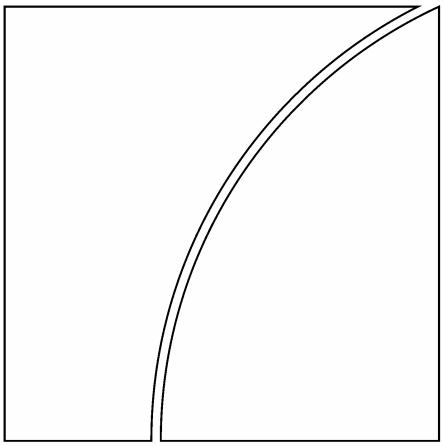
Committee on Payment and Settlement Systems



Cross-border collateral arrangements

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Foreword

The Committee on Payment and Settlement Systems (CPSS) has long given attention to liquidity issues arising from commercial banks' use of payment systems. And because collateral plays an important role in securing the credit extended by a central bank, these liquidity issues are deeply interrelated with policies stipulating the terms and conditions under which a central bank accepts collateral. During the past few years, with the globalisation of financial markets and the increasing use of collateral to mitigate counterparty risks in financial market transactions, the banking community has discussed the potential to use collateral in one country or currency to obtain liquidity in another.

In this context, and under the leadership of its former chairman, Tommaso Padoa-Schioppa, the Committee established a working group to investigate: (i) calls for central banks to accept collateral denominated in a foreign currency or located in a foreign jurisdiction in order to support intraday or overnight credit, either routinely or in extraordinary situations; (ii) the existing institutional arrangements through which central banks accept foreign collateral; and (iii) alternative models for the acceptance of foreign collateral. As part of this effort, the working group conducted a series of interviews with selected internationally active banks.

The report notes that large internationally active banks must manage their collateral and liquidity in multiple currencies and jurisdictions, and, as a result, they are developing new techniques to conserve collateral and liquidity. Accordingly, accepting foreign assets as collateral, either routinely or only in extraordinary circumstances, is an option that central banks could take in order to address commercial banks' intraday liquidity requirements.

At the same time, the diversity and complexity of domestic financial markets, liquidity usage, and the operational structure of G10 central banks suggest a wide range of approaches regarding whether, and, if so, under what circumstances, it would be appropriate for an individual central bank to take cross-border collateral. Thus, the G10 central banks agreed on adopting an "à la carte approach", under which it is left to each central bank at this stage to decide independently its policies on foreign collateral. Hence, this report is intended to serve as a guide for central banks as they review the potential costs and benefits associated with accepting cross-border collateral in the context of their financial markets. In addition, the report recognises that some forms of coordination and cooperation among central banks may increase the effectiveness of an individual central bank's policies and actions, or may aid the private sector in developing more advanced tools for managing collateral and liquidity.

The CPSS is very grateful to Tommaso Padoa-Schioppa for supporting this project, and to the members of the working group, its chair, Koenraad De Geest (until December 2004) and Daniela Russo (from January 2005), both from the European Central Bank, and the CPSS secretariat at the BIS for their excellent work in preparing this report.

Timothy F Geithner, Chairman
Committee on Payment and Settlement Systems

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Introduction and executive summary

Background

The Committee on Payment and Settlement Systems (CPSS) has long been involved with liquidity issues related to market infrastructure and payment systems. During the past 10 years, the CPSS and other Basel committees[1] have focused attention on the use of collateral in financial transactions, including the cross-border use of collateral.[2]

Recently, the CPSS has discussed the issue of foreign collateral in relation to the request from some market participants that the Group of Ten (G10) central banks consider accepting G10 sovereign debt as collateral for G10 central bank credit arrangements.

In early 2004, the G10 Governors requested three Basel committees to analyse the issue of liquidity provision, particularly during times of stress, and its possible implications for central banks.

In this context, the CPSS commissioned a working group to analyse institutional arrangements through which central banks could accept foreign collateral on a routine and/or emergency basis to support intraday and/or overnight credit, and identify potential policy issues.[3]

In this report, collateral is defined as *foreign*, or *used cross-border*, if, from the perspective of the jurisdiction in which the assets are accepted, at least one of the following is foreign: the currency of denomination, the jurisdiction in which the assets are located, or the jurisdiction in which the issuer is established. *Emergency* is defined here as a situation resulting in a large, extraordinary and unexpected liquidity shortage, which may arise on a local, regional or global basis.

The report represents the conclusions of the working group, drawing on the CPSS central banks' experience and the outcome of a series of interviews with selected internationally active banks held in December 2004 and the first quarter of 2005. After analysing the trends in the cross-border use of collateral, it reviews the main policy considerations raised by having central banks implement cross-border collateral arrangements. Based on the existing arrangements already in use, the report describes and evaluates five generic models that could be implemented by central banks and suggests a range of possible central bank actions, including encouragement of private sector initiatives. In this regard, the CPSS takes note of the initiative of the Payments Risk Committee to propose some private sector solutions that will facilitate intraday liquidity management for internationally active banks.[4]

Cross-border use of collateral

Over the last three decades, banks and other financial institutions have been expanding operations outside their country of incorporation. This process of globalisation has left banks with the challenge of managing liquidity in multiple currencies and jurisdictions.

At the same time, the stronger emphasis on risk management in both the conduct of wholesale payments and securities businesses and the design of market infrastructure has been reflected in the shift towards real-time gross settlement (RTGS) in large-value payments and delivery versus payment (DVP) in securities settlement, which are typically associated with higher liquidity pressures. Furthermore, liquidity demands have become concentrated on certain high-flow payment days or times during the operating day, and are becoming increasingly time-critical. Key implications of these developments that banks are facing are the more complex liquidity management requirements in using

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[1] The CPSS, the Committee on the Global Financial System (CGFS) and the Basel Committee on Banking Supervision (BCBS) serve as forums for the central banks of the Group of Ten countries (G10).

[2] See *Collateral in wholesale financial markets: recent trends, risk management and market dynamics*, CGFS, March 2001.

[3] The report analyses only the cross-border use of collateral and does not consider issues associated with the use of currency swaps.

[4] See *Global payment liquidity: private sector solutions*, PRC, Report by the Global Payment Liquidity Task Force, October 2005. The Payments Risk Committee (PRC) is a private sector group of senior managers from US banks that identifies and analyses issues of mutual interest related to risk in payment and settlement systems.

the payments and securities settlement infrastructure, and the growing importance of collateralisation as a widespread risk mitigation technique. Further, the increasing collateralisation to support both demands for central bank credit and other wholesale market business means that, in some cases, there are now competing demands on banks' collateral holdings.

On the other hand, the working group identified some factors that have an offsetting effect on collateral demands and constraints. New design features implemented in some new large-value payment systems,[5] such as offsetting algorithms in RTGS systems and the combination of bilateral or multilateral netting with real-time settlement functionality can significantly reduce the liquidity burden on system participants, thereby reducing the potential demand for intraday credit and the associated need for collateral. Similarly, automated supply-driven self-collateralisation procedures in securities settlement systems (SSSs) and banks' implementation of in-house liquidity- and collateral-saving payment management techniques, help to mitigate liquidity pressures.

Notwithstanding the efforts of the public and private sectors to manage the upward pressure on the demand for collateral, internationally active banks may, under certain circumstances, still face liquidity and collateral pressures in foreign, and even domestic, markets. Such banks may find it costly to hold sufficient quantities of eligible collateral in every market in which they operate directly, and may face mismatches between the location of their liquidity needs and the collateral they hold. Although, at present, interviewed market participants see no evidence of collateral shortage in routine situations, there is a concern that in emergency scenarios, especially in cases of systemic crises, existing arrangements could prove inadequate.

