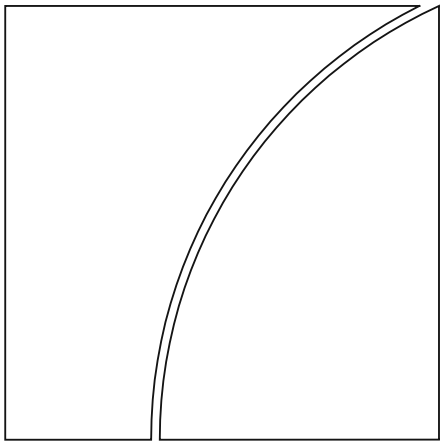
Committee on Payments and Market Infrastructures



Liquidity bridges across central banks for cross-border payments

Analysis and framework

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Executive summary

In October 2020, the G20 endorsed a roadmap to enhance cross-border payments, developed by the Financial Stability Board (FSB) in coordination with the Bank for International Settlements' Committee on Payments and Market Infrastructures (CPMI) and other relevant international organisations and standard-setting bodies. The G20 cross-border payments programme aims to address long-standing challenges in the cross-border payments market, including high costs, low speed, limited access and insufficient transparency. This programme comprises the necessary elements of a globally coordinated response in the form of a set of 19 building blocks (BBs), based on a CPMI report to the G20 (CPMI (2020a) (2020b)).

This report, produced by the Committee on Payments and Market Infrastructures (CPMI) Cross-Border Payments Liquidity Workstream ("Workstream"), completes the second action of BB 11, "Analysis of concrete practical experience to identify the benefits and risks of liquidity bridges and development of a framework on how to establish them." It sets out an analytical framework for central banks that wish to consider establishing one or more liquidity bridges, recognising that it is up to each central bank to decide whether and when to establish a liquidity bridge.

This report considers a liquidity bridge to be a cross-currency intraday liquidity arrangement between two or more central banks. In a liquidity bridge, large-value payment system (LVPS) participants pledge collateral – typically cash – to a given central bank ("facilitating central bank") in exchange for short-term (typically intraday) liquidity from another central bank ("lending central bank") in the latter's currency. This liquidity, provided by the lending central bank, can be used to meet the participants' own routine payment obligations, or those of the participants' subsidiaries or affiliates, in the lending central bank's currency.[1]

In terms of their potential benefits, liquidity bridges may improve the efficiency and effectiveness of the global liquidity pool of banking groups operating in several currencies and reduce the opportunity costs associated with holding liquidity buffers in multiple currencies. Liquidity bridges may also reduce FX and credit risks for participants that raise intraday liquidity through FX transactions with commercial counterparties. They could also potentially confer broader financial stability benefits, for example, by reducing intraday settlement risk across borders. These benefits may enhance cross-border payments by reducing funding costs, thus helping to meet the quantitative targets for addressing cross-border payment challenges (FSB (2021a)).

The design and operation of a liquidity bridge must overcome several challenges. Establishing and operating a liquidity bridge necessarily entails some financial risk to at least one of the central banks involved and must be managed carefully. Liquidity bridges also entail operational costs and risks, and require robust legal documentation that is consistent with the statutory responsibilities of the central banks involved.

While liquidity bridges may provide a useful source of intraday liquidity for participants, they may be more useful in some cases than in others. From a participant's perspective, greater payment volumes/values, and greater uncertainty over their timing would increase the size of their required liquidity buffers and therefore the potential usefulness of a liquidity bridge. Liquidity bridges may also be particularly useful where participants hold excess liquidity/collateral in one currency in one LVPS but expect high volumes of payments in another currency in another LVPS. The usefulness of a liquidity bridge may also benefit from a significant overlap in LVPS membership, the degree of regional or financial integration, and overlap in LVPS operating hours. Conversely, conditions of excess liquidity, high FX pair volatility and/or constraints on collateral eligibility may make liquidity bridges less practical or useful. The

[1] This includes obligations arising from customer payments.

value of a liquidity bridge may be limited if the likely participants in such an arrangement already have access to ample intraday liquidity in the jurisdictions in which they operate.

While creating liquidity bridges is in the remit of central banks, individual central banks and jurisdictions will ultimately determine whether setting up liquidity bridges would be consistent with their policy objectives. The purpose of this report is to help central banks perform such an assessment and, if justified, proceed with designing and implementing a liquidity bridge. For central banks considering whether to establish a liquidity bridge, this report also provides a practical framework for evaluating the potential design and feature choices that a liquidity bridge would involve. The input for this report includes information gathered about the two liquidity bridges in existence today and scoping exercises between central bank pairs to explore how a hypothetical liquidity bridge between them could be designed and operated.[2] These scoping exercises aimed to identify and explore the operational, risk, legal and other policy considerations that would need to be considered by central banks seeking to establish a liquidity bridge.

[2] The two liquidity bridges in existence today are: (i) a bilateral liquidity bridge between the BoE and DNB; and (ii) a multilateral liquidity bridge arrangement among the central banks of Denmark, Sweden and Norway – the Scandinavian Cash Pool (SCP)

1. Introduction

In 2019, the G20 finance ministers and central bank governors tasked the Financial Stability Board (FSB), together with the Committee on Payments and Market Infrastructures (CPMI) and other international standard-setting bodies, to develop a roadmap to address challenges with cross-border payments: high costs, low speed, limited access and insufficient transparency. Through a three-stage process, 19 building blocks (BBs) were identified to tackle these challenges and ultimately to enhance cross-border payments. Following the G20 Leaders' endorsement of the programme at their November 2020 Summit, standard-setting bodies (SSBs) and other relevant international organisations that are leading the implementation of the BBs have started to work on the delivery of the programme's actions. The FSB coordinates the overall process and reports to the G20.

The Cross-border Payments Liquidity Workstream is leading work on exploring liquidity arrangements across central banks (liquidity bridges) as part of BB11. A premise for BB 11 is that internationally active banking organisations (and other payment service providers (PSPs)) face certain costs from holding liquidity and collateral in different currencies in multiple jurisdictions for the purposes of facilitating payments in LVPSs. Where these PSPs face a shortfall in one currency, they may instead conduct a foreign exchange (FX) transaction to fund the shortfall with a liquidity surplus in another currency. These FX transactions also incur costs and exchange rate, credit and settlement risks. These costs may impede banks' activity in foreign jurisdictions, thereby limiting the offering of cross-border payments via correspondent banking. These costs, however, are difficult to quantify and are likely to vary according to the circumstances, such as under business as usual (BAU) or stress conditions, the relative abundance of reserves or available collateral in different jurisdictions, currency pair volatility, or the perceived credit risk of a particular banking organisation. In theory, liquidity bridges can help address the fragmentation in liquidity that banking organisations may face by facilitating access to intraday liquidity in the jurisdictions where it is needed.

Prior work by both the banking industry and the central bank community in the mid-2000s explored potential solutions to the rising liquidity and collateral pressures then faced by banks in their payment and settlement activities, particularly in foreign markets (PRC (2003) and CPSS (2006)).[3] Several central banks established cross-border collateral arrangements at around this time. Since then, accommodative monetary policy and large-scale central bank asset purchases have reduced liquidity pressures within individual jurisdictions, although some cross-border frictions remain.

This report is informed by existing and hypothetical liquidity bridges. Two liquidity bridge arrangements established in the 2000s are still in operation today: first, a bilateral euro liquidity bridge established in 2007 by the Bank of England (BoE) between the UK RTGS system and TARGET2 via the Netherlands Bank (DNB), which allows the BoE to provide intraday GBP liquidity to UK RTGS system participants against euro cash collateral held in TARGET2; and, second, the Scandinavian Cash Pool (SCP), a multilateral liquidity bridge arrangement between the central banks of Denmark, Norway and Sweden, originally established in 2003 to support local Continuous Linked Settlement (CLS) members' access to intraday liquidity in DKK, NOK and SEK, especially for large time-critical payments.

The report also draws on insights from scoping exercises conducted between two pairs of CPMI central banks to identify and explore the practicalities of designing and establishing liquidity bridges in the current environment. These exercises signal neither an intention to develop liquidity bridges nor any commitment to further action; rather, they are purely analytical initiatives intended to better understand the key design and practical considerations around the establishment of such bridges. The scoping teams

[3] Refer to Annex 2 for summary of prior work.

deliberated on a range of design aspects and parameters of a hypothetical liquidity bridge. These are discussed in detail in Section 6.

Consistent with the G20 cross-border payments programme, this report leaves individual central banks and jurisdictions to decide whether liquidity bridges are appropriate for their payment system participants. Central banks will need to evaluate whether they expect the potential benefits outlined in this report to materialise and exceed the costs and justify the risks of establishing and operating a liquidity bridge. In making such a determination, central banks and jurisdictions might consider aspects such as the primary use case for such arrangements and the existence and relative cost of public or private sector alternatives for intraday liquidity.

The report is organised as follows. First, the scope, definition and basic functioning of liquidity bridges is discussed in Section 2. Section 3 considers the potential benefits of liquidity bridges while Section 4 focuses on the risks and challenges associated with liquidity bridges. Section 5 discusses the contextual factors which may make a liquidity bridge arrangement more or less effective for particular jurisdictions. Section 6 introduces a framework for implementing liquidity bridges for central banks that may wish to establish them. Section 7 concludes.

2. Scope, definition, and basic functioning of liquidity bridges

2.1 Scope and definition

For the purposes of this report, a liquidity bridge is a short-term, typically intraday liquidity arrangement set up between two or more central banks. In a liquidity bridge, collateral – typically cash – held by payment system participants at one central bank (the facilitating central bank) in the currency issued by the facilitating central bank is used as collateral to enable the provision of intraday liquidity by another central bank (the lending central bank) in its own currency to the participants or their related entities (eg branch or subsidiary) in the jurisdiction of the lending central bank. Liquidity bridge participants typically use this liquidity to meet routine intraday payment obligations which can be highly variable and quite large due to mismatches in the timing of payment inflows and outflows throughout the course of the business day. Without the liquidity bridge, the participant would need to obtain the liquidity in the market, possibly at increased cost, or via the lending central bank's existing intraday or short-term liquidity facilities, if available. In some cases, this may also entail FX risk associated with funding the temporary liquidity shortage via a FX transaction. For example, a participant in need of intraday liquidity but lacking local collateral may seek to raise liquidity by exchanging foreign currency for local currency via an FX swap or spot sale.

