

Executive summary

The numerous payment and settlement systems that underpin the global financial system are growing more interconnected. Tighter direct relationships between systems, stronger indirect relationships arising from the activities of large financial institutions in multiple systems, and broader commonalities, such as the use of common third-party service providers, all contribute to this trend. As a result, the settlement flows, operational processes and even risk management procedures of many systems have become more interdependent.

The development of tighter interdependencies has helped to strengthen the global payment and settlement infrastructure by reducing several sources of cost and risk. Yet, tightening interdependencies have also increased the potential for disruptions to spread quickly and widely across multiple systems and markets.

This report identifies three important challenges that, if met, would help systems, institutions and service providers adapt their risk management efforts to this increased potential for disruptions to spread quickly and widely across systems. These challenges include: (i) adopting broad risk management perspectives; (ii) having risk management controls that are commensurate with the system's, institution's or service provider's role in the global infrastructure; and (iii) implementing wide coordination among interdependent stakeholders.

The report suggests several actions that relevant systems, institutions and service providers could take to effectively address those challenges. It also suggests a number of related actions for central banks. Taking these steps would reinforce the benefits of tightening interdependencies and make the global payment and settlement infrastructure more resilient to potential disruptions. While this report focuses on the development of interdependencies within and among CPSS countries, the analysis and suggested actions in this report may also be relevant to other countries.

The characteristics of interdependencies in CPSS countries. Over the past 30 years, technological innovations, globalisation and financial sector consolidation have fostered a broad web of interconnections among a large number of payment and settlement systems, both within and across CPSS countries. These interconnections reflect efforts on the part of systems and institutions to seek new business opportunities and to reduce clearing and settlement costs. They also reflect efforts by central banks and the financial industry to promote the low-cost and safe transfer of money and financial instruments. The focus of the CPSS on reducing foreign exchange settlement risk and the work of the G30 to reduce risk in securities settlement systems, for example, have both led to tighter, more integrated settlement processes. The development of these numerous interconnections has helped to create tighter interdependencies among systems.

Systems can be interconnected in a variety of ways. In some cases, interdependencies arise from direct relationships among systems. For example, central securities depositories (CSDs) and large-value payment systems (LVPSs) may establish technical links or account relationships to facilitate efficient delivery versus payment (DVP) settlement of securities transfers. Similarly, the continuous linked settlement (CLS) system depends on the account relationships that CLS Bank has established with the central banks of CLS-eligible currencies to facilitate the funding process that supports the payment versus payment (PVP) settlement of foreign exchange trades across the books of CLS Bank.

But, systems can also be interdependent in less direct and more complicated ways. Financial institutions that have settlement activities in several systems or that provide services to several systems can create indirect relationships among those same systems. Interdependencies can also result, for example, from the dependence of a number of systems on a common messaging service provider like SWIFT, or on a common third-party service provider for their IT systems.

Some types of interdependencies are more prevalent than others. Interdependencies are particularly strong on a domestic, same-currency basis.¹ The central counterparties (CCPs), CSDs and LVPSs supporting the financial markets of a given currency are strongly interdependent in several, distinct ways. In most cases, these systems are directly connected through technical or account relationships. CCPs typically depend directly both on the LVPS and the CSD to conduct settlement and manage risk. The CSD and LVPS often are interconnected in some way to achieve DVP for securities settlements. And in many cases, an institution's use of central bank intraday credit within an LVPS can be dependent in part on their ability to deliver collateral through one or more CSDs. Furthermore, the key participants of these domestic systems overlap significantly. This overlap can increase the interdependence of domestic systems, as an institution's settlement flows in one system can have a strong influence on its ability to make transfers in other domestic systems. Finally, in a few cases, domestic systems become interdependent because of their reliance on common service providers or common risk management policies or resources.

Currently, cross-border and cross-currency interdependencies appear to be less extensive than domestic interdependencies, though some are quite significant. The arrangements used by CLS to facilitate PVP settlement constitute the most prominent set of cross-currency interdependencies.² In addition, many systems and institutions depend on SWIFT for messaging services. Yet with respect to relationships among systems arising from the activities of institutions, it appears that only a very few institutions both have significant cross-border activities and are direct participants in many payment and settlement systems. Nonetheless, further globalisation and consolidation could raise the importance of cross-border, institution-based interdependencies going forward.