Existing central bank cross-border collateral arrangements

It is against this backdrop that central banks analysed arrangements for the cross-border use of collateral. Cross-border use of collateral either on a routine or on an emergency-only basis may be an effective policy response to alleviate collateral pressure.

Several central banks (in Sweden, Switzerland, the United Kingdom and the United States) have already introduced such facilities and have adopted a range of approaches to accepting these assets. In the Eurosystem, too, there is extensive use of cross-border collateral among the euro area countries, although this is currently limited to euro-denominated collateral assets issued in the European Economic Area (EEA) and settled/held in the euro area. The existing arrangements vary from emergency-only facilities through infrequently used routine cross-border collateral arrangements to arrangements used extensively on a routine basis.

The following considerations, among others, have influenced central banks' decisions to implement cross-border collateral facilities: (i) the size and international orientation of the local financial sector and wholesale markets; (ii) the high liquidity and collateral demands of the local payment system relative to the size of the local debt market; (iii) the significant presence of large internationally active banks in the local payment system; and (iv) the highly integrated financial markets and banking sector in the countries concerned.

Policy considerations for central banks

The acceptance of foreign collateral suggests a number of policy considerations that may influence central bank approaches to foreign collateral. These considerations include its potential effects on global systemic risks, monetary policy implementation, and the smooth functioning of payment systems, as well as its implications for competition in financial markets and between payment system participants. In particular, central banks must be aware of the trade-offs among policy considerations that may arise in assessing whether the acceptance of cross-border collateral helps improve a central bank's ability to extend credit in either emergency or routine situations.

Whether cross-border use of collateral can deliver significant overall benefits depends largely on a number of factors, including the characteristics of the local banking sector and financial markets along

[5] For more details, see *New developments in large-value payment systems,* CPSS, May 2005.

with relations/links with international financial markets and infrastructure. The analysis undertaken by the working group, alongside findings from the interviews held with internationally active banks, reveals considerable variety in banks' international activities and their liquidity and collateral management approaches. Similarly, domestic financial infrastructures vary considerably from country to country. This complexity and heterogeneity in the environment imply potentially differing demands for the cross-border use of collateral and a variety of potential risks and cost reduction benefits. Furthermore, the policy effects could differ quite substantially depending on the characteristics of the particular mechanism used for accepting cross-border collateral as well as whether the facility is operated on a routine or on an emergency basis.

In general, routine cross-border collateral arrangements might facilitate the extension of intraday or overnight credit against collateral held abroad under circumstances where it is deemed desirable by the central bank extending the credit. In certain countries, such acceptance of foreign collateral might work to increase the flexibility of banks in obtaining credit and reduce its overall cost. Furthermore, a routine cross-border collateral arrangement could act as a natural "shock absorber" in an emergency, at least for those participating directly in the arrangement, and in case of local shocks. In addition, the more frequently these participants used such an arrangement, the more familiar they would be with the related infrastructure, and hence the greater their confidence that it could be accessed effectively in a crisis.

Some central banks have noted that the routine acceptance of cross-border collateral may have some potential to affect the competition between market participants, depending on the domestic market structure and the particular characteristics of the arrangements used. In addition, routine acceptance could have some impact on the demand to hold balances of specific currencies, on the demand for government debt, and on the concentration of business in some financial centres, with a negative effect on smaller markets and currencies. Moreover, a significant potential drawback of routinely used cross-border arrangements is that they may increase the interdependence of certain markets. This could be exacerbated to the extent that a bank may have an incentive to economise on precautionary collateral holdings in each market, leading the bank to reduce its ability to obtain credit quickly in an emergency.

Some central banks note that the emergency use of cross-border collateral has the potential to promote financial stability during a crisis. Based on the interviews, emergency-only facilities would probably appeal to a larger community of users, although it is acknowledged that only a limited number of internationally active banks will fully reap the benefits. In particular, in some circumstances, such cross-border collateral arrangements could allow banks to access collateral assets in a market that may not have been directly affected by the emergency. Further, if foreign assets are only accepted in case of emergency and there is a low probability that an emergency-only facility will be triggered, banks may have a lower incentive to economise on precautionary collateral holdings and will, therefore, have a larger pool of collateral on which to draw in the event of an emergency arising.[6] Such a result would to some extent alleviate the concerns that establishing cross-border facilities would reduce the overall collateral holdings of banks.

Issues relating to jurisdictional conflict, regulation, taxation and exchange controls also arise in cross-border securities transactions. Although these issues may be very complex, they could be crucial in evaluating the costs and risks of accepting foreign collateral.

These and other policy considerations are explained in Chapter 2.

Central bank approach

The variety of current central bank collateral policies and practices, and differing participants' needs, procedures and legal frameworks from country to country, imply that no single solution or model for cross-border use of collateral fits all central banks' requirements and all market conditions. Thus, the G10 central banks agree that an "à la carte approach" to cross-border collateral policies is the most appropriate response at this stage. In practice, a central bank might choose from a range of potential

[6] See M Manning and M Willison, "Modelling the cross-border use of collateral in payment systems", *Bank of England Working Paper*, no 286, 2006.

cross-border collateral options, depending on its particular circumstances. Each central bank should carefully analyse, prior to implementation, potential risk and cost implications and possible risk mitigation measures.

An important initial assessment is whether there is a need to use cross-border collateral at all and, if so, whether the central bank will implement arrangements on a routine or on an emergency-only basis. Some central banks consider that the strongest immediate case in many countries may be made for emergency-only facilities, given the relatively low level of direct foreign participation in their payment systems and the absence of a pressing need for routine cross-border arrangements among domestic banks. Other central banks note that there is a case for routine cross-border collateral arrangements in their markets, particularly to facilitate liquidity management for internationally active banks participating directly in systemically important payment systems. Central banks may implement a combination of both routine and emergency arrangements, with several G10 central banks having already taken action in this regard.

Potential central bank actions

Notwithstanding the differences described above, further cooperation and coordination among central banks may be desirable to make the actions of individual central banks more effective while also addressing possible common needs and ensuring readiness to address future challenges. Central banks might consider various options with regard to the needs described above, including encouragement of private sector initiatives, individual domestic market responses, internationally coordinated encouragement of infrastructural enhancements, and bilateral or multilateral central bank cooperation.

On this basis, the following set of potential central bank actions can be identified, with each central bank tailoring its specific actions to the circumstances and needs of its financial markets and to any existing framework between the two currency areas to be "connected":

- supporting central banks' partners in implementing a cross-border arrangement of their choice, where appropriate. For instance, central banks may determine a framework for sharing assessments of critical infrastructures (eg (international) central securities depositories, links), determining inter alia the purpose and content of the information exchanged. Another possibility is coordinating responses and information exchange by central banks in the event of a severe emergency situation;
- acceptance of additional categories of foreign collateral, through either existing or new cross-border collateral arrangements (at least for emergency use);
- enhanced coordination (and cooperation) among the G10 central banks with respect to the elimination of operational and legal constraints.

Furthermore, to foster the enhancement of market infrastructures and to facilitate progress towards smoother and more efficient cross-border use of collateral, central banks, perhaps in cooperation, might also take actions to promote private sector solutions related to:

- risk mitigation in collateralisation practices;
- interoperability between relevant infrastructures.

These potential actions are elaborated in Chapter 4.