As defined in this report, liquidity bridges differ significantly in several respects from other central bank liquidity arrangements such as central bank swap lines or repurchase agreement (repo) lines. First, in a liquidity bridge, there is no exchange of assets between the central banks involved. Instead, there is simply the holding of collateral by one central bank for the lending of the other central bank. Second, in a liquidity bridge, the lending central bank lends its own currency to participants in its own LVPS, whereas in central bank swap and repo lines the lending central bank lends foreign currency to its domestic market counterparties. In addition, liquidity bridges would probably be established to support routine intraday payments by participants in normal circumstances. In contrast, a currency swap line is an agreement between two central banks to exchange currencies under exceptional market circumstances and for overnight or longer tenors. Repo lines between central banks are similar, although with one central bank pledging high quality securities from its foreign reserve portfolio, instead of its local currency, in exchange for foreign currency from another central bank. Both swap and repo lines are typically established to fund the foreign currency operations of the borrowing central bank in the currency of the lending central bank during exceptional market situations. Thus, the conclusion is that liquidity bridges should be considered a

very different type of facility than swap lines and repo facilities between central banks (Table 1 summarises the key differences between liquidity bridges and central bank swap or repo lines).

The definition of liquidity bridges in this report is also narrower than the general concept of cross-border collateral arrangements (CBCAs) which have been the focus of past analysis by the Committee and established by a number of central banks in recent decades (CPSS (2006)). While the basic concept is similar – ie a participant posting foreign collateral in exchange for domestic liquidity – liquidity bridges are set up only between central banks and serve to facilitate routine intraday credit extension by lending central banks. By contrast, a broader set of CBCAs may involve entities other than central banks such as collateral management and custodial agents (eg international central securities depositories, collateral management services, securities settlement systems)[4], for exceptional use cases only, and for overnight or longer tenors.[5] As such, liquidity bridges can be considered a specific type of CBCA.

Key differences between central bank liquidity lines and liquidity bridges Table1

	Central bank swaps/repos	Liquidity bridges
Purposes	• address stresses in funding markets by facilitating access to key international currencies • prevent spillover effects across jurisdictions and tenors • prevent abrupt asset deleveraging when cross-border funding is disrupted in a broad market crisis • prevent liquidity problems from becoming financial stability risks in a broad market crisis	• meet payment needs by facilitating access to intraday liquidity from a central bank in its own currency • reduce "trapped liquidity", ie maintaining fragmented liquidity pools to meet peak intraday payment demands across jurisdictions • optimise collateral allocation (and thus potentially lower the costs of cross-border payments)
Operating modalities and circumstances	• involves an exchange of assets between central banks • support liquidity provision of foreign currency via predefined tenders scheduled by central banks (swaps) • support the provision of overnight and term credit, never intraday	• no exchange of assets between central banks • support liquidity provision of domestic currency via standing facility for draws on demand throughout the day at discretion of participant • support the provision of intraday credit by definition
Scope	• focus on the foreign currency funding needs of domestic banks	• focus on domestic currency payment needs of banks with foreign collateral
Cost	• often priced at backstop level to minimise usage in normal market conditions and utilised only in times of market stress to encourage market	• priced at a lower level than swaps and repos and may entail less cost except from the opportunity cost of the collateral mobilised

Source: CPMI.

[4] An international central securities depository (ICSD) is a central securities depository (CSD) that settles domestic and international securities transactions and typically offers additional services such as securities lending and collateral management. ICSDs are usually run on direct or indirect (through correspondent banks) links to local CSDs. A collateral management service (CMS) is a centralised service that may handle any of a variety of collateral-related functions, including information on collateral holdings, the optimisation or allocation of collateral, and collateral transformation services. A securities settlement system (SSS) is an entity that enables securities to be transferred and settled by book entry according to a set of predetermined multilateral rules. Such systems allow transfers of securities either free of payment or against payment (CPMI (2016)).

[5] Past work on CBCAs has also considered models that involve the extensions of intraday liquidity drawn from a home central bank's foreign reserve holdings rather than through the creation of intraday liquidity by the central bank of issue (eg the "cash collateral pool home central bank option" in PRC (2003)).

2.2 Basic functioning of liquidity bridges

At a high level, a liquidity bridge may operate as follows:

The facilitating central bank enables the provision of liquidity by the lending central bank by holding the participant's collateral in its custody. The lending central bank typically secures its interest in the collateral by obtaining a security interest in such collateral in an account under its control at the facilitating central bank, as defined in bilateral legal agreements between the participating central banks (see below for further discussion).

The lending central bank makes available to the participant the local currency equivalent of the foreign currency collateral received, net of applicable haircuts. The lending central bank is the principal in the transaction with the participant and therefore takes on the FX risk (and possibly market risk if the collateral consists of securities), applies an appropriate haircut on the value of the collateral posted to account for these risks and decides on collateral eligibility.

The transaction is unwound by the participant repaying its outstanding balance to the lending central bank, which would then instruct the facilitating central bank to release the collateral delivered by the participant (either by transferring title back to the participant or releasing the guarantee or pledge). Should the participant default on its obligations vis-à-vis the lending central bank, the lending central bank would be entitled to enforce its claim on the participant, including by instructing the facilitating central bank to liquidate the participant's collateral.

Box 1 discusses two examples of existing liquidity bridges in operation the Bank of England-Netherlands Bank (BoE-DNB) liquidity bridge and the Scandinavian Cash Pool (SCP), while Annex 3 provides further details on their mechanics.

Box 1

Existing liquidity bridges

The BoE-DNB liquidity bridge

The BoE (lending central bank) established a one-way intraday euro liquidity bridge between the UK RTGS system and TARGET2 via the DNB (the facilitating central bank) in 2007. The BoE is an indirect member of TARGET2 as it uses for the liquidity bridge a specific TARGET2 account held at the direct TARGET2 member DNB. The liquidity bridge allows the BoE to provide intraday GBP liquidity to UK RTGS system participants against euro cash liquidity held in TARGET2. Liquidity generated through the liquidity bridge is currently free of charge, uncapped and time-limited (participants must unwind their borrowing by the end of the TARGET2 business day (ie the facility is for intraday liquidity only).

Usage of the BoE-DNB liquidity bridge has fallen since quantitative easing (QE) was implemented in the United Kingdom in March 2009. Nevertheless, in 2019, five participants (out of 19 banks that are participants in both the UK RTGS system and TARGET2) made some use of it and the total daily average across participants was the equivalent of USD 400 million; in 2020, the total daily average was even lower, at USD 50 million. One participant made regular use of the BoE-DNB liquidity bridge while four used it intermittently over approximately four months in 2019. In 2008, the bridge was used primarily by two large participants and in 2012 it was used by six participants. On some occasions, the liquidity bridge was used more heavily than others, especially in the five years after the global financial crisis. However, feedback from participants does indicate that they value having an additional potential source of liquidity if required.

The Scandinavian Cash Pool (SCP)

The SCP is a three-way liquidity bridge arrangement between the central banks of Denmark, Norway and Sweden. It was originally established to support Scandinavian CLS members' access to intraday liquidity in Danish krone (DKK), Norwegian krone (NOK) and Swedish krona (SEK), especially for large time-critical payments. The SCP

consists of a common framework for messaging standards, haircuts and procedures for handling the pledging of collateral. The main principle of the SCP is that liquidity raised at the central bank of one country is pledged as collateral in the central bank of another country.

The SCP is used by five large Scandinavian banks. In Danmarks Nationalbank approximately USD 2.3 billion was collateralised in the SCP per banking day in 2020. One particular bank located in one of the three countries sends large amounts of liquidity to subsidiaries in the other two countries every day, allowing it to centralise collateral management in one country. The other banks use the SCP on an infrequent ad hoc basis, but participation in the SCP enables them to raise large amounts in the Scandinavian currencies at short notice which is a requirement of being a CLS liquidity provider.

Design features of the BoE-DNB liquidity bridge and the SCP

The BoE-DNB liquidity bridge and the SCP share some similarities in their eligibility criteria, duration of credit provided and costs, but differ in terms of the central bank relationships (bilateral vs multilateral) and the direction of liquidity and collateral flows (one-way vs two-way/reciprocal). They both involve advanced economy central banks that issue liquid and widely traded currencies, meaning that FX volatility risk is limited and FX haircuts are not particularly punitive. They also both operate in broadly the same time zones which reduces operational challenges and both involve participants covered by similar settlement finality protections. The features of the BoE-DNB liquidity bridge and SCP are outlined in Table 2 below.

Design features of existing liquidity bridges — Table 2

Design factor	BoE-DNB liquidity bridge	Scandinavian Cash Pool
Number of central banks involved	Bilateral	Multilateral (3)
Direction of liquidity and collateral flows	One-way	Two-way/reciprocal
Role of facilitating central bank	Passive	Active
Financial risk	Lending central bank[1]	Lending central bank[1]
Eligible collateral	Cash	Cash
Eligible participants	Direct LVPS participant	Direct LVPS participant
Duration of liquidity provided	Intraday	Intraday
Pricing	Free of charge	Free of charge
Use	Uncapped	Uncapped

[1] While an intraday securities-against-cash operation with the facilitating central bank may generate the cash for the participant, this would be outside the liquidity bridge and therefore the financial risks remain with the lending central bank.

Source: CPMI.

3. Potential benefits of liquidity bridges

Liquidity bridges may provide benefits to participants by reducing the need to have multiple cash or collateral buffers in multiple currencies/jurisdictions, and/or to undertake FX transactions. This, in turn, can help to reduce funding and transaction costs, operational complexity, and associated FX, credit and settlement risks, and it may increase flexibility in banks' intraday liquidity management. Although difficult to quantify precisely, these benefits, if realised, should feed through to reduced funding costs for cross-border payments. Indeed, industry outreach has indicated widespread interest in exploring how liquidity bridges could help banks (and other PSPs) manage intraday liquidity needs, so that they can better provide

cross-border payment services at lower cost. As the cross-border payments landscape evolves in response to the G20 cross-border payments programme and other factors, the potential benefits and challenges of liquidity bridges may evolve too (see also Section 5). This section outlines some key benefits of liquidity bridges that may help to inform central banks in their deliberations on whether to establish a liquidity bridge.

3.1 More efficient use of liquidity

International banks hold foreign currency liquidity in nostro accounts at their correspondent banks, or at the foreign central bank (if they are direct participants and self-clear in the foreign market), or invest it in highly liquid assets that can be easily sold or used as collateral in repo agreements to obtain cash. Sourcing this liquidity can pose credit risks to the bank and incur an opportunity cost, particularly if the bank overfunds its payment obligations to mitigate uncertainties about payment timing.

Liquidity bridges can reduce liquidity costs and release trapped liquidity for participants, which in turn would be expected to reduce the cost of payments. Without liquidity bridges, banks operating in multiple currencies may need to hold larger liquidity resources, on aggregate, to maintain sufficient pools of liquidity in every jurisdiction where they wish to be active in payments. The costs of funding this liquidity may be high, especially when liquidity conditions are tighter, and they are ultimately passed on to end users, contributing to the cost of cross-border payments.[6] The liquidity costs from such fragmented holdings may prevent banks from providing cross-border payment services or other financial services in certain markets or jurisdictions (eg where FX risks are greater). In addition, liquidity bridges can increase flexibility in intraday liquidity management, helping banks to optimise liquidity and collateral allocation across jurisdictions and reduce funding costs.