Impact on the safety of the global payment and settlement infrastructure. The development of interdependencies has several, sometimes conflicting, implications for the safety of the global payment and settlement infrastructure. On the one hand, interdependencies have facilitated significant reductions in specific payment and settlement-related risks. Most importantly, direct relationships among systems play an important role in facilitating DVP and PVP processes and therefore in eliminating the risk of loss of the full value of securities or foreign exchange transactions (principal credit risk). In addition, technical relationships among systems that facilitate the standardisation, automation and integration of processes have helped to reduce operational risks. The relationships of domestic CCPs, CSDs and ancillary payment systems with the domestic LVPS to facilitate the use of central bank money also eliminate a different source of credit risk, namely the potential default of the settlement institution. Also, central banks' role as settlement institutions provides more assurance of continuity in the provision of intraday liquidity to LVPS participants, reducing the liquidity risk they otherwise face.

On the other hand, interdependencies raise the potential for disruptions to spread widely and quickly across the financial system in at least three ways. First, interdependencies can propagate disruptions sequentially from one system to another. This potential effect arises when the smooth functioning of one or more systems is conditional on that of another system. For example, in the case that a LVPS participant experiences an operational disruption or liquidity shortfall, it may be unable to transfer funds to its counterparties. As a result, other LVPS participants may have lower balances than expected. This shortage of funds could prevent these institutions from receiving incoming securities transfers in a linked CSD, causing securities fails. In this way, a disruption in the LVPS could pass to the CSD.

¹ In this report, "domestic" generally refers to a currency area, unless indicated otherwise by context.

² While other multicurrency and cross-border systems exist, including international CSDs, these other systems either do not have the same high level of activity or do not have the same cross-currency settlement mechanisms present in CLS.

This type of interdependency creates what might be called a “cross-system” risk between the CSD and the LVPS. The settlement arrangement of CLS Bank poses a similar set of risks.

Second, interdependencies can also act to spread disruptions simultaneously to many systems. This potential effect stems from many systems depending in common on other critical systems, on large financial institutions or on key service providers. From an international perspective, many systems are dependent on SWIFT. As such, a SWIFT outage could have direct and immediate implications for many systems. From a domestic perspective, many systems are critically dependent on the primary LVPS, and a disruption affecting a LVPS could impair the functioning of those other systems.

Third, in some circumstances, interdependencies may transmit disruptions beyond systems and their participants to financial markets. The functioning of markets with relatively short settlement cycles, such as the markets for uncollateralised overnight loans and repurchase agreements, might be particularly affected.

The actual impact of a given disruption will depend on many factors, and is difficult to predict. First, and most importantly, systems’ and institutions’ risk management procedures can help prevent the transmission of disruptions across systems. Second, interdependencies can sometimes be useful in mitigating the impact of a disruption. For example, “liquidity bridges” can allow institutions to move available liquidity resources between systems, potentially helping to manage potential liquidity disruptions, and preventing their further transmission. Third, the reaction of systems and institutions to a particular disruption may significantly influence whether and how a disruption spreads. These reactions may be very difficult for other parties to anticipate. Moreover, market conditions can influence both the initial intensity of a disruption as well as systems’ and institutions’ reactions to it.

Implications for the effectiveness of risk management. To address the increased potential that disruptions quickly spread across many interdependent systems, it is important that systems, institutions and service providers adapt their risk management efforts. To that end, at least three challenges should be met. First, it is important that these stakeholders adopt broad risk management perspectives, and look beyond their direct operations and exposures to identify the broad range of disruptions that might affect them because of interdependencies. It is also crucial that they understand their role in the broader global infrastructure and in creating significant interdependencies among other systems.

Second, it is important that systems, institutions, and service providers at the centre of key interdependencies have especially strong risk management controls. Strong business continuity arrangements become increasingly critical, as operational outages can have widespread effects. The ability of systems to provide minimum service levels and the ability of systems and institutions to continue to conduct activity in the event of a problem are especially useful in containing the impact of a disruption. As such, the capacity of “offline” processing facilities, the availability of alternative arrangements to settle transactions and the ability to reroute transactions rise in importance. The liquidity risk management techniques of key systems and large institutions also take on greater importance. Central banks’ provision of intraday credit, securities lending programmes and measures to prevent “liquidity sinks”, may be particularly effective at containing disruptions at the system level. And at the institution level, contingency funding plans that incorporate the possibility that liquidity strains arise in multiple payment and settlement systems simultaneously, including on an intraday basis, are particularly important.