Possible cross-border arrangements

The report describes five generic cross-border collateral arrangements, each of which requires some action by central banks and might be implemented separately or in combination: (i) correspondent central banking model (CCBM); (ii) guarantee model; (iii) links between securities settlement systems; (iv) remote access to a securities settlement system; and (v) collateral management system (CMS). Each of the generic models could be applied routinely or in an emergency situation only.

It is recognised that the performance of each arrangement will depend crucially on the way in which it is implemented (and whether the particular building blocks are implemented individually or in combination), its interaction with existing financial infrastructure, and the specifics of the local banking sector. For example, whether the central bank has existing arrangements in place, and where its

settlement banks tend to hold their securities, are just two of the crucial factors in the assessment process.

A detailed analysis of the generic models and how they have been implemented is presented in Chapter 3 and in the annexes.

Conclusions

Accepting foreign collateral is not a new activity for central banks. Several arrangements currently exist; the extent of their use varies from "hardly" to "very intensively", sometimes even exceeding the use of domestic collateral. All but one of the existing arrangements are being used routinely.

Accepting foreign collateral to secure central bank credit operations could help to mitigate global systemic risk, especially by facilitating collateralised lending in emergency situations, but also when implemented on a routine basis. Indeed, routine cross-border collateral arrangements can provide an efficient liquidity bridge across markets, help to relax collateral cost constraints for the largest internationally active banks, and contribute to the efficiency of some asset markets. On the other hand, the linkages that would need to be in place to facilitate these arrangements could create significant interdependencies among settlement systems that would need to be managed. The legal and technical complexity of cross-border collateral arrangements implies that, if introduced for emergency usage only, the facility would have to be planned in advance, regardless of which model was ultimately chosen. In addition, once implemented, regular testing would be required.

However, as mentioned earlier, routinely used and emergency-only arrangements might not be designed to fulfil the same function and are likely to differ with respect to potential users, costs and the degree of technical sophistication. Indeed, an existing (and frequently used) routine arrangement may not necessarily be the preferred emergency solution. In particular, the resilience of the systems (and market infrastructures) used in an emergency must be carefully assessed.

Given the different needs of the domestic financial markets and different arrangements among the G10 central banks, an "à la carte approach" seems to be the appropriate response at this stage. Each central bank should carefully analyse the particular needs of its financial markets and assess potential risk and cost implications associated with the implementation of cross-border collateral arrangements. Further coordination and cooperation among the G10 central banks may be desirable to address common needs, including enhancing the operability, resilience and interoperability of key infrastructures, thus contributing to risk mitigation and improving efficiency in the cross-border use of collateral.

Structure of the report

The report consists of four parts and annexes. Chapter 1 presents the main trends in the development of international financial infrastructure, which shape the demand for collateral and, in particular, cross-border use of collateral to support central banks' intraday and overnight credit operations. Drawing on the existing central bank arrangements and the outcome of the interviews with internationally active banks, it proposes a range of possible central bank approaches to address the needs of the banking community. Various policy considerations associated with the cross-border use of collateral, whether available on a routine or on an emergency-only basis, are explained in Chapter 2. Chapter 3 describes five generic models for facilitating the cross-border use of collateral. It proposes some criteria to assist central banks in identifying and assessing those solutions that best meet their particular collateral policy and the needs of their counterparties. Chapter 4 addresses a range of potential central bank actions that may facilitate the removal of operational obstacles and help further mitigate risks when using collateral across borders. Annex 1 provides a comparison of the generic models, while Annex 2 and Annex 3 summarise, respectively, the existing arrangements for cross-border use of collateral and the operating hours of selected large-value payment and securities settlement systems.

1. Cross-border use of collateral

The international financial system has undergone immense change in recent decades, driven in large measure by the fundamental forces of globalisation and technological innovation. This chapter seeks to establish the extent to which increased cross-border use of collateral might serve as a vehicle for optimising liquidity management and mitigating risks in this environment, and examines potential constraints currently associated with such use. In this report, collateral is defined as *foreign*, or *used cross-border*, if, from the perspective of the jurisdiction in which the assets are accepted, at least one of the following is foreign: the currency of denomination, the jurisdiction in which the assets are located, or the jurisdiction in which the issuer is established.

Drawing on intelligence gained during a series of meetings with internationally active banks, and in the context of central banks' current collateralisation policies, the chapter also investigates commercial banks' demand for the cross-border use of collateral, noting that this varies considerably with the scale of their international activity and the nature of their participation in foreign markets. The particular focus is on the cross-border use of collateral to support central bank credit operations.

1.1 Key factors influencing the demand for cross-border use of collateral

Evolutionary factors, risk management and the market microstructure

Over the past 30 years, financial markets around the globe have become increasingly integrated and banking activity has been expanding across country borders. This process of globalisation has left banks with the challenge of managing liquidity in multiple currencies and jurisdictions.

While globalisation has spurred increased cross-border flows, market participants' management of associated risks has been hampered by, amongst other factors, the limitations of an existing market infrastructure designed principally to meet the needs of domestic markets. Such difficulties arise in the context of banks' global liquidity management efforts and in the collateralisation of both cross-border exposures and exposures arising in away markets.

At the same time, increasing financial sophistication, combined with rapid technological innovation, has led to greater complexity in financial products and contributed to a stronger emphasis on risk management in both the conduct of wholesale business and the design of market infrastructure. This has been reflected in the shift towards real-time gross settlement in payments and delivery versus payment in securities settlement. Key implications of these developments are the more complex liquidity and collateral management requirements faced by banks accessing the infrastructure, and the growing importance of collateralisation to support both liquidity demands and other wholesale market business. Further, in globalising markets, banks operating across borders may, in some cases, face a heightened liquidity and collateral management challenge.

In addition, liquidity demands are becoming concentrated on certain high-flow payment days or at critical times during the day, such as when a key system requires payments to settle. Peak liquidity demands can come from the need to fund payments at specific times on different systems, such as the Continuous Linked Settlement (CLS) system for foreign exchange transactions.

While for many commercial banks collateral assets held to support demands for central bank credit will constitute the larger part of their total collateral requirements, increasing collateralisation in wholesale markets means that there are now competing demands on banks' collateral holdings. Repo transactions, for instance, inherently rely on collateral, while in derivatives and money markets collateral is used to protect market participants against exposures to one another. Clearing houses involving the use of a central counterparty are also becoming more common, with such institutions typically relying on collateral to manage replacement cost risk during the presettlement period. In addition, many expect that the new Basel II capital adequacy framework might lead banks to use collateral more intensively to reduce exposures, thus significantly reducing their regulatory capital. These developments constitute a multitude of competing uses for the collateral holdings of internationally active banks.

Offsetting factors

The technological advancements facilitating RTGS and DVP settlement, and thereby leading to heightened liquidity demands on direct participants in payment and securities settlement systems

when compared to net settlement systems, have also driven the design of sophisticated liquidity-saving features in modern large-value payment systems. These include the implementation of offsetting algorithms in RTGS systems and the combination of bilateral or multilateral netting with real-time settlement functionality. Where applied, such design features have significantly alleviated the liquidity burden on system participants, thereby relaxing potential collateral constraints. Similarly, automated supply-driven self-collateralisation procedures in securities settlement systems, and banks' implementation of in-house liquidity- and collateral-saving payment management techniques (again sometimes involving queue release algorithms or internal schedulers to manage the flow of payments and prioritise obligations) help to mitigate liquidity risk pressures. There is also increasing evidence of recourse to portfolio-based margining and offsetting techniques both in bilateral arrangements between banks and, to a more limited extent, in central-counterparty clearing arrangements. Such techniques take account of potentially offsetting exposures, thereby allowing some economisation of collateral posted.