3.2 Reduction of FX, credit, and settlement risks and operational complexity for participants

Liquidity bridges may reduce FX and credit risks for participants if their use of bridges replaces the sourcing of FX liquidity via FX swap transactions with commercial counterparties. Liquidity bridges would operate irrespective of wider market conditions, whereas LVPS participants' access to FX swap markets may be less certain in periods of market stress.

Liquidity bridges may also help to reduce or eliminate credit and settlement risks to the participants arising from FX outright and swap transactions and/or short-term borrowing in one currency to fund temporary liquidity shortfalls.[7] Participants may also realise benefits in terms of operational efficiency as liquidity bridge transactions are likely to involve fewer settlement legs and fewer counterparties/clearing entities than the alternatives. This can help tackle the friction in cross-border payments related to long transaction chains and thus support faster and cheaper payments.

[6] The large-scale asset purchase programmes and balance sheet growth policies pursued by several central banks have recently reduced the liquidity opportunity cost and greatly increased the liquidity pools available to meet payment obligations, thereby, somewhat reducing the benefits of liquidity bridges for as long as these conditions persist.

[7] While current practices for settling same-day FX swaps between market participants may limit their suitability for managing pools of liquidity across currencies, it is possible that industry solutions may arise to reduce credit/settlement risks associated with using FX swaps for this purpose.

3.3 Support for financial stability

Central banks already provide intraday liquidity to domestic participants to facilitate intraday payment obligations. Wider adoption of liquidity bridges could similarly help in reducing intraday settlement risk across borders. By providing additional liquidity facilities across currencies, wider availability of liquidity bridges could also enable flexible liquidity management for participants. In addition to potentially providing benefits during normal market conditions, liquidity bridges may be useful in times of stress. The wider availability of central bank money may be particularly helpful to institutions operating cross-border in times of heightened volatility and disorderly market conditions when foreign currency liquidity sources are likely to be tighter.

Liquidity bridges may also support financial stability by reducing asset and currency volatility and stabilising the demand for collateral and reserves. They could make LVPS participants' cross-currency liquidity management more robust to market disruption, eg limited access to FX swap markets. Without liquidity bridges, either precautionary liquidity buffers would need to be higher to ensure the fulfilment of payment obligations or assets would need to be rapidly sold and temporarily converted into the currency of the liquidity shortfall, possibly exacerbating disorderly market conditions.

4. Potential challenges and risks of liquidity bridges

The design and operation of a liquidity bridge must overcome several challenges. Establishing and operating a liquidity bridge necessarily entails some financial risk to at least one of the central banks involved (typically the lending central bank). This risk must be managed carefully. Liquidity bridges also entail operational costs and risks. Moreover, a central bank can establish a liquidity bridge only where it has legal authority to do so and must also ensure that the legal framework supporting a liquidity bridge, including relevant documentation, is robust. Finally, while liquidity bridges may help to reduce systemic risk by facilitating smooth payment flows (as discussed in Section 3), they also may have implications for how prudential liquidity regulations are designed and applied.

The extent of these challenges and the potential solutions are likely to vary considerably depending on the specific context for a liquidity bridge but may be greatest for jurisdictions with more volatile currencies and less mature legal systems and operational arrangements. Additionally, a multilateral liquidity bridge arrangement may incur more risks and complexities than a bilateral arrangement, particularly from an operational perspective.

4.1 Financial risks

Liquidity bridges necessarily entail some financial risk taking for at least one of the central banks involved, usually the lending central bank. Financial losses for central banks may materialise in the following sequence of events: (i) the borrowing LVPS participant fails to repay the intraday credit provided by the lending central bank; (ii) liquidation proceeds of the collateral fall short of the credit provided because of unexpectedly large adverse movements of the exchange rates and/or of the value of the collateral posted to the facilitating central bank (the latter only if securities are accepted), such that haircuts prove insufficient; and (iii) the borrowing LVPS participant is in default and cannot be forced to compensate for the shortfall of collateral liquidation value.

Mitigation measures can go a long way to reduce these risks, notably if counterparty eligibility is limited to direct payment system participants, collateral eligibility is restricted to cash, and FX haircuts are conservative.

4.2 Costs of establishment and operation

The costs of establishing and operating a liquidity bridge will vary depending on the precise operational design and the degree of operational integration between participating central banks. The two principal areas of cost in establishing a liquidity bridge are likely to be the technical implementation costs and the cost of establishing legal agreements, both between the central banks in question and between the central banks and their respective participants.[8]

Practical experience from existing implementation of liquidity bridges has shown that the internal legal experts of central banks are typically able to draft the necessary legal agreements without incurring the additional cost of external advice. Costs may, however, significantly increase if the implementation of a liquidity bridge were to require additional changes to the legal and operational frameworks of the participating central banks.

The operational set-up and maintenance costs will vary depending on circumstances and the ongoing costs would need to be assessed on a case-by-case basis (including an assessment of the complexity of user requirements). If established using cash collateral in an account-based structure (as in the BoE-DNB liquidity bridge), costs may be lower. Costs may be higher in multilateral bridges and when using a broader range of collateral if real-time monitoring of positions and collateral reallocation across bridges is required. Costs may be lower when the liquidity bridge makes use of existing operational capabilities, IT systems and frameworks, but they will increase if new systems are required. For example, the SCP is based on existing structures and systems. In it, liquidity is pledged via an ordinary transfer between accounts in the national RTGS system and the communication between the central banks is automated and based on existing standards (SWIFT). Where communication between central banks cannot easily be accommodated via existing messaging protocols (eg where an RTGS system is not connected to the SWIFT network) the costs of establishing and maintaining automated communications could be more substantial, particularly if they are intended to support real-time changes in collateral availability.

In the case of the SCP, implementation costs were financed by the participating banks. Ongoing costs are not charged to the SCP participants since the cost is very low and difficult to distinguish from the other costs associated with running an RTGS system. The BoE-DNB liquidity bridge is similar in that participants are not charged for use of the bridge. Ongoing costs (which are low) are included in the operational costs of the UK RTGS system, which is funded via a tariff paid by participants on a full cost-recovery basis.

4.3 Operational and systemic risks

To the extent that liquidity bridge arrangements increase the operational interdependencies between participating central banks, the effects of an operational failure at one central bank may affect the orderly functioning of the RTGS system operated by the other. This is especially the case if one or more participants becomes dependent on the liquidity bridge to fund payment obligations in multiple national RTGS systems. For example, if participants pooled very large amounts of liquidity in a few key jurisdictions and used the generated liquidity in jurisdictions outside a liquidity bridge arrangement, temporary impediments in one jurisdiction may have multiple cross-currency repercussions. Depending on their design, if there were "chains" of multiple bilateral liquidity bridges established, the knock-on effects of a default in one jurisdiction could potentially impact central banks in other jurisdictions. These risks are generally low in existing liquidity bridges because of their simplicity and limited reach.

[8] Should the lending central bank need to become a direct participant of the facilitating central bank's RTGS for the purposes of holding foreign currency collateral, the costs of being a direct participant could also be high.

For liquidity bridges to function, a number of subcomponents across participating central banks must also be functional. For example, in a liquidity bridge, the lending central bank might require robust real-time information regarding collateral availability and encumbrance at the facilitating central bank. This entails dependencies on the availability and accuracy of collateral management systems and an infrastructure to transfer information between central banks (eg SWIFT). Liquidity bridges are therefore dependent on central banks building and maintaining resilient infrastructure, well tested operational procedures to manage operational issues, and appropriate contingency plans for operational outages.

4.5 Intersection with liquidity regulation

As noted, liquidity bridges may influence how global banking groups manage liquidity across jurisdictions. This can have implications for how liquidity regulation is designed and applied. For example, if a participant in Jurisdiction A regularly pledges a sizeable quantity of its high-quality liquid assets (HQLA) during the day to facilitate the foreign currency activities of its affiliate in Jurisdiction B, those assets may potentially not be counted as HQLA in Jurisdiction A. The financial and operational risks discussed earlier could make the domestic HQLA effectively unavailable to satisfy domestic liquidity pressures. As such, participants would need to ensure that their use of liquidity bridges aligns with their overall need for liquidity and collateral across jurisdictions, including in compliance with local regulatory requirements.

4.6 Specific challenges for emerging market and developing economies (EMDEs)

The challenges of designing and implementing liquidity bridges may be especially acute for EMDEs. In EMDEs, currency volatility and the relative scarcity of suitable collateral may make liquidity bridges difficult to implement and/or prohibitively expensive (due to large haircuts) for banks and other payment system participants. Legal certainty (eg over rights of collateral) and conflicts of law would need to be addressed in order not to expose central banks and/or participants to increased risk (see also Section 6.11).

Further challenges could emerge from relative lack of experience and technical capabilities in EMDEs, underscoring the potential value of technical assistance (TA) from international financial institutions. TA could also help EMDEs overcome concerns around a lack of trust or political and reputational risks that might otherwise limit opportunities to establish economically viable liquidity bridges.[9] Establishment of liquidity bridges would require strong coordination and collaboration between the involved central banks.

5. Factors influencing the potential usefulness of liquidity bridges

Liquidity bridges can provide a useful source of intraday liquidity for participants to multiple LVPS. They may be more effective and useful in some cases than others. The factors influencing the usefulness of liquidity bridges are analysed in detail in this section.

5.1 Volumes, values and uncertainty of payments in LVPS

Liquidity bridges incur some fixed costs. Therefore, high volumes and values of payment flows and related liquidity needs in LVPS will be a first driver for their utility. Greater payment volumes and values and greater

[9] Action 3 of BB 11 calls for "relevant bodies to provide technical assistance to central banks considering whether to establish liquidity bridges."

uncertainty over their timing will proportionally increase the size of the necessary liquidity buffers to be maintained in the currencies in which payments are processed. They also increase the cost of the FX transactions necessary to offset a temporary shortfall in one currency with a surplus in others. Uncertainties regarding the direction of cross-border payments and implied overall liquidity needs also support the potential usefulness of liquidity bridges.

However, the potential usefulness of liquidity bridges, is not limited to supporting cross-border payments. Conceptually, they could also support the efficiency of liquidity pools without any cross-border payment flows. The liquidity outflows of a bank in one currency may be driven by various factors, including domestic ones. Liquidity bridges could therefore also reduce the opportunity costs of holding multiple liquidity buffers in multiple currencies to facilitate the orderly processing of domestic payments.

5.2 Asymmetry of liquidity/collateral buffers

Liquidity bridges may be particularly useful where participants hold excess liquidity/collateral in one currency in one LVPS but expect high volumes or values of payments in another currency in another LVPS, in which access to adequate liquidity/collateral is more difficult. However, this kind of imbalance is not a necessary precondition for the usefulness of liquidity bridges to participants. They would also be useful in a situation which is ex ante fully symmetrical for a participant, but only ex post asymmetrical as volumes and directional payment flows materialise in the course of daily payment activity. In this case, the liquidity bridge can work both ways and all the central banks involved may be called upon to act as facilitating and lending central banks.