Third, because interdependencies allow disruptions to pass among systems through complex paths and with uncertain intensity, interdependencies also call for wide coordination of risk management and crisis management efforts. For example, an effective response to a particular disruption may be dependent on the actions of many parties. As such, timely and yet sufficiently secure information sharing can facilitate systems’ crisis management arrangements. In addition, cooperation among central banks and other authorities, including on a cross-border basis, is also important. Such cooperation may be critical both in crisis

management situations and in normal circumstances for authorities to meet their responsibilities.

Conclusions and suggested actions. The CPSS encourages system operators, financial institutions, and service providers to strengthen further the global payment and settlement infrastructure by addressing the challenges posed by interdependencies. For that purpose, the CPSS suggests a set of actions to be undertaken by these stakeholders. Taking these steps would reinforce the benefits of tightening interdependencies and make the global payment and settlement infrastructure more resilient to potential disruptions.

Challenge 1: Broad risk management perspectives

Suggested action: System operators, financial institutions and third-party service providers should regularly review the risks they bear from and pose to other entities as a result of interdependencies.

When taking this action, a stakeholder might consider whether its risk management framework allows it to:

- identify the systems, institutions, service providers and financial markets (a) that are critical to the normal performance of its clearing and settlement activities, and (b) that could be materially affected by its inability to provide services or conduct settlement as expected.
- understand the type of risks borne from and posed to those interdependent entities.

Challenge 2: Risk management commensurate with stakeholders' roles

Suggested action: System operators, financial institutions and third-party service providers should regularly assess whether their risk management tools are proportionate to the risks they bear from and pose to other interdependent entities.

When taking this action, a stakeholder might assess:

- whether it has implemented risk management tools that are well fitted to the operational and liquidity risks arising from interdependencies. Such tools might include business continuity arrangements that allow for the rapid recovery and resumption of critical activities, alternative settlement channels to process key transactions (eg "offline" capacity) and liquidity risk management techniques, for both systems and institutions, that help address market-wide stress conditions.
- whether those tools effectively limit the likelihood of spreading disruptions to multiple interdependent entities, both by preventing new disruptions and by effectively managing those disruptions that have already occurred. From an operational risk perspective, systems, institutions and service providers could assess this capacity by organising or participating in business continuity tests that include interdependent entities, potentially including market-wide tests. With respect to liquidity risks, systems and institutions could conduct failure-to-settle simulations or stress tests of contingency funding plans that assume wide-ranging disruptions affecting multiple other systems or institutions.

Challenge 3: Wide coordination

Suggested action: System operators, financial institutions and third-party service providers should regularly review whether their crisis management arrangements allow effective coordination among interdependent entities.

When taking this action, a stakeholder might assess:

- whether its crisis arrangements address the need to communicate with other interdependent entities, as well as central banks and other relevant authorities on a domestic and international basis.
- whether crisis arrangements, including business continuity plans, are tested with all relevant parties on a regular basis.

While systems, institutions and service providers bear the responsibility for addressing these three challenges, tightening interdependencies also have implications for public authorities in their oversight, supervisory or regulatory roles. In this light, the CPSS suggests several potential steps to be taken by central banks.

- Central banks should have a clear understanding of how interdependencies can affect the systems they oversee.
- Central banks should review whether their policies provide entities with proper incentives to address sufficiently the risks brought by interdependencies. Bank supervisors, securities regulators and other authorities may also wish to consider similar steps where relevant.
- Central banks should regularly review whether their cooperative efforts with other central banks and relevant public authorities sufficiently address the coordination challenges brought by interdependencies.

At the same time, collective efforts may also serve to complement the actions of individual central banks or public authorities. In this context, the CPSS will continue to pursue several objectives related to the challenges of interdependencies, including:

- identifying the relative importance of those systems, institutions and service providers that are most critical to the safety of the global payment and settlement infrastructure;
- reviewing and, where necessary, adapting the internationally recognised principles and recommendations for the management of payment and settlement risks, especially operational and liquidity risks, to reflect the challenges posed by interdependencies;
- improving cooperative efforts with bank supervisors, securities regulators and other authorities at the international level to bring about consistent progress in the management of liquidity and operational risks by entities that are subject to different regulatory or oversight frameworks.