The continuing globalisation and consolidation trend within the financial sector might itself contribute to a relaxation of the pressure on collateral demand for some participants. For instance, cross-border consolidation of banking groups might ultimately lead to the emergence of market participants with both the necessary resources at their disposal to fulfil their own collateral requirements and the ability to facilitate cross-border access to foreign markets, leaving them no more constrained than domestic counterparts. Indeed, there is already some evidence of this in markets in which banks have expanded across borders via acquisition. On the other hand, as explained later on, even consolidated banking groups could be collateral-constrained in some foreign markets.

Furthermore, several initiatives currently under way at both national and international levels seek to encourage the harmonisation of legal, regulatory and technical frameworks. The development of common technical standards by the private sector, such as uniform communication protocols (mainly based on SWIFT technology) has already led to considerable progress in the implementation of cross-border straight through processing (STP), thereby reducing complexity and facilitating the global flow of liquidity for internationally active institutions.

In addition, the problem of competing demands on banks' collateral holdings is mitigated to some extent by the fact that many private sector collateral-takers accept a broader range of collateral assets than do most central banks.

1.2 The current environment: central banks, internationally active banks, markets and infrastructure

Notwithstanding these efforts to manage and mitigate the upward pressure on the demand for collateral, internationally active banks may, under certain circumstances, still face constraints in away markets, or even domestic markets. In particular, to the extent that central banks' eligible collateral lists are restricted to high-quality domestic assets, such banks may find it costly to hold sufficient quantities of eligible collateral in every market in which they operate directly, and may face mismatches between the location of their liquidity needs and the collateral they hold. To this extent, internationally active banks may be more likely to face liquidity shortfalls than purely domestic counterparts.

Indeed, even participants in foreign markets operating through "small" local subsidiaries or branches could become collateral-constrained as their natural assets are typically those held on the balance sheet of their parent (ie those denominated in the parent's domestic currency). This problem may be particularly acute for banks participating directly in away payment or securities settlement systems.

Cross-border use of collateral, either on a routine or on an emergency-only basis, may be an effective policy response to alleviate such pressures. *Emergency* is defined here as a situation resulting in a large, extraordinary and unexpected liquidity shortage, which may arise on a local, regional or global basis. Whether cross-border use of collateral can deliver significant benefits depends largely on the characteristics of internationally active banks and how they manage their collateral portfolios and their liquidity needs. It also depends on the international market infrastructure, and whether it can support efficient mobilisation of collateral assets.

Central banks

Some central banks already accept cross-border collateral and have adopted a wide range of approaches to accepting such assets. At one end of the spectrum are central banks that have knowledge of potential cross-border collateral arrangements, but have not signed legal agreements or established operational mechanisms for using cross-border collateral. Next along the spectrum are those central banks that have established and tested emergency arrangements. Then come those that have established routine cross-border collateral arrangements, but these are used infrequently. Finally, at the most active end of the spectrum are central banks that have established routine cross-border arrangements that are used extensively.

Within the G10, there are examples of each approach. In each case, the cross-border collateral arrangements implemented have been carefully designed and analysed prior to implementation, with potential risk implications identified and risk mitigation measures taken where appropriate. All but one of the existing arrangements have been designed for routine use, with that established for emergency-only use yet to be used in production.

At the active end of the spectrum, foreign collateral constitutes a significant proportion of total collateral posted to support routine central bank credit operations in Switzerland and the United Kingdom. In both cases, the following considerations have influenced central banks' decision to implement these arrangements: (i) the size and international orientation of the local financial sector and wholesale markets; (ii) the large size of the local payment system, relative to the size of the local debt market; (iii) the close links between the local banking sector and that of the neighbouring euro area; and (iv) the significant presence in the local payment system of large internationally active banks - some domestic, and some foreign-owned. Both cases are special in that they facilitate integrated liquidity management for banks operating both in the euro area and in the most important financial centres directly neighbouring the euro area, particularly those with natural assets denominated in euros. In the Eurosystem, too, there is extensive cross-border use of collateral among the euro area countries, although this is limited to euro-denominated collateral assets issued in the EEA and settled/held in the euro area.

Elsewhere in the G10, cross-border collateral is also used routinely in Sweden and the United States: in Sweden, cross-border use of collateral is typically moderate, but still significant, while in the United States usage is low, but important for some participants. The Swedish case, and in particular the usage of Danish and Norwegian collateral within the Scandinavian Cash Pool (SCP), is a good example of how cross-border collateral arrangements may be of benefit when two or more countries' banking sectors and money markets are so highly integrated that the distinction between "domestic" and "foreign" markets becomes increasingly blurred and one might speak of virtually a single ("domestic") market.

Frequently used routine arrangements might also provide adequate protection in an emergency. For example, both the central bank and the banking community in the United Kingdom, Switzerland and Scandinavia have, through regular usage, developed a high degree of familiarity with their routine facilities, instilling confidence that they can be relied upon in a crisis. Even in the United States, where the cross-border arrangements are not widely used, there is a high degree of confidence that the facilities will work because both the Federal Reserve and the participants are familiar with the infrastructure and because they use international central securities depositories (ICSDs) to settle other transactions on a routine basis. However, routinely used and emergency-only arrangements are likely to differ eg as regards potential users, costs and the degree of technical sophistication, since they might not be designed to fulfil the same function.

As mentioned, there is currently only one example of an emergency-only facility, with the Bank of England having put in place procedures for the acceptance of US Treasury securities in "exceptional circumstances". An emergency-only facility can work well if the central bank and its participants routinely use the same, or similar, infrastructure for other business lines. In this example, the Bank of England's familiarity with US markets, acquired through the management of its foreign exchange reserves, gives it a high degree of confidence that it can handle additional collateral transactions on an emergency basis. And with sufficient prearrangement and testing, interested counterparties can also be confident in the reliability of the facility in a crisis scenario.

Eligible collateral in the G10

In order to understand how and under what circumstances collateral constraints might arise, it is instructive to consider in more detail central banks' current collateral policies. Analysis of the size and usage of each central bank's eligible pool of collateral might provide some guide as to the existence of such constraints. A particularly high percentage usage, for example, might suggest that banks' requirements for eligible assets to back central bank credit are a principal driver of demand in a particular market segment, potentially having a marked effect on pricing, and raising concerns about accessibility/availability of additional assets. This may be particularly important should demand rise unexpectedly. A comparison across central banks is not possible, however, as data are available at differing levels of disaggregation and completeness at each central bank. Nevertheless, some broad observations may be made, which are further informed by reference to the interviews with internationally active banks.

According to the banks interviewed, there is no obvious shortage of eligible assets to back routine requirements for intraday and overnight central bank credit in the G10 markets. Indeed, it would appear that the size of the market for eligible collateral assets in each country is more than sufficient to meet aggregate collateral needs. This is generally borne out by the data available.

Countries in which usage of a purely domestic pool might have led to collateral constraints have already taken steps to expand the range of collateral available to include foreign securities. For example, the average daily usage of the total pool of outstanding eligible collateral to meet banks' demands for central bank credit is currently less than 1% in Sweden, approximately 1% in Switzerland, [7] and around 3.5%[8, 9] in the United Kingdom. If, instead, the eligible lists of Sveriges Riksbank, the Swiss National Bank and the Bank of England were restricted to eligible domestic debt securities, utilisation of their pools would be 11%, 15% and almost 30%, respectively. At these much higher levels of utilisation, supply constraints might begin to emerge, providing justification for the extension of eligible lists in these countries to include foreign securities.