One-way liquidity bridges, in which one central bank is always the facilitating central bank and the other central bank is always the lending central bank, may be useful for situations which are clearly asymmetrical ex ante. In these situations, participants hold structural excess collateral in one currency and have recurrent, short-term liquidity needs in another currency.

5.3 Excess liquidity

The excess liquidity resulting from the large-scale asset purchases conducted in many jurisdictions in the years after 2007-09 global financial crisis may reduce the usefulness of liquidity bridges as such purchases provide large structural liquidity buffers and allow liquidity to be sourced domestically. This liquidity may be used to fulfil short-term, payment-related needs. For example, usage of the BoE-DNB liquidity bridge has fallen since quantitative easing (QE) was implemented in the United Kingdom in March 2009 (see Annex 4). However, excess liquidity may not completely eliminate the potential usefulness of liquidity bridges, as the intraday flow of incoming and outgoing payments may not be fully synchronised. In these cases, liquidity bridges may still be useful to accommodate larger than normal payment outflows in one jurisdiction occurring, perhaps exceptionally, in the early part of the business day via intraday credit provided against collateral pledged in another jurisdiction.

5.4 Availability of uncollateralised liquidity and credit limits

A key assumption of the stylised design of a liquidity bridge is that PSPs access to intraday credit is collateralised. However, certain central banks may also extend uncollateralised intraday credit (eg subject to a fee). The availability of uncollateralised intraday credit may lessen the business case for a collateralised intraday facility. The provision of liquidity via a liquidity bridge could also be constrained by limits on accessing intraday credit set by a central bank's underlying intraday credit framework. The potential usefulness of a liquidity bridge therefore also depends on the framework already in place for the provision of intraday credit and the extent in which a liquidity bridge extends the existing scope, removes constraints and reduces costs.

5.5 Overlapping membership of LVPS

The potential usefulness of a liquidity bridge increases with the degree of overlap of participant membership between LVPS. The greater the overlap, the greater the number of participants that will be able to benefit from the liquidity bridge. However, banking groups with access via different entities to different LVPS may also have multiple funding options available for intraday and term liquidity in the different jurisdictions in which their entities have access to the LVPS.

It is, however, important to note that for many banking groups with different entities with access to different LVPS, a complex set of regulatory constraints and internal liquidity management rules determine how banking groups allocate liquidity/collateral at the legal entity level and across them. These rules may hinder the extent to which a given legal entity may access intraday liquidity via collateral held by a different legal entity of the same group. The complex intersection between a liquidity bridge and prudential liquidity regulation will influence the practical benefit of a liquidity bridge.

How an international banking group operates in different jurisdictions, whether via separate legal entities/subsidiaries or via branches, may also matter if for legal, risk or operational reasons it were decided to limit access to intraday liquidity provision via the bridge to the legal entity that pledges the collateral with the facilitating central bank.

5.6 Economic and financial integration

Economic and financial ties increase the usefulness of liquidity bridges. Financial institutions within a region tend to have a high degree of economic and financial integration with each other. The overlap in LVPS membership across jurisdictions within a region could thus be wider and cross-border payment flows could be greater reflecting the trade and financial flows within the region. However, the usefulness of liquidity bridges is not limited to geographical proximity as significant payment flows also occur between major remote currency areas.

5.7 Degree of FX pair volatility and implied haircut under different methods

For more volatile currency pairs, a higher FX haircut will need to be applied. This means that a larger amount of liquidity pledged to the facilitating central bank would be required for the same value of liquidity provision by the lending central bank. At the same time, higher haircuts also reduce the potential usefulness of a liquidity bridge and/or may increase the opportunity cost of using a bridge from a participant's perspective relative to alternative funding options.

For EMDEs whose currencies exhibit greater volatility vis-à-vis advanced economy currencies, the higher haircuts and increased opportunity costs may reduce the potential benefits of liquidity bridges with more advanced economies. These factors may also reduce the potential benefits of liquidity bridges between EMDEs themselves when their currencies are loosely correlated and mutually volatile.

The size of the haircut may also be affected by the time it would take before a position could be liquidated after a counterparty failure to pay back the intraday credit based on the liquidity bridge. If the liquidity bridge spans different time zones, and if liquidation procedures would, for this reason, imply a two-day horizon instead of a one-day horizon, then haircuts would need to be about 50% higher. This could again reduce the potential usefulness of the liquidity bridge (see Box 2 for examples of the necessary haircuts).

Box 2

One-day volatility estimates, value-at-risk and expected shortfall at the 99.9% level for selected currencies

The table below shows one-day estimates of volatility, Value-at-Risk (VaR), and Expected Shortfall (ES) at the 99.9%[10] confidence level for the currencies against EUR: USD, GBP, JPY, CNY, AUD, CAD, SAR, ZAR, TRY, INR and SEK. In its monetary policy operations, the Eurosystem calibrates haircuts and markdowns so that they cover risk measures such as VaR and ES over a certain horizon and at a given confidence level. VaR and ES measure respectively the quantile threshold in a return distribution and the expected value of the returns if returns fall below that threshold. The Eurosystem defines the threshold with a reference to the worst 1% of outcomes. However, in this particular application, the selected risk measures focus on the worst 0.1% of outcomes (99.9% confidence level) that could be expected over a one-day horizon for the considered currency pairs.

The numerical results are based on two standard approaches for measuring the risk of holding a financial asset: (i) a model building (parametric) approach, estimating the volatility of the historical series of returns of the currencies, and assuming a normal distribution; and (ii) a historical simulation approach, using the historical empirical distribution of returns.[11]

The analysis is conducted using ECB Statistical Data Warehouse data, within the January 2002 to May 2021 time window. However, not all data are equally relevant for the different methods, as explained below.

	USD	GBP	JPY	CNY	AUD	CAD	SAR	ZAR	TRY	INR	SEK
(1) Volatility-Std Roll	0.39%	0.43%	0.39%	0.35%	0.45%	0.41%	0.39%	0.85%	1.11%	0.40%	0.34%
(2) Volatility EWMA	0.40%	0.36%	0.28%	0.27%	0.37%	0.40%	0.41%	0.49%	1.02%	0.40%	0.27%
(3) ES999 Parametric EWMA – with (2)	1.34%	1.21%	0.95%	0.91%	1.23%	1.36%	1.38%	1.67%	3.45%	1.36%	0.92%
(4) ES999 Parametric Roll – with (1)	1.30%	1.44%	1.30%	1.18%	1.50%	1.37%	1.32%	2.85%	3.75%	1.33%	1.15%
(5) ES999 Historical	2.35%	2.38%	5.02%	2.38%	4.26%	2.63%	2.52%	4.62%	5.96%	3.21%	2.27%
(6) VaR999 Parametric EWMA – with (2)	1.23%	1.11%	0.87%	0.83%	1.13%	1.25%	1.27%	1.53%	3.17%	1.25%	0.85%
(7) VaR999 Parametric Roll – with (1)	1.19%	1.32%	1.19%	1.09%	1.38%	1.25%	1.21%	2.61%	3.44%	1.22%	1.05%
(8) VaR999 Historical Roll	0.86%	1.22%	1.06%	0.93%	1.62%	1.16%	0.86%	2.06%	5.67%	0.94%	0.79%

The table indicates that a high degree of risk protection against market risk at a one-day horizon can generally be achieved for stable currency pairs with haircuts of not more than 1%. Even for the most volatile currency towards vis-à-vis the euro, and taking the most conservative methodology, a 6% haircut would seem to be sufficient. Of course, if a central bank seeks protection for a longer horizon (eg because of the time required for liquidation of assets) then haircuts would need to be higher. For example, it could be assumed that the liquidation of cash in foreign

[10] The Article 24 of the European Union Regulation (EU) No 153/2013 (which provides regulatory technical standards for the EMIR Regulation) states the minimum confidence intervals that central clearing counterparties (CCPs) shall respect. The Regulation requires a minimum c.l. of 99.5 for derivatives while LCH implements a c.l. of 99.7. In this analysis, a 99.9 c.l. is used.

[11] See for example J. C. Hull (2007) "Risk Management and Financial Institutions", Prentice Hall. For further references to similar methods employed by CCPs, see European Commodity Clearing AG (ECC) and LCH Limited self-assessment of the principles for financial market infrastructures (CPSS-IOSCO, 2012).

currency through an FX sale would take place on T+1, so that the horizon for which the haircut would be calibrated would be two days. If high-quality liquid securities were to be accepted, an orderly liquidation might take longer (eg three days). While the volatility of the value of the security would be covered by a separate haircut, this should also imply a longer horizon for the calibration of the FX related haircut. For time series with independent and normally distributed price changes, volatility increases with the square root of time (ie haircuts for a four-day period would have to be broadly twice as high). If normality is not observed, historical approaches can be adopted to capture the empirical distribution of multi-day returns (eg three-day returns).

Notes:

Volatility
Volatility is calculated as a standard deviation of daily log price returns with:
(1) rolling window of 261 days – close to (slightly more than) one year, which is a standard according eg to the BIS Minimum capital requirements for market risk – 32.18);
(2) calculated using EWMA (with a decay factor of 0.94), following well-established market standards (see eg JP Morgan's RiskMetrics methodology, Deloitte's review and LCH comprehensive disclosure[12]).
Parametric
Expected shortfall estimate, computed under the assumption of normally distributed daily log returns.
(3) The expected shortfall estimate is calculated using the exponentially weighted moving average (EWMA) estimator of volatility (2).
(4) The expected shortfall estimate using volatility estimates (equally weighted) with rolling window of 261 days.
Value at Risk (VaR) estimates
Computed under the assumption of normally distributed daily log returns.
(6) VaR estimate is calculated using the exponentially weighted moving average (EWMA) estimator of volatility (2).
(7) VaR estimate using volatility estimates (equally weighted) with rolling window of 261 days.
Historical
(5) The historical simulation approach is implemented calculating daily log returns over the whole period and looking at the historical distribution of such returns to identify the worst 0.1% of the outcomes. The average of the worst 0.1% of the outcomes is taken as the ES at 99.9% estimate.
(8) The historical VaR estimate is implemented as the 0.1% quantile of the loss distribution in the rolling windows of 261 days.

Source: CPMI.

5.8 Operating hours

Where there are significant overlaps in operating hours, the lending and the pledging of collateral can be completed as part of intraday operations in both RTGS. This is the case for existing bridges such as the SCP and the BoE-DNB liquidity bridge, where the overlaps are considerable.

