules and differentiated by the source of loss (e.g., investment, custody, operational, legal, etc.) and its size. This menu would significantly reduce the risk of a legal challenge to the loss allocation because the committee would choose from a limited set of options that are in the FMI rulebook. Fostering incentives to encourage agreement, especially arbitration, could be challenging, yet many business settings use independent, third-party arbitration to avoid

[8] The guidance on FMI recovery is not prescriptive about which specific recovery tools an FMI should have.

- **Custodian losses** include losses resulting from failures of securities custodians or settlement banks. An FMI could face liquidity challenges, solvency challenges or both if it loses timely access to its assets.[2]
- **Legal losses** include losses resulting from legal or regulatory action against an FMI.

Who should absorb non-default losses?

Current business practices in leading FMIs do not suggest that one practice dominates for allocating a non-default loss. This could be due to several factors.

First, the sources of NDLs can be different and therefore require different treatments. For instance, while some risks are more easily quantifiable, such as risks from collateral investment, others are more difficult to quantify, such as risks from legal action or a cyber attack.[3] This difficulty in quantifying non-default risk makes it challenging to address such NDLs with pre-funded resources because those resources would need to be set to specific levels of coverage. This makes allocating losses an important part of the NDL toolbox.

Second, different ownership models could call for different allocation practices. For example, a for-profit FMI may be expected to absorb some amount of loss before allocating the residual to its participants, while a participant-owned FMI would divide the loss among the participants.

Table 1 shows the significant diversity in how different FMIs in the business of central clearing allocate certain NDLs. For example, while some major clearinghouses share investment losses among the FMI and its members, others do not.[4] Likewise, while most benchmarked FMIs agree that losses related to their day-to-day operations are principally the FMI's responsibility, some FMIs nonetheless refuse to absorb losses from custodial and currency risk. NDL allocation schemes also differ between FMIs, even within the same risk category. For instance, some FMIs include liability caps, skin in the game requirements or other features that alter both the FMI's liability and the impact on its members (CPMI-IOSCO 2017; Lewis and McPartland 2017).

[2] See Financial Stability Board (2020a).
[3] See Chande and Yanchus (2019).
[4] One such instance is Nasdaq Clearing, a major CCP in Europe that absorbs all losses stemming from its investment policy.

Table 1: Who absorbs non-default losses at major clearinghouses?
Loss allocation practices at selected Canadian and international financial market infrastructures

Type of loss	CDCC	CDS	LCH	ICE Clear	Eurex	Nasdaq
Investment	FMI	Members	FMI + members	FMI + members	FMI or FMI + members	FMI
Operational / business	FMI + members	FMI + members	FMI	FMI	FMI	FMI
Custodian	FMI + members	Members	Members	Members	FMI	FMI
Legal	FMI + members	FMI + members	FMI	FMI	FMI	FMI

Note: "FMI" includes the use of different tools by the FMI to cover the loss (e.g., prefunded resources, insurance, etc.). "Members" may indicate either an individual member incurring the non-default loss or a combination of members sharing the loss depending on the arrangement in each FMI.
Sources: Canadian Derivatives Clearing Corporation Rules; CDS Participant Rules; Lewis and McPartland (2017)

The literature on NDLs suggests that allocating them is not a trivial task. Indeed, to do so in an optimal way requires the decision maker to consider more factors than it would in the case of a default loss.[5] For an NDL, information may be needed about the party whose decisions or risk management practices caused the loss in the first place in addition to information about the type of loss (e.g., investment, operational, etc.). Information about the cause of an NDL may not be readily available at the start of the allocation process. For example, a cyber breach at an FMI could occur due to poor cyber security at the FMI itself, at an FMI participant or at a third-party service provider through which hackers gain access to the FMI's system.[6] The fairness of the loss allocation could be jeopardized if this additional information is not considered. More information about the nature and origin of the loss is indispensable before determining who should absorb it.

Proposed considerations

All of the above suggests that a one-size-fits-all loss allocation scheme, such as those used for default-related losses, may not work for non-default losses. The variety of revenue models, legal structures and operating frameworks at FMIs make having a range of

[5] See Lewis and McPartland (2017).
[6] A 2016 incident known as the Bangladesh Bank heist is a case in point. Having compromised the IT security at the central bank of Bangladesh, hackers used legitimate electronic credentials to withdraw millions from its account at the Federal Reserve Bank of New York.

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