In other countries, routine supply constraints do not appear, due either to the particular design of the payment system, or to the collateral policy of the central bank. For example, in Canada, despite the fact that eligibility of collateral is restricted to domestic marketable debt securities, the design of the large-value payment system (LVTS) ensures efficient usage of liquidity, hence also of collateral. Furthermore, there is no regular schedule for open market operations in Canada, thereby removing another potential source of collateral demand for central bank credit operations. In the United States, intraday credit is provided on a priced, but typically uncollateralised, basis, thereby significantly limiting banks' collateral demands in routine circumstances.

And in those countries, such as the United States and the members of the Eurosystem, where non-marketable, or less liquid, assets are also accepted to back demands for central bank credit, there is again no obvious routine shortage of eligible assets.

Nevertheless, while there may be no routine shortage, and while banks may have adapted their internal processes so as to ensure that routine needs are met in all the markets in which they are active, constraints may arise at specific times, particularly in times of stress. Hence, increased cross-border use of collateral, at least in emergency situations, may be considered by the central banking community.

Market infrastructures

Despite the globalisation of financial markets, the infrastructure for using collateral has remained largely domestically oriented, sometimes resulting in difficulties in moving collateral from one national system to another. Currently, the international architecture of the financial markets for settling securities transactions, including the mobilisation of collateral in cross-border arrangements, is based

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[7] This excludes collateral pledged for the liquidity shortage financing facility.

[8] This includes credit generated by self-collateralising repos (SCRs) in CREST, the United Kingdom's securities settlement system.

[9] The true comparison should, of course, be relative to "accessible" eligible securities. To the extent that several countries accept euro-denominated securities, for example, there are competing claims on a common pool.

on two types of market organisation: international markets and domestic markets with an international dimension.

- International markets are typified by borrowers that issue debt instruments in markets located outside their home country and/or their home currency. Typically, international debt instruments are settled through international central securities depositories (ICSDs), such as Euroclear Bank in Belgium and Clearstream Banking Luxembourg, and virtually all major international market players access at least one of the ICSDs.
- Domestic markets with foreign participation are mainly the G10 domestic financial markets and a few of the more advanced emerging markets. These markets differ from purely domestic markets in that they have a larger participation level from foreign financial institutions. The foreign participation level varies from country to country, as barriers to entry, legal risks of transacting in the host country and the level of development of the market infrastructure will influence foreign participation.

In both international markets and domestic markets with foreign participation, international linkages exist. Sometimes the location in which securities are used as collateral differs from that in which they have been issued, creating a linkage between these two countries. In some cases, the collateral is being posted by an institution from a third country, creating another linkage. These linkages exist regardless of whether access to the ICSD or local depository is achieved through direct or indirect participation.

Market participants can settle foreign securities through a variety of settlement schemes:

- Some market participants access a foreign settlement system through a correspondent. Many international players prefer using the service of a local custodian to access a domestic central securities depository (CSD) to avoid the expense of developing expertise and infrastructure in a large number of local markets.
- Other market participants prefer to settle foreign securities through a link established by the local CSD in their home market. They are able to settle foreign securities this way because some pairs of countries (or blocks of countries) maintain links between their home CSD and one or several CSDs located in foreign countries. These types of links are quite developed in Europe between local systems, but often are used only marginally, even if such usage is growing steadily.
- Yet another option is for market players to settle foreign securities directly either through remote access or by establishing a presence in the local market (eg a branch or subsidiary). Most major market players opt for remote access to the ICSDs due to the large variety of actively exchanged international securities accessible through the ICSDs.

Internationally active banks

Over the years, banks' foreign businesses have grown and become more complex. While diversifying into new markets, internationally active banks have developed a variety of strategies and business models to accommodate local market practices and regulatory requirements: some banks have established subsidiaries or branches in local markets, whereas others rely primarily on correspondent relationships with local banks. In addition to this heterogeneity arising from banks' choice of business model, internationally active banks have also developed a variety of approaches to liquidity and collateral management. Moreover, regional idiosyncrasies, which have evolved over time due to the local proximity of market participants and for common legal grounds, business practices or technical procedures, have created their own challenges, prompting tailored solutions (eg between the euro area and the bordering countries, or in the North American market).

Market participants' decisions as to whether to access foreign markets directly (ie self-clear) or through nostro agents are in part subject to their individual liquidity and collateral management approaches.

In order to better understand the interaction between central bank policy, the infrastructural environment and the international banking community, the working group met with more than 30 banks active in the G10 countries. The interviews focused on banks' liquidity and collateral management processes, the challenges and constraints they faced, and the potential effect of cross-border use of collateral, either routine or emergency-only.

Interestingly, the majority of banks interviewed self-clear in only a small number of currencies: those which they consider to be of particular strategic importance. Hence, direct foreign participation in many countries' payment systems is relatively low as a percentage of total values processed. For example, in Sweden, Switzerland and the United Kingdom, foreign participants account for 13%, 17% and 15%, respectively. Nevertheless, the absolute values directly processed by banks in foreign systems are still often large in monetary terms and can be significant in terms of the flow of liquidity.

For other currencies, banks tend to rely on a network of correspondent banks (nostro agents). This is seen as an efficient solution from both a cost and a risk perspective. Importantly, in the context of assessing collateral demands in away markets, intraday liquidity is typically provided by nostro agents on an uncollateralised basis. However, to the extent that credit lines offered also tend to be uncommitted, this does not preclude the possibility that a bank operating in an away market might seek credit from the local central bank in the event that its nostro agent could not, or was not willing to, provide liquidity. Assuming that the bank had a relationship with the central bank, eligible collateral would be required to support such a credit extension. Hence, in extremis, even banks participating indirectly in foreign payment systems might face collateral constraints.

A small group of banks interviewed participate directly in multiple payment and securities settlement systems around the world (or remotely, through a local branch or subsidiary), operating under a diversity of jurisdictions and in different currencies. This direct participation in foreign financial markets does indeed typically carry with it a heightened and routine requirement for (domestic) eligible collateral, implying a complex and costly collateral management effort, and introducing the potential for collateral mismatches and liquidity shortfalls.

Increased cross-border use of collateral is likely to help most those banks that manage liquidity and collateral on a globally integrated (or centralised) basis with direct access to a multitude of markets. However, according to the survey conducted by the working group, at present only a small minority of internationally active banks apply such an approach (see Figure 1). Banks that manage liquidity and collateral in this fashion can identify a collateral mismatch and address it by shifting assets from one location to another. The degree of centralisation of the liquidity and collateral management function tends to be driven by one or more of several factors: cost efficiency; the legal form of the foreign entities (ie branch or subsidiary); local regulatory factors; technological capacity and the integration of IT systems across the banking group; and a bank's particular contingency arrangements. In particular, banks with sizeable operations in multiple markets perceive the greatest scale economies from centralisation, with technological capacity and group-level contingency planning providing an added impetus. However, particularly where cross-border expansion has been achieved via growth through acquisition, there are often legal or regulatory barriers to integrating the treasury function across separate legal entities, even within the same banking group. Further, some banks mentioned during the interviews that a decentralised liquidity and collateral management approach also supports business continuity planning, ensuring diversification of collateral/liquidity holdings/sources in the event of an emergency.