In the case of a liquidity bridge between two jurisdictions where there is little or no overlap in operating hours, the overall duration of the collateral pledged may have to be greater than intraday. For example, the lending central bank might be able to lend intraday but the facilitating central bank holding the collateral may release that collateral only the following day. In this case, the duration of the effective collateral encumbrance would span two days (overnight) from the perspective of the facilitating central bank and from the perspective of the banking entity pledging the collateral. Moves toward longer RTGS operating hours would increase the potential for pure intraday liquidity bridges.[13] This may have implications for the extent to which operating hours overlap between LVPS in which liquidity bridges are established (see Box 3). The scoping exercises identified some issues that would need to be addressed among central banks operating in different time zones. For example, collateral used to support the liquidity bridge may be encumbered beyond the time for which it is used. If the collateral encumbered is cash collateral, issues of renumeration policy would also need to be addressed. However, these issues were not determined to be insurmountable such that a liquidity bridge spanning multiple time zones was deemed unfeasible.

Liquidity bridges that operate on an overnight basis would need to identify operational protocols to release pledged collateral, for example, in instances where the lending central bank's LVPS is closed. In liquidity bridges that span multiple time zones, the participating central banks may opt to release collateral

[12] Explicit reference to EWMA and other methods can be found in Section 4.

[13] BB 12 focuses on the operating hours of LVPS.

earlier in the day to avoid or minimise instances of overnight collateral encumbrance. One potential option might be to develop ad hoc, quasi-real-time messaging between the facilitating central bank and the lending central bank to process participants' requests as quickly as possible. It would also be important to clearly communicate to participants the cut-off times after which collateral would be encumbered overnight.

Any overnight use of collateral might increase the costs of the liquidity bridge as this would entail a slightly higher opportunity cost for the participant.

Box 3

Global liquidity bridges and time zone considerations

Existing liquidity bridges have been established only between countries within the same time zone or nearby ones. As businesses increasingly operate in very different time zones, demand for global payment services to be facilitated via global liquidity bridges cannot be overlooked. This is the case even if demand for liquidity bridges may be greater at a regional level across jurisdictions with a greater overlap of participant membership in respective LVPS. This box considers the scenario where the overlap in operating hours of the LVPS would be too short to be useful and therefore where a liquidity bridge may need to extend beyond intraday (for at least one of the jurisdictions).

Liquidity bridges across time zones require a fundamental choice. Either the bridge can be used only during the period in which the LVPS of the two jurisdictions across which the bridge operates are both operational, or the liquidity bridge can be used beyond intraday.

Possible operating modalities of multi-time zone liquidity bridges

One solution for addressing the limited overlap in the operating hours of the LVPS involved in a liquidity bridge could be to extend the LVPS operating hours and the collateral management systems of the central banks involved in order to increase the overlap.

If there is limited overlap in operating hours, multi-time zone liquidity bridges could work according to the following principles:

Liquidity provision from the lending central bank would remain intraday. Participants receiving intraday liquidity from the lending central would always repay the liquidity ahead of the close of business of the lending central bank if it were decided to restrict the liquidity provision to intraday scenarios.

Collateral may need to be held with the facilitating central bank overnight. Participants in the LVPS of the facilitating central bank may need to post collateral the preceding business day to access intraday day liquidity from the lending central bank at the start of the latter's business day. All else equal, if the operating hours of the facilitating central bank precede those of the lending central bank, the participant in the facilitating central bank's LVPS may have the collateral held due to any intraday liquidity provision by the lending central bank released only the next business day. Unused collateral, however, may be returned earlier if requested, thus reducing the amount of available intraday credit accordingly.

For instance, a euro area participant seeking intraday Korean won liquidity would post collateral at the ECB for a hypothetical ECB-BOK bridge on the previous business day in Europe in order to gain access to Korean won liquidity at the start of the Bank of Korea's operating hours. Similarly, a Korean participant seeking euro intraday liquidity could have the collateral posted for any intraday liquidity provided by the ECB returned only on the next business day as the Korean LVPS may be closed when the ECB notifies the Bank of Korea of repayment.

Operational implications

From a participant perspective, there is a need for closer coordination across liquidity management teams. If collateral is intraday, one may assume that it can be reallocated across bridges operating within the same time zone. But this may not be possible for bridges operating across time zones. If bridges were in place, for instance, between Korea

and several European countries, by the close of the Korean LVPS, the liquidity management team operating in Korea would need to predefine the amount of collateral used for liquidity bridges in different European currencies (eg in EUR, GBP and CHF) and this could not be changed later.

Haircuts on collateral may need to be higher to account for the longer exposure.

The facilitating central bank might want to define a remuneration policy of any overnight cash posted as collateral if legally authorised. The collateral remuneration could also depend on the custodial model used and might need to be consistent with the remuneration of excess reserves and of cash balances held by foreign central banks.

Real-time intraday position adjustment might also need to be introduced. If the operating hours of the facilitating central bank end earlier than those of the lending central bank, participants might wish to have the option of having any posted collateral returned prior to close of business, so that it would not be retained overnight. In such a case, the amount of available intraday credit during the remaining business hours of the lending central would need to be reduced accordingly.

6. A framework for the implementation of a liquidity bridge

While the design of any liquidity bridge will be specific to the circumstances of the participating central banks, this section identifies several key elements of an implementation framework that could be considered by any central banks contemplating the establishment of a liquidity bridge.

6.1 Use

For the purposes of this report, liquidity bridges are used for the routine intraday liquidity needs of LVPS participants (ie BAU payment activity). While in recent decades central banks have established contingency-only cross-border collateral arrangements to facilitate liquidity provisions in emergency scenarios, the existence of these arrangements would not be expected to meaningfully affect the day-to-day cost and speed of cross-border payments. That said, within the boundaries of routine usage, central banks may make a policy decision to restrict the use of liquidity bridges to certain kinds of routine payment activity such as large timed payments related to participation in market infrastructures.

6.2 Central bank relationship

Central bank participation in liquidity bridges can vary with respect to the number of central banks involved, the direction of liquidity and collateral flows, and the role of the facilitating and lending central banks, including with respect to allocation of risk.

1. *Number of central banks involved:* A liquidity bridge involving only two central banks is bilateral (eg the BoE-DNB liquidity bridge). If more than two central banks are involved, the liquidity bridge is multilateral (eg the SCP between Danmarks Nationalbank, Norges Bank and Sveriges Riksbank). In a multilateral arrangement, the collateral pledged with a facilitating central bank may be used to generate liquidity from multiple lending central banks.

2. *Direction of liquidity and collateral flows (one-way or two-way/reciprocal):* In terms of liquidity and collateral flows, in a one-way relationship, collateral is always pledged in one currency in one jurisdiction and liquidity always provided in another currency in another jurisdiction. The BoE-DNB liquidity bridge allows the BoE to provide intraday GBP liquidity to the UK RTGS system participants against euro cash liquidity held in TARGET2, but the reverse (EUR liquidity against GBP collateral) is not possible. In a reciprocal or two-way relationship, either central bank could serve as the facilitating central bank or the lending central bank and participants could post

collateral in either jurisdiction in order to generate liquidity in the other. The SCP arrangement is reciprocal. Where a reciprocal bridge is established, it may be set up as two separate, one-way bridges between a pair of central banks that would permit some asymmetry in various operational, risk and technical parameters. This asymmetrical approach may be particularly desirable given that the lending central bank is most likely to bear the financial risk (see section on the allocation of financial risks). Therefore, this approach provides the lending central bank with full discretion to set risk parameters consistent with its existing frameworks, for example with regard to collateral and participant eligibility and haircuts.[14]

3. *Role of lending and facilitating central bank:* The lending central bank always provides liquidity in domestic currency against foreign currency collateral. In the existing BoE-DNB liquidity bridge arrangements, as well as in both of the scoping exercises, the role of the facilitating central bank is more passive, simply providing the custodial or cash accounts controlled by the lending central bank in which the participant's collateral is held, and facilitating the establishment of a security interest by the lending central bank in the collateral. It is also possible that the facilitating central bank may be a more active facilitator for the lending central bank by maintaining custody and management of the collateral transferred by the participant into an account under the facilitating central bank's control (rather than the lending central bank's control, as would be the case in a more passive arrangement).[15] In this case the lending central bank may establish a security interest in the collateral through the facilitating central bank providing a pledge or guarantee on the collateral. The latter active facilitator model is closer to the SCP arrangement.

4. *Allocation of financial risks:* Participating central banks would determine to what extent the various financial risks associated with a liquidity bridge would be borne by the lending central bank as opposed to the facilitating central bank. In general, including in both existing liquidity bridges, the credit and FX risk associated with the arrangement is likely to be fully borne by the lending central bank. This allocation of risk suggests that the lending central bank would be responsible for relevant risk mitigation decisions, such as defining collateral eligibility, haircuts and participant eligibility criteria.

6.3 Collateral eligibility

In concept, collateral accepted under a liquidity bridge could comprise cash and/or high-grade securities (eg government bonds). Generally, cash may present a more obvious type of collateral for intra-day operations for operational and risk reasons, including with respect to collateral valuation and haircut assignments. Accepting securities would probably introduce additional complexity such as the potential involvement of third-party central securities depositories (CSDs) in addition to valuation and haircut issues. If financial risk is borne by the lending central bank and thus it defines collateral eligibility, then the eligibility criteria will likely be stricter due to the lending central bank being less familiar with local markets, laws, and asset types than the facilitating central bank. Additional and perhaps significant challenges may arise, regardless of collateral type, if collateral denominated in the currency of the facilitating central bank is not currently accepted by the lending central bank.

The lending central bank typically secures its interest in the collateral either by transferring title or ownership of the collateral to an account under its control at the facilitating central bank, or by obtaining

[14] An alternative arrangement could be where liability is shared between the lending and facilitating central banks, which would probably require a more symmetrical design, introducing additional complexities that would need to be worked through.

[15] If collateral consists of securities, the facilitating central bank may define the applicable haircut and enable the onward liquidity provision by the lending central bank by crediting the lending central bank's account with the cash equivalent of the collateral received net of haircut.

a security interest in such collateral in such an account. Irrespective of the precise mechanism used, the security interest is defined in bilateral legal agreements between the participating central banks (discussed further below).

6.4 Haircuts

Haircuts would typically be set by the central bank bearing the credit and FX risk associated with the arrangement and be in line with its preferred policies for setting margin requirements. In general, and in the two existing examples of liquidity bridges, this is likely to be the lending central bank.

If only cash collateral is eligible for a liquidity bridge, haircuts would be designed to primarily cover intraday exchange rate risk. Cash represents a less risky asset than other forms of collateral, although is still subject to the risk of depreciation of the currency in the event of liquidating the cash collateral.[16] A pre-defined valuation haircut would be applied to the nominal amount of the cash mobilised as collateral to cover for these risks. In theory, when calibrating the haircuts, the lending and facilitating central banks could agree on a common risk measure (eg VAR or ES) for the currency pair (with potential conservative add-ons).

6.5 Collateral pledging arrangements

The lending central bank must be confident of the availability of collateral posted by the participant to secure its intraday liquidity provision and its ability to rapidly and safely enforce against and liquidate it if the participant fails to repay in full any liquidity extended under the bridge. Any collateral pledging arrangement needs to take into account national legislation and collateral frameworks.

Several options for collateral pledging mechanisms exist. One possibility is for participants to transfer collateral to a pooled account that the lending central bank maintains with the facilitating central bank, either as a customer of the facilitating central bank (ie the facilitating central bank acting as the correspondent bank for the lending central bank) or as a direct participant of the relevant RTGS (Option A).[17] Another option could be for participants to transfer collateral to a segregated pledge account that the participant itself maintains at the facilitating central bank (Option B). Option A helps ensure collateral ownership, direct control of collateral, and the ability of immediate collateral disposal in case of an event of default. Option B may be better aligned with the necessary recordkeeping of collateral pledged by individual counterparties and with the usual collateral pledge arrangement in applicable jurisdictions. Under Option B, the account in which cash collateral would be maintained would be segregated from the main account held by the participant at the central bank, with the collateral pledged to the lending central bank. The segregated pledge account would be used only for the provision of intraday liquidity by the lending central bank consistent with the agreed terms governing the liquidity bridge. These options do not preclude other options.

The implementation of both Option A and Option B requires context-specific legal and operational analysis taking into account national constraints, legal framework and collateral practices. A legal arrangement would likely need to be established to ensure that the cash collateral is transferable without restriction and immediately to the benefit of the lending central bank in case of an event of default.

[16] In the event that collateral eligibility is extended to non-cash collateral, additional haircuts or equivalent risk management measures would be required.

[17] The direct participant approach is likely to be more onerous for the lending central bank to establish compared with simply opening a nostro account with the facilitating central bank.

In the case of Option A, the legal format and contractual details of the transfer of cash collateral to an account of the lending central bank at the facilitating central bank and of the reversal of such transfer (once the credit is repaid), would need to be specified.

Additionally, collateral pledging arrangements can vary in terms of when the participant would have access to intra-day liquidity sought via a liquidity bridge. For example, one option is that participants can send and redeem cash collateral at any time during the day subject to meeting cut-off times. Another option is that participants can only send and redeem collateral at specific times of the day.

6.6 Eligibility criteria for participants

The central banks involved will define the eligibility criteria for participants in the liquidity bridge. The participant seeking liquidity via a liquidity bridge is likely to be a direct participant in the LVPS of the jurisdiction where the liquidity is sought. Eligibility may also be restricted to entities already eligible for intraday liquidity provision. This could mean that the scope of access in terms of participants may differ across the different central banks participating in a liquidity bridge. Expanding eligibility beyond participants already eligible for intraday liquidity provision from the lending central bank may pose considerable legal and operational challenges. It is likely that, in practice, the primary participants in a liquidity bridge would be international banking organisations using the bridge to facilitate their cross-border payment obligations.

In scoping a liquidity bridge framework, another consideration includes the composition of a liquidity receiver-pledgor pair and the possible legal, operational and other implications in the applicable jurisdictions. A liquidity bridge framework could require the participant receiving intraday liquidity in one jurisdiction and the entity posting collateral in another jurisdiction to be the same legal entity.[18] Alternatively, a legal entity other than the liquidity receiving participant (possibly an affiliate of the participant or otherwise) could be the collateral provider. The implications of the different structures would need to be considered in light of the legal framework in the relevant jurisdictions and the risk appetite of the central banks involved in the liquidity bridge. For the more straight-forward arrangement where the liquidity receiving participant and the collateral provider would be in the same legal entity, the availability of the liquidity bridge would be limited to only entities with foreign branches or offices. The latter structure, where the liquidity receiving participant and the collateral provider would not be required to be the same legal entity, may allow for more liquidity bridges to be established but would come with additional legal and operational complexities.[19] As such, in designing a liquidity bridge, the central banks involved may take into account, among other things, the participants' characteristics, the applicable jurisdictional requirements and their risk appetite.

6.7 Pricing and remuneration

A range of pricing options can be considered for liquidity bridges. One consideration would be consistency with a central bank's policies with respect to the pricing of domestic lending facilities. For example, a central bank may wish to consider the pricing of using a liquidity bridge relative to the pricing of domestic collateralised intraday lending facilities. Alternatively, a central bank providing uncollateralised intraday lending facilities may seek to differentiate pricing for draws through a collateralised liquidity bridge. As a

[18] A liquidity bridge may be established for a participant which is a banking organisation and which has branches or offices operating in the multiple jurisdictions, for instance.

[19] For instance, the underlying jurisdiction's regime with respect to a lender's claims over collateral pledged by an affiliate or a non-affiliated party would need to be explored.

general matter, however, if liquidity bridges are to be used and considered to be ordinary tools in the participant's day-to-day liquidity management, pricing should not be punitive nor should it differ substantially from the charge applied by the lending central bank for intraday liquidity.[20] Punitive pricing could introduce a stigma effect that discourages use to a greater degree than the simple pricing effect. However, the lending central bank may wish to consider a penalty for non-default situations in which intraday liquidity is not returned in time, for example due to an operational failure.

The facilitating central bank might elect to define a remuneration policy with respect to any cash posted as collateral on an overnight basis, for example related to time zone issues. The collateral remuneration may depend on the custodial model used and might need to be consistent with the remuneration of excess reserves and/or cash balances held by foreign central banks. Additionally, in case of overnight balances held in the name of the participant (as in collateral pledge Option B), the central bank would need to determine whether that cash would count towards the computation of reserve requirements, wherever applicable.

6.8 Size

The size of drawdowns from a liquidity bridge could potentially be uncapped (ie unlimited), that is, limited only by the amount of the eligible collateral participants have available. Alternatively, it could be a capped facility, either in terms of aggregate exposure or on a per participant basis. Establishing a notional limit per participant for the maximum amount of collateral that may be pledged for the liquidity bridge could help limit potential interference with the monetary policy operations of the central banks as liquidation of very large exposures in the event of a default might be perceived as an intervention by the central bank. Depending on where the collateral risk resides and given the possible links to collateral availability and liquidity in the facilitating central bank jurisdiction, these caps may be imposed by either the lending central bank or the facilitating central bank, and/or codified in the legal agreement between them. In an uncapped liquidity bridge, a risk mitigation option could be for the central banks to retain the right to reject an extremely large amount of borrowing on a situational basis without the need to impose ex ante caps.

6.9 Operating hours, duration of liquidity availability and collateral encumbrance

The intended duration of the liquidity provided via a liquidity bridge is intraday and is designed to facilitate the intraday liquidity needs of direct LVPS participants. Intraday liquidity provision of this nature should have no impact on overnight reserve balances. However, differences in time zones and operating hours between central bank participants in a liquidity bridge may impact the period over which collateral is encumbered at the facilitating central bank. In addition, the overnight encumbrance of collateral may have implications for the design of liquidity regulation, as outlined in Section 4.5 (Intersection with liquidity regulation).

Differences in time zones and operating windows between the participating central banks may not be insurmountable, though they could have implications for cut off times and duration of collateral encumbrance. For example, in a hypothetical liquidity bridge with limited overlapping LVPS operating hours, drawdowns from the liquidity bridge may be possible only while the facilitating central bank is still able to receive collateral, which would significantly shorten the bridge's operating window. Moreover, as

[20] Central banks may, however, want to apply a flat fee aimed at cost recovery for joining the scheme. In these circumstances, participants may be indifferent, once they have joined the scheme, between using local currency collateral or cross-currency collateral pledged through the liquidity bridges.

funds could only be returned after the close of the facilitating central bank's LVPS, collateral would not be returned until the LVPS re-opened the following business day. Alternatively, participants could pre-position collateral at the facilitating central bank in anticipation of future liquidity needs. This could limit the fungibility of the collateral pool at the facilitating central bank and increase the opportunity cost of the encumbered collateral, thus limiting the usefulness of liquidity bridges in such cases. The fundamental reality in these circumstances is that, while the liquidity provision via a bridge would remain intraday, differences in operating hours would lead to an overnight collateral encumbrance.

Real-time intraday position adjustment might also need to be introduced. If the operating hours of the facilitating central bank were to end earlier than those of the lending central bank, participants might wish to have the option of having any posted collateral returned prior to close of business in order not to hold it overnight. In such a case, the amount of available intraday credit during the remaining business hours of the lending central would need to be reduced accordingly.

One solution for addressing the limited overlap in the operating hours of the LVPS involved in a liquidity bridge could be to extend these operating hours and those of the collateral management systems of the central banks involved in order to lengthen the overlap. Although this solution would increase the usefulness of the bridge, it may not always be feasible to implement.

6.10 Operational communication flows

The execution and processing of timely message flows between the lending and facilitating central banks are fundamental to the success of a liquidity bridge. In particular, it is likely to be helpful for participating central banks to facilitate (i) the single-step processing of information on the availability of collateral and its encumbrance, and (ii) the initiation and termination of lending. Some pairs of central banks may be able to establish messaging and processing flows quickly, particularly where central banks and/or the LVPS rely on common messaging protocols (eg SWIFT) and the relevant account infrastructures and collateral management systems are well integrated. In other cases, there may not be an immediately available mechanism that would allow for such flows to be processed easily in real time, and central banks may need to establish multi-step operational processes in order to generate, transmit and process messages. Such operational set-up constraints may affect the degree to which credit becomes available to participants in real time and may thereby limit the usefulness of a liquidity bridge. Central banks may be able to overcome such challenges by developing automation to enable the automatic transmission and straight-through processing of relevant messaging.

6.11 Legal considerations

Before two or more central banks establish a liquidity bridge, a number of foundational legal issues must be considered.

First and foremost, the lending central bank(s) would need to have the statutory or regulatory authority to lend to participants in its LVPS system against collateral denominated in other currencies and held abroad. Additionally, central banks would need to assess the legal implications of different liquidity bridge frameworks such described in Section 6.6 (Eligibility criteria for participants)

A second key issue relates to how interest in collateral is typically secured in a jurisdiction (whether through a transfer of such collateral directly into a lending central bank's account or indirectly through a control account arrangement over a participant's account). This presents an important distinction with implications for considering the requisite collateral pledge arrangements and procedures for the liquidity bridge.

Establishing a liquidity bridge would require the development of robust legal documentation to define the arrangement between the relevant central banks, and between the central banks and

participants themselves. For example, these legal documents would typically be expected to cover the types of account provided; standard of care and their terms of use; terms of the liquidity provision and security interest in the collateral; definition of and procedures to follow in the event of a participant default; data protection; anti-money laundering and indemnities; rights and obligations of each party and other relevant issues. Differences in legal systems and authorities granted to the central bank (eg regarding settlement finality, liability, indemnification, authorised collateral types, authorised account usage or pledging issues) could pose challenges, especially where the jurisdictions involved do not share similar legal traditions and conventions. Here, too, there may be value in an asymmetrical arrangement that allows each central bank to ensure that the liquidity bridge complies with its own legal frameworks.