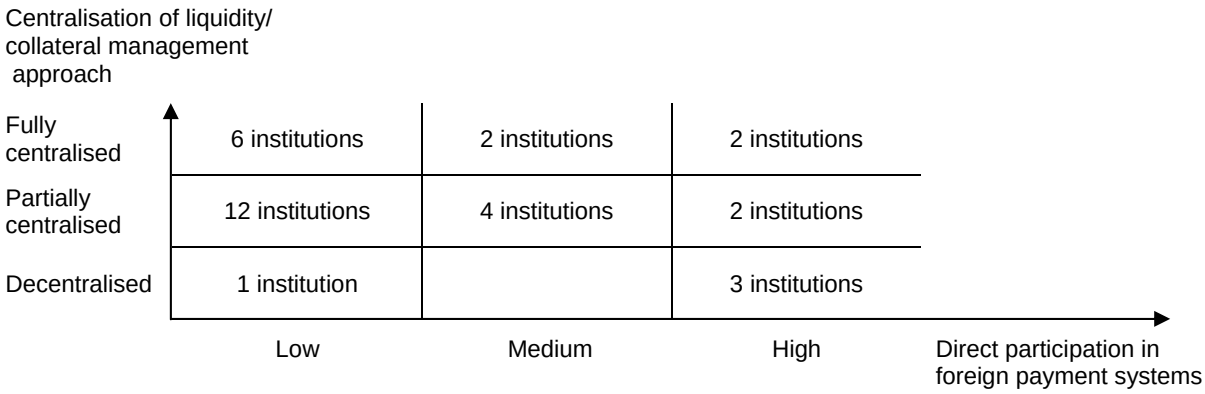
Thus, the extent to which a bank faces collateral constraints in away markets, and the degree to which these may be alleviated by cross-border use of collateral, would appear to be driven largely by the interaction of two key factors:

- the degree to which liquidity and collateral management is centralised within the banking group; and
- the extent to which a bank settles directly (ie acts as a self-clearer) in multiple payment systems.

Mapping the internationally active banks interviewed by the working group according to these two dimensions results in the following picture:

Figure 1

Liquidity and collateral management organisation in internationally active banks



As is clear from Figure 1, a large number of internationally active banks operate primarily through correspondent banking relationships, accessing only a select group of markets directly and often managing their network of nostro agents on a partially centralised basis. To the extent that nostro agents provide intraday credit on an uncollateralised basis, these banks do not typically face routine collateral constraints in away markets. However, some of the banks interviewed expressed the view that, in a crisis situation, existing arrangements might not be adequate to facilitate the smooth and uninterrupted settlement of their obligations, including perhaps the most critical payments (such as CLS pay-ins), and systemic implications could emerge. They also indicated that central bank acceptance of foreign collateral, at least in an emergency, would be welcome.

Of the small group of banks with a high level of direct participation in international payment systems, few operate with a fully centralised liquidity and collateral management function. Several others are partially centralised, managing liquidity on a regional basis. These banks would indeed expect significant gains in cost efficiency and reductions in liquidity risk from extended use of cross-border collateral arrangements. The remaining banks operate a fully decentralised liquidity and collateral management function, in which each individual branch or subsidiary manages its liquidity and collateral needs autonomously. As a result, these banks tend to perceive limited benefit from increased cross-border use of collateral.

Thus, only a small number of the banks interviewed were likely to face collateral constraints on a routine basis when operating in away markets, and fewer still organised their liquidity and collateral management function in such a way that increased cross-border use of collateral would alleviate such constraints. Nevertheless, some central banks might still wish to consider accepting foreign collateral for a number of reasons.

First, a disaggregated analysis of banks' participation in G10 payment systems reveals that the largest foreign participants in G10 payment systems tend to be those banks which access multiple systems directly and which manage their liquidity and collateral on a centralised basis. Often, these banks are also among the largest participants in their home market. Thus, despite the relatively low number of banks in this class, they are important at home, and becoming increasingly important in the away markets in which they are active. And because these banks tend to be dominant in their home markets, a liquidity problem in an away market which had spillover effects around the group (more likely where operations are centralised) could have systemic implications at home.

Furthermore, looking ahead, as the banking sector continues to globalise and consolidate, direct participation by foreign banks could become more important, particularly where banking groups grow by acquisition. While the foreign share of domestic payment system activity may seem low at this time, it was close to zero just three decades ago, and can reasonably be expected to increase further as the driving forces of globalisation and consolidation continue.

Finally, as discussed above, even banks that clear indirectly in a foreign payment system could face collateral constraints in extremis. To the extent that this can have spillover effects, cross-border use of collateral, at least in an emergency, could offer risk reduction benefits.

2. Policy considerations

This chapter considers various policy issues associated with cross-border use of collateral, whether permitted on a routine or on an emergency-only basis.

The acceptance of foreign collateral introduces a number of policy considerations, including potential effects on global systemic risks, monetary policy implementation and payment system safety and efficiency, as well as implications for competition in financial markets and among payment system participants. In particular, central banks must be aware of the trade-offs that arise in determining whether the acceptance of cross-border collateral helps create a diversified toolbox for central bank use in emergency and routine lending situations. On the one hand, implementing such services could help to mitigate the global systemic effect of liquidity shocks, relax collateral cost constraints for the largest internationally active banks and increase market efficiency. On the other hand, such services imply additional operational risks and costs for central banks and market participants, and might result in greater geographical concentration to the detriment of the local market in smaller currencies.

Emergency-only and routine facilities can have different effects on risks, competition, cost efficiency and disclosure. While emergency use of collateral is motivated mainly by financial stability considerations and would probably appeal to a larger community of users, routine facilities also allow internationally active banks greater flexibility in their liquidity and collateral management, thereby also contributing to payment system efficiency.

2.1 Global systemic risks

Financial liberalisation and globalisation have made financial markets more efficient, but the greater connectedness of the global financial system leaves it susceptible to global financial crises - a problem in one economy can lead to problems in other economies. Financial crises raise the costs of intermediation and restrict credit, which may impose severe costs on the real economy. In addition, liquidity problems can spill over into other financial economies because of the connectedness of the international financial system. The prevention of a financial crisis is one motivation for managing liquidity problems, typically through emergency lending. Sound risk management practices may suggest that collateral should be posted to secure such lending; indeed, in some cases, it is required by legislation.

Cross-border collateral arrangements increase available collateral and thus reduce the risk of liquidity shortfalls for individual market participants and, therefore, the risk that any given liquidity shock might have systemic effects. For that reason, such arrangements are important for facilitating emergency liquidity funding and have been proved in practice.[10] Second, to the extent that the collateral portfolio currently used to support central banks' intraday or overnight extension of credit becomes more highly diversified, market risks associated with liquidating such collateral in the event of a counterparty's default would be reduced. Well established arrangements can be viewed as an improvement in the design of the global financial infrastructure by alleviating potential constraints for central bank liquidity provision in emergencies. This not only helps manage a liquidity disruption, but may also help prevent such a disruption from precipitating a global financial crisis.

On the other hand, compared to a situation where eligible collateral is fragmented and specialised, a global bank could use domestic collateral (reducing accordingly the collateral potentially available with its home central bank) in order to generate liquidity to cover its settlement needs at an away central bank, should the latter accept foreign collateral. Such a situation could present additional settlement risk in the participant's home country to the extent that the participant was unable to satisfy its domestic obligations when due. The likelihood of such a situation, however, would depend on key factors such as reciprocity (ie whether each central bank accepts the other's local collateral), whether the central bank accepts a broad range of domestic collateral, and the opportunity costs of collateral, as well as conditions for rapidly increasing the collateral provided to the central bank in the home market. It is not clear whether this issue would be more problematic for central banks if foreign

[10] The US Federal Reserve's cross-border collateral arrangements at Clearstream Banking Luxembourg and Euroclear Bank were actively used in the wake of the 11 September, 2001 terrorist events.

collateral was accepted on a routine or on an emergency basis. If foreign collateral is accepted on a routine basis, banks may become quite comfortable in managing collateral mismatches across various markets, but the potential for mismanagement of such mismatches might increase. Furthermore, the incentive for banks to economise on their overall collateral holdings might be bigger when routine use was envisaged.[11] With emergency-only use, the banks would not have the same management experience, but, equally, instances of mismanagement would be far less frequent and economisation concerns less conclusive.

A related issue is that, due to the time zone differences between the main currency areas, routine use of foreign collateral by the G10 central banks could facilitate the sequential use of the same collateral assets across time zones, either on a same or next value date basis. While clearly efficient from the perspective of a globally active bank (with centralised liquidity and collateral management), this behaviour introduces an additional potential source of contagion in that a disruption in one financial centre could have direct spillover consequences. For example, an operational problem in one country may impede the transfer of collateral to the other and hence could propagate a liquidity shortage from one country to another. With routine cross-border use of collateral potentially also increasing a bank's incentive to economise on its collateral holdings, both overall and in each centre in which it is active, this effect could be aggravated. Capped usage of foreign collateral is one policy option to mitigate such risk, although this might reduce the potential benefits of using such collateral.

As noted in Chapter 1, there is tremendous diversity in the scale of banks' international activities and internal organisation. Similarly, there is considerable variety in the domestic financial infrastructure from country to country, which implies potentially differing demands for cross-border use of collateral. It also implies significant heterogeneity in potential systemic risk reduction benefits, with these depending on the characteristics of the local banking sector; the complexion of the local infrastructural landscape; the scale of foreign participation in local payment and settlement systems; and the extent to which such participation is direct or indirect.

2.2 Monetary policy

Routine cross-border collateral arrangements may be specifically intended to facilitate extensions of overnight or intraday credit by a central bank, under either ordinary or extraordinary circumstances. Existing central bank terms and conditions for overnight lending would generally provide adequate safeguards against undesirable effects arising from the establishment of cross-border collateral arrangements. In some cases, overnight credit is only extended at the central bank's discretion. And the rates at which overnight credit is extended at standing (or lombard) facilities in routine situations would continue to make their use uneconomical except under the types of circumstances for which they are generally designed.

The dynamics could be somewhat different for intraday credit, where availability of collateral itself, and not rates or discretionary limits, may be the primary constraint on the levels of intraday credit incurred. Where an institution operating domestically suddenly has access to very large levels of foreign collateral through a routine cross-border arrangement, the size of daylight overdrafts it might incur in the domestic market could be difficult to anticipate. This could be of concern to a central bank that is not indifferent to the level of intraday credit, even though collateralised, which it extends to a single institution.[12] This risk, however, may typically be mitigated by strong penalties or other controls imposed by central banks to limit such risks.

The kinds of cross-border collateral arrangements under consideration would not appear to have any impact on levels of autonomous factors on a central bank's balance sheet that might need to be sterilised.[13] Conceivably, widespread use of domestic assets to, say, collateralise intraday overdrafts

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[11] See M Manning and M Willison, "Modelling the cross-border use of collateral in payment systems", *Bank of England Working Paper*, no 286, 2006.

[12] The US Federal Reserve's requirements are different in that intraday overdrafts are generally not collateralised, which could present unique issues.

[13] Arrangements where a foreign central bank directs lending in the domestic market and raises the necessary funds by executing a pre-existing swap agreement it has with the domestic central bank could be an exception, as this would affect the level of autonomous factors on the domestic central bank's balance sheet.

abroad on a routine basis could affect the pool of collateral that might be available to support domestic open market operations or for other domestic central bank operations, even though these arrangements might contribute to global efficiencies in the deployment of collateral.

By facilitating desired forms of borrowing from the central bank through its standing facilities, routine cross-border collateral arrangements could enhance the ability of the central bank to influence trading conditions in the interbank market, which typically plays a critical role in the implementation of monetary policy.[14] In the event of counterparty default, the central bank might have to liquidate collateral if it wished to unwind the reserve or portfolio impact of its initial extension of credit to the failed counterparty.[15]

With respect to emergency cross-border collateral arrangements, it does not appear that such arrangements would have a meaningful impact on a central bank's monetary policy objectives. Although emergency cross-border arrangements have the potential to create large amounts of reserves through overnight lending, these arrangements will typically be invoked only at times when financial stability concerns are paramount. Given that a financial emergency would be expected to last only a limited length of time, any potentially negative effects would only be temporary.

2.3 Smooth functioning of payment and settlement systems

Both routine and emergency acceptance of foreign collateral could have significant implications for payment system safety, efficiency and access.

As noted earlier in the report, in the absence of cross-border use of collateral, banks operating in multiple payment systems may face mismatches between the location in which liquidity needs arise and those in which their collateral is held. By expanding the collateral set, which could decrease the opportunity cost of obtaining intraday credit and increase the amount of collateral available to meet obligations as they arise, cross-border use of collateral can positively influence the availability of liquidity in the payment system, resulting in reduced risk of gridlock and shorter delays in settlement. This in turn can increase payment system safety and efficiency by facilitating the timely settlement of, in particular, time-critical payments. Furthermore, by enabling banks to reduce precautionary holdings of collateral in each centre in which they are active, cost efficiency might also be improved for payment system participants.

While the argument that cross-border use of collateral will deliver liquidity risk reduction benefits is quite strong when liquidity surprises are local, or at least uncorrelated across markets,[16] it is less persuasive when there is a potential for aggregate shocks - ie when liquidity surprises can arise simultaneously across systems. To the extent that a bank retains an incentive to economise on its total collateral holdings, even when such shocks are possible, it may have a smaller pool on which to draw should it face significant liquidity needs in multiple systems.[17] A bank may have a lower incentive to economise on its collateral holdings when cross-border use of collateral is permitted on an emergency-only basis.

An expanded collateral set (eg foreign collateral) could introduce additional sources of liquidity in a local payment system; however, this benefit could be offset by the risks arising from differences in processing and settlement times among alternative cross-border arrangements. On the one hand, if an operational disruption were centred on a local SSS or an important custodian, access to foreign

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[14] Conceivably, arrangements allowing for the use of cash held in an account at a foreign central bank as collateral for lending by the domestic central bank could interfere with the smooth functioning of the foreign interbank market if cash balances tied up at the foreign central bank for this purpose were sizeable. Thus, these types of arrangements might call for closer coordination between the central banks directly involved.

[15] A central bank would probably wish to unwind the reserve impact of intraday extensions of credit to a failed counterparty, as these are not normally consistent with end-of-day reserve objectives, but less so on its overnight extensions of credit.

[16] In "Modelling the cross-border use of collateral in payment systems", *Bank of England Working Paper*, no 286, 2006, Manning and Willison develop a stylised model to compare banks' collateral choices in environments with and without cross-border use of collateral. In this work, the metric for systemic (liquidity) risk is the expected shortfall in collateral posted relative to liquidity required.

[17] However, notwithstanding competing claims on the same pool of collateral in such circumstances, a broader eligible list might make collateral more accessible and hence payment delays shorter.

collateral held (or acquired) via a route that did not rely on local providers would help keep payments flowing in the local system. On the other hand, differences in operating hours could cause problems (or fail to mitigate credit risk) if foreign collateral failed to settle in time to satisfy a liquidity demand in the local payment system.