6.12 Conclusions on the design features of liquidity bridges

Given the combination of the parameters outlined above, liquidity bridges may be implemented in several different ways. This is illustrated by both the examples of liquidity bridges currently in operation and the scoping exercises conducted. Three interwoven conclusions can be drawn.

First, the choice of the parameters should reflect and be consistent with the legal and operational frameworks of the participating central banks to mitigate legal and operational risks, facilitate implementation, and avoid conflict with existing domestic arrangements.

Second, in line with the premise stated above, in bilateral or multilateral arrangements, the liquidity bridge parameters might differ between the participating central banks. Such asymmetry may span most of parameters discussed in this section and beyond. For example, the arrangements established to secure the interest of the lending central bank in the collateral provided may differ; the eligibility of the participants may equally vary depending on the type of participant eligible for intraday credit in each jurisdiction; and haircut imposed on collateral may vary to reflect the credit risk control frameworks of the respective central banks. These differences may be desirable to the extent that they ease implementation and ensure the effectiveness of the risk management, operational and legal arrangements and do not undermine per se the effectiveness of a liquidity bridge.

Third, liquidity bridges are operationally relatively simple constructs that may often not require extensive infrastructure investment to establish and run. They need to be designed carefully, but there would be no fundamental technical obstacles to creating a liquidity bridge, at least between the pairs of central banks participating in the scoping exercises.

7. Conclusion and outlook

Well designed liquidity bridges can help to reduce the funding costs incurred by banks (and other payment services providers) that make cross-border payments. In particular, liquidity bridges may help improve the efficiency and effectiveness of the global liquidity pool of banking groups operating in several currencies and reduce transaction costs by allowing participants to raise short-term liquidity in different currencies without having to execute an FX trade. Liquidity bridges can also reduce the opportunity costs of cross-border payments as participation in cross-border payment systems and arrangements requires PSPs to hold liquidity buffers in multiple currencies. In this way, they may lower barriers to entry for banking groups when providing cross-border payment services in multiple jurisdictions, thereby reducing reliance on correspondent banking relationships and shortening transaction chains.

Beside cross-border payments, liquidity bridges can generally support the efficiency of global liquidity pools as they could allow surplus collateral held in one jurisdiction to facilitate the intraday provision of liquidity in another jurisdiction where a PSP may experience larger temporary outflows due to domestic liquidity factors. Without liquidity bridges, either precautionary liquidity buffers may need to

be higher to ensure the fulfilment of payment obligations or assets may need to be rapidly liquidated and temporarily converted into the currency of the liquidity shortfall, possibly exacerbating disorderly market conditions.

The experience of existing liquidity bridges and findings from the bilateral scoping exercises for the establishment of hypothetical liquidity bridges suggest areas for further exploration and analysis that could be undertaken by authorities contemplating the formation of a liquidity bridge as set out in Section 6. There are practical challenges to implementing a liquidity bridge, and central banks would need to assess and manage the legal, operational and financial risks and costs that can arise from liquidity bridges as well as considering the broader policy implications. They would also need to assess the additional benefits liquidity bridges provide relative to existing intraday lending facilities and relative to the extent to which the private sector can fulfil this role via the correspondent banking network and FX (swap) markets.

Considering these risks and the fixed setup and ongoing operational costs that may be consequential for some central banks, liquidity bridges may be more effective and useful in some cases rather than others. They may be particularly useful between jurisdictions with low currency volatility and with a high volume and value of cross-border payments, and a degree of overlap in the participants and operating hours of the respective LVPS.

The work of building block 11 will be focused on facilitating technical assistance by relevant bodies to central banks considering establishing liquidity bridges. Technical assistance could take a number of different forms and might entail knowledge-sharing among central banks as well as the involvement of international financial institutions. The technical assistance should respond to the particular needs and requirements of the central banks considering the formation of liquidity bridges. As discussed in this report, the specific details of a liquidity bridge may vary based on the circumstances of the currency areas in question, the risk appetites of the participating central banks, the relevant legal frameworks, and other factors.

As a general matter, the CPMI will continue to be attentive to the impact that developments in cross-border payments (including in response to progress on other building blocks) may have on the practical usefulness of liquidity bridges or how they could be designed. For example, the emergence of new PvP solutions (BB9) or multilateral platforms (BB17) could help ease certain operational aspects of central bank liquidity bridges and cast a new light on their potential usefulness. Similarly, progress towards extending and aligning RTGS operating hours (BB12) could simplify the design of liquidity bridges between central banks in distant time zones. The developments with regard to the tokenisation of collateral and impact on liquidity bridges and the relevance of LBs in the context of mCBDC arrangements (BB 19) would also continue to be monitored.

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[21] The Committee on Payment and Settlement Systems (CPSS) changed its name to Committee on Payments and Market Infrastructures in September 2014. References to reports published before that date use the Committee's old name.

Annex 1: Actions and milestones for building block 11 – Exploring reciprocal liquidity arrangements across central banks (liquidity bridges)

The full actions and milestones for BB 11 are outlined below, based on the G20 roadmap (FSB (2020a)) and the first consolidated progress report (FSB (2021b)).

The dates for each milestone in the table indicate the start date and completion date for the steps described in the milestone. For all actions in 2021 and 2022: actions and dates are committed deliverables. The content of actions and dates of milestones beyond end-2022 are indicative (see FSB (2020b and 2021b)).

Actions and milestones

Action 1: Exploration, experimentation and piloting by pioneering central banks

CPMI to consult central banks that have established, are willing to pilot or are in the process of implementing reciprocal liquidity arrangements on aspects such as (i) reciprocal account opening; and (ii) operational procedures to enable robust accounting in real-time for creating (and unwinding) liquidity and accepting (and returning) collateral in foreign currency.

November 2020–November 2021

Action 2: Analysis of concrete practical experience to identify the benefits and risks of liquidity bridges and development of a framework on how to establish them

CPMI together with relevant authorities, central banks and SSBs to conduct an in-depth analysis of existing/envisaged liquidity bridges and the benefits and risks they can bring to cross-border payments (drawing on examples from Action 1) and publishing a framework and procedures on how a liquidity bridge can be established.

July 2021–July 2022

Action 3: Technical assistance for implementation of liquidity bridges

CPMI to develop technical and operational approaches on entity-level and/or required industry-wide rule changes to support the respective end states for authorities and operators aiming to extend/align operating hours.

October 2021–March 2022

Relevant bodies to provide technical assistance to central banks considering establishing liquidity bridges.

From August 2022 onwards

Annex 2: Past central bank-sponsored work on cross-border collateral arrangements

In the early and mid-2000s, two efforts explored the need for cross-border liquidity arrangements and their feasibility. In March 2003, the Cross-border Collateral Pool Task Force of the New York Fed-sponsored Payment Risk Committee (PRC) published a report entitled "Managing Payment Liquidity in Global Markets: Risk Issues and Solutions", which examined the need for enhanced cross-border intraday liquidity services and evaluated possible private and public sector solutions. Following the publication of that report, in 2004 the then Committee on Payment and Settlement Systems (CPSS) commissioned a working group which further analysed institutional arrangements through which central banks could accept foreign collateral on a routine and/or emergency basis to support intraday and/or overnight credit. The working group also identified areas for potential coordination and coordination among the then G10 central banks.

The PRC report responded to medium- and long-term developments in the global payments environment, which had seen significantly increased demand for intraday liquidity by commercial banks, including in foreign markets. Those developments included the widespread adoption of RTGS systems by central banks, overall growth in financial market activity resulting in increasing funding requirements for commercial banks, particularly associated with the concentration of activity in securities, derivatives, and funds clearinghouses, the move towards delivery versus payment (DvP) for securities settlements, greater asymmetry in payment flows and a growing role for foreign banks in local markets. Additionally, the advent of CLS Bank and resulting need for participants to make large value, timed payments in multiple currencies was cited as a particular factor.

The report observed that the provision of intraday liquidity (typically collateralised) within multiple RTGS systems by the then G10 central banks was "generally viewed to be sufficient to support commercial banks' domestic payment activities." Nevertheless, access by commercial banks to central bank intraday liquidity in foreign markets was inherently constrained, particularly given commercial banks' inherently limited holdings of foreign currency collateral that would be acceptable to foreign central banks. Meanwhile, existing holdings of liquid, low-risk collateral were subject to increasing demands, expected to further accelerate. The Task Force indicated concern that these factors, in conjunction with the growing interconnectedness of domestic and international markets and market infrastructures, could increase the potential for a single event in one market or system to immediately affect others and cause global disruption.

The Task Force's interest in enhanced intraday liquidity availability focused on access to intraday liquidity by participants operating in foreign markets. While the report indicated that the robust supply of intraday liquidity on a routine basis was critical to support timed payments and reduce the likelihood of systemic disruption, the availability and reliability of such liquidity during periods of market stress was a key goal. This distinguishes that work from the objectives of the current work on liquidity bridges, which is focused on facilitating routine intraday liquidity to enhance cross-border payments. Further, the report did not narrowly address cross-border payments as a use case. Rather the report focused on intraday liquidity enhancements that could support a wider range of foreign currency obligations, including those related to securities and derivatives settlements.

The Task Force identified possible actions that could be implemented by both central banks and the private sector. However, the report characterised the identified private sector actions – including commercial bank-provided intraday real-time repos, currency swaps and collateral swaps, as well as cross-border pool facilities – as probably lacking sufficient depth to function reliably in terms of market stress. Further, a number of those solutions also relied upon the willingness of commercial banks to accept credit risk – the regulatory cost of which may make such solutions less realistic in the wake of the post-Great Financial Crisis regulatory reforms.

The Task Force made stronger and more specific recommendations to central banks, calling upon them to expand the range of eligible collateral for intraday RTGS liquidity to include high-quality, liquid foreign collateral. The report outlined various models for facilitating broader G10 central bank acceptance of cross-border collateral, comprising variations of both a securities collateral pool (where a central bank would provide liquidity to a payment system participant based on securities collateral), and a cash collateral pool (where a central bank would provide liquidity to a participant based on the acceptance of foreign currency cash collateral). In the cash collateral pool model, a possible variation included options with respect to which entity plays the role of liquidity provider (ie the "away" or foreign central bank in its domestic currency, or the participant's home central bank using its official FX reserves).

For both the securities collateral pool model and cash collateral pool model, a key variation included assignment of the custodian/collateral manager role ("away" or foreign central bank vs home central bank vs third-party agent). A central bank guarantee option was also identified, whereby a home country central bank would provide a guarantee on behalf of a domestic institution to a liquidity-providing "away" (foreign) central bank, based on the pledging of domestic cash collateral by the domestic institution. Certain of these models closely resemble the liquidity bridges outlined in this report, in particular: (1) a cash collateral pool "away" central bank option, where a foreign central bank provides liquidity to a RTGS system participant based upon the pledging of cash at that participant's home central bank, and (2) a securities collateral pool home central bank option, where the home central bank serves as custodian and collateral management agent for a foreign central bank providing intraday liquidity.