As noted in Section 2.1, a significant drawback of routinely used cross-border arrangements is that they can strengthen the interconnectedness and interdependence of certain markets, and therefore have the potential to propagate crises rather than contain them. Indeed, while cross-border collateral arrangements could provide an efficient liquidity bridge across markets and provide a margin of safety for the payment system, the linkages that would need to be in place to facilitate these arrangements could create significant interdependencies among settlement systems that would need to be managed.[18]

A routine cross-border collateral arrangement could act as a natural "shock absorber" in a stress situation, at least for regular users of such a facility. For such participants, the knowledge and familiarity acquired through regular usage may prove beneficial in times of stress and contribute to more efficient mobilisation of emergency liquidity. But it is unlikely that the same community of users would participate in both routine and emergency situations, and hence this argument holds only for a subset of users rather than the system as a whole.

Central banks' routine acceptance of foreign collateral may also contribute at the margin to broader participation in the payment system, although the strategic decision of an institution to become a direct participant in a given system and to self-clear is driven by a multitude of factors, the opportunity cost relating to collateral being only one consideration. Widening participation in the system may increase efficiency in different ways: higher dissemination of social benefits (practicality of the system for the economy) and potentially lower fees; improved cost recovery rates; and higher capacity to finance future system development efforts. However, central banks should consider that the acceptance of foreign collateral would generate additional costs, including the legal, operational and custody costs specific to foreign collateral. These additional costs may affect overall system efficiency differently depending upon whether the central bank decides to recover part or all of these costs through fees to its counterparties using foreign collateral. A notable increase in fees could reduce the potential for broader participation in the payment system.

Emergency-only cross-border use of collateral, on the other hand, can be an attractive policy option under certain circumstances, such as when foreign participation in the local payment and settlement system is primarily indirect. In such cases, emergency-only cross-border use of collateral can help to relax the constraints a bank may face in accessing liquidity in times of stress or allow access to collateral assets in a market that may not have been directly affected by the emergency. For an indirect participant, such a facility may be a useful contingency tool to the extent that the regular, but uncommitted, intraday credit line from its nostro agent is unavailable. This presupposes that the participant has a relationship with the central bank and an alternative arrangement for taking receipt of the liquid funds and effecting payment obligations, perhaps with the central bank itself effecting a limited number of payments on its behalf. Another potential policy advantage to emergency-only cross-border use of collateral, as mentioned above, is that, insofar as there is a very low probability that an emergency-only facility will be triggered, banks may have a lower incentive to economise on collateral holdings than when cross-border collateral is routinely accepted.[19] If so, they will therefore have a larger pool of collateral on which to draw in the event that an emergency arises.

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[18] See *Cross-border securities settlements*, BIS, March 1995. In its report, the Cross-Border Securities Settlement Working Group acknowledged that there are a number of intermediaries involved in securities custody and settlement processes, particularly so in cross-border settlement arrangements.

[19] Moral hazard is, of course, a theoretical possibility here. However, in practice, the probability of the facility being triggered would be low, the trigger point would not be fully disclosed and, in the context of G10 government bonds, the relative opportunity cost of holding eligible and emergency-only assets would be similar. Hence, banks would be unlikely to significantly alter their holdings of routinely eligible securities.

2.4 Effect on competition

Central banks must also consider potential effects on competition associated with the acceptance of foreign collateral, and in particular the implications for competition between individual institutions, between currency areas, and in financial markets.

Effects on individual institutions and correspondent banking

As described in Chapter 1, internationally active institutions with a significant presence in a large number of countries manage their liquidity and the related collateral in a variety of ways, implying an uneven distribution in the benefits of cross-border use of collateral. A small number of these banks, which manage their inventory of collateral on a global basis, are likely to benefit most from the routine acceptance of foreign collateral. In contrast, many internationally active banks manage their liquidity and collateral either on a regional or on a local basis. The benefits of a wider routine acceptance of foreign collateral would probably be less relevant for these institutions. Finally, smaller institutions with predominantly domestic activities and domestic collateral are likely to derive little benefit from the acceptance of foreign collateral, except to the extent that they will be better able to diversify their collateral portfolios. Hence, one might argue that, if some internationally active firms faced reduced costs of operating in local markets, then local institutions could face more competition. In major international financial centres, however, such adjustments have been ongoing for many years and the argument can equally run in the opposite direction if a restricted eligible list currently benefits local institutions disproportionately.

Similarly, better access to intraday liquidity in foreign markets might at the margin allow some commercial banks to be more competitive in providing correspondent banking services in away markets, increasing efficiency in such markets. However, currently only a few internationally active banks provide significant correspondent banking services in currencies other than their home currency.

Therefore, the implications of routine acceptance of cross-border collateral for competition between market participants would vary depending upon the domestic market structure and conditions, and the specifics of the arrangement used. It seems, though, that there would be virtually no competitive impact (or resulting change in market structure) if foreign collateral were only accepted in emergencies.

Effects on the currency area

In theory, the routine acceptance of foreign collateral by central banks could have some effect on the demand to hold balances of particular currencies, on the demand for government debt, and on financial centres to the extent that more banks are able to access the payment system in these centres. For example, if the acceptance of foreign collateral resulted in more efficient infrastructures and better liquidity, then the attractiveness of these currencies could be increased at the margin, which could raise the demand to hold balances of those currencies. Similarly, the ability to use foreign government debt as collateral could augment the demand for that debt. Moreover, the acceptance of foreign collateral by central banks with smaller markets could marginally decrease the demand for local government debt.

As a result, the competitive implications arising from the acceptance of foreign collateral are mixed and partly hypothetical, but are likely to be limited to routine lending facilities. Based on experience to date, there does not appear to be a significant effect from the establishment of either routine or emergency-only cross-border collateral arrangements.

Effects on financial markets

Central bank acceptance of foreign collateral for routine operations may increase demand for certain securities, which could have implications for market participants and the issuers of the securities. In theory, increased demand for these eligible securities may have some effect on the pricing or liquidity of the assets, which may result in the greater marketability of the instruments at the margin.

Because commercial banks' investment policy is influenced inter alia by the eligibility of the respective assets for central banks' credit operations, acceptance by central banks of foreign collateral would boost the attractiveness of that foreign collateral. This, in turn, could result in increased marketability of the instruments at the margin. Issuers may respond by supplying more debt or changing the terms of

the asset. In addition, the enhanced marketability may encourage new participants to enter the home country market of the newly central bank-eligible collateral, thus creating additional liquidity in those markets and raising cross-border securities settlement volumes. However, this increased marketability is debatable since many institutions maintain a stable pool of collateral with central banks and do not view those assets as fungible with their trading portfolios.

Central bank acceptance of foreign collateral could affect a global bank's preference to invest in collateral with the lowest opportunity cost that could be used as collateral with various central banks, potentially resulting in some concentration of assets. In practice, the Bank of England, which uses cross-border collateral on a routine basis, has experienced instances of collateral concentration, which it has addressed through the application of concentration limits.

Alternatively, the acceptance of cross-border collateral could cause a decrease in volumes for certain markets, especially in markets where the local securities are accepted only for the domestic operations of the local central bank. In these markets, some local market participants might shift their business towards other regions and/or currency areas, especially if the debt of these other regions is accepted as collateral at more than one central bank. As a result, there is a case for central banks' keeping each other informed of their policies with regard to cross-border use of collateral. As a general matter, it appears that the acceptance of foreign collateral would not have an obvious effect on the rates in financial markets for government debt of big countries.

In summary, the acceptance of foreign collateral may affect market participants' investment policies, issuer behaviour with respect to the eligible collateral, and the underlying markets in which the securities are traded. These implications, however