The Task Force most strongly endorsed a securities collateral pool model, operated by a third-party agent (TPA) – most likely an ICSD. Under this preferred model, payment system participants would deliver collateral to a designated account held in the name of the liquidity-providing central bank at the TPA. The TPA would perform custody and collateral management responsibilities and provide relevant confirmation services. The Task Force saw important advantages to this model as it could achieve near 24-hour availability for collateral services without requiring changes to central banks' operating hours. The model would also leverage infrastructure and capacity already in place at ICSDs, as well as existing concentrations of participant collateral already in custody at these institutions, reducing the operational burden for central banks.

In addition, the CPSS working group in 2006 outlined a set of potential central bank actions on the basis that central banks take an "à la carte" approach where each central bank can choose the approach best suited to its particular circumstances. Potential areas of cooperation cited were support for central bank partners in implementing the arrangement of their choice (eg sharing assessments of critical infrastructures such as ICSDs and establishing information-sharing arrangements) and measures to foster increased harmonisation of collateral practices (eg coordination of eligible collateral lists) and the legal aspects of cross-border collateralisation. Ultimately, however, global momentum for cross-border collateral arrangements has waned due to the excess liquidity conditions in many jurisdictions as a result of large-scale asset purchases by central banks.

Annex 3: Functioning of existing liquidity bridges

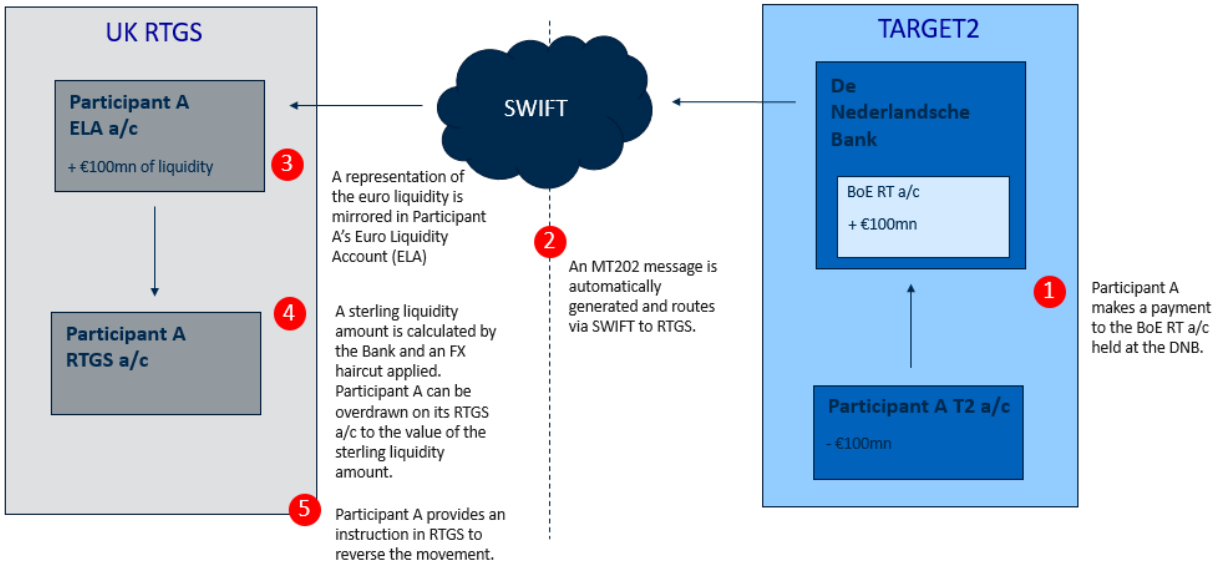
Bank of England (BoE)-Netherlands Bank (DNB) liquidity bridge

In this example, Participant A wants to generate GBP liquidity using euro cash it holds in TARGET2. Participant A is a direct member of both the UK RTGS system and TARGET2.① DNB is the facilitating central bank and BoE is the lending central bank. Participant A uses the liquidity bridge in five steps (Graph 3.1):

1. Participant A initiates a cash payment from its TARGET2 account to the UK RTGS system account held at the DNB.
2. A SWIFT② message is sent across the bridge.
3. A representation of the euro balances delivered to the BoE's account at the DNB by the participant are 'mirrored' in Participant A's Euro Liquidity Account (ELA) in the UK RTGS system.
4. The GBP equivalent amount is calculated against the euro exchange rate that is set in the UK RTGS system each evening. A haircut to address exchange rate volatility is deducted, resulting in the amount by which the participant is allowed to be overdrawn on its account in the UK RTGS system. The FX haircut is set at 6% to reflect potential EUR/GBP exchange rate volatility.
5. When Participant A has finished using the GBP liquidity, it sends an instruction in the UK RTGS system to reverse the transfer.

A legal requirement③ exists whereby the reversal must be performed prior to the TARGET2 end of day (18.00 CET). If the participant fails to do this (for example, because of an operational issue) then the BoE will hold the euro liquidity overnight, but this is highly undesirable.④

BoE-DNB liquidity bridge process flow — Graph A3.1



① It is not required that the participant entity (legal entity) be the same in both UK RTGS system and TARGET2. ② SWIFT (Society for Worldwide Interbank Financial Telecommunication) provides a messaging network for financial institutions to send and receive payment messages. ③ As per the legal agreement's terms and conditions between the BoE and direct participants in the UK RTGS system eligible to participate in the BoE-DNB liquidity bridge. ④ The ECB and/or DNB can levy penalties against participants for holding euro liquidity overnight.

Source: Bank of England.

Scandinavian Cash Pool (SCP)

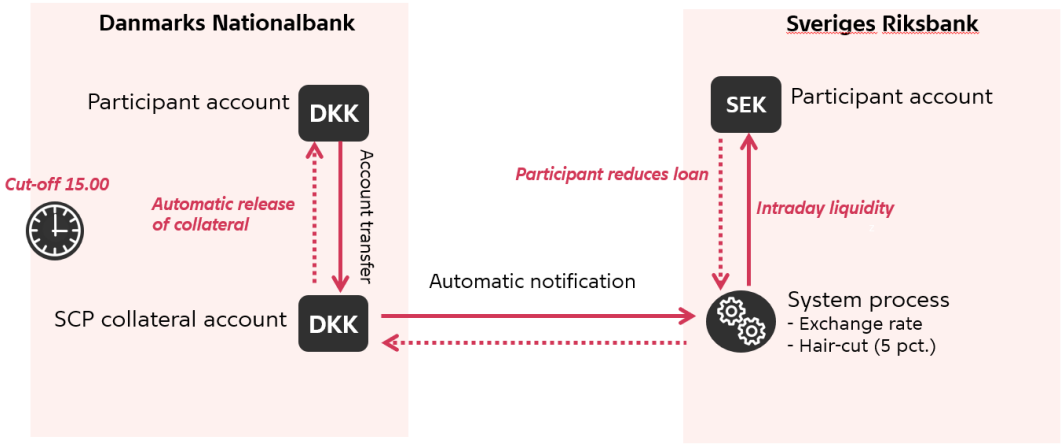
In the example below (Graph 5), a participant in Danmarks Nationalbank wants to generate SEK liquidity for use at Sveriges Riksbank. Danmarks Nationalbank is the facilitating central bank and Sveriges Riksbank is the lending central bank.

In Danmarks Nationalbank the participant transfers from its current account to its SCP collateral account DKK liquidity that is pledged to Sveriges Riksbank. Danmarks Nationalbank then automatically notifies Sveriges Riksbank of the pledged amount in DKK. After receiving the message, the exchange rate and a haircut are automatically applied at Sveriges Riksbank and the amount in SEK is made available to the participant as intraday liquidity. Upon the participant's repayment to Sveriges Riksbank (the dotted lines), Danmarks Nationalbank is automatically notified, and the collateral initially pledged at Danmarks Nationalbank is released.

If by 16:45, CET the credit is not repaid, Sveriges Riksbank may enforce its collateral rights by notifying Danmarks Nationalbank to transfer the pledged collateral to an account in Danmarks Nationalbank owned by Sveriges Riksbank.

The example above covers the arrangements between Danmarks Nationalbank and Sveriges Riksbank. Similar arrangements are in place between Danmarks Nationalbank and Norges Bank (and vice versa in all cases).[22]

Scandinavian Cash Pool example — Graph A3.2



Source: Danmarks Nationalbank.

[22] Even though the SCP is a three-way arrangement it consists of bilateral agreements and separate bilateral account setups between each central bank. As such collateral is always pledged in one currency in one jurisdiction and credit always provided in another currency in another jurisdiction.

Annex 4: Cross-border Payments Liquidity Workstream

Chair of the Workstream

Ulrich Bindseil (European Central Bank)

Members

European Central Bank	Guido Della Valle Andreja Birsa (Alternate, until April 2021) Maria Huhtaniska-Montiel (Alternate, from April 2021)
Bank of Italy	Federico Semorile
Bank of Korea	Sangho Park Sanghyun Song (Alternate)
Central Bank of the Russian Federation*	Mikhail Bolshakov* [until February 2022]
Saudi Central Bank	Ibrahim Alsughyer
South African Reserve Bank	Shaun Rayfield Jeannie Weilbach (Alternate)
Central Bank of the Republic of Türkiye	Hakan Er Esra Dönmez Haşimi (Alternate)
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Federal Reserve Bank of New York	Catherine Lomax (from August 2021) Sishush Maru (Alternate)

Observers

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* The access of the Central Bank of the Russian Federation to all BIS services, meetings and other BIS activities has been suspended.

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Annex 5: Acronyms and abbreviations

BAU	business as usual
BIS	Bank for International Settlements
BoE	Bank of England
CBCA	cross-border collateral arrangements
CCBM	correspondent central bank model
CET	Central European Time
CLS	CLS Bank International
CMS	collateral management service
CPMI	Committee on Payments and Market Infrastructures
CPSS	Committee on Payment and Settlement Systems
CSD	central securities depository
DKK	Danish krone
DNB	Netherlands Bank
ELA	Euro Liquidity Account
EMDE	emerging market and developing economy
FATF	Financial Action Task Force
FMI	financial market infrastructure
FPS	fast payment system
FSB	Financial Stability Board
FX	foreign exchange
G10	Group of Ten
G20	Group of Twenty
GBP	British pound sterling
ICSD	international central securities depository
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
ISO	International Organization for Standardization
LVPS	large-value payment system
NOK	Norwegian krone
PRC	Payment Risk Committee
PFMI	Principles for Financial Market Infrastructures
PSP	payment service provider
PvP	payment versus payment
QE	quantitative easing
RTGS	real-time gross settlement
SCP	Scandinavian Cash Pool
SEK	Swedish krona
SSS	securities settlement system
SWIFT	Society for Worldwide Interbank Financial Telecommunication
TPA	third-party agent
USD	United States dollar
ZAR	South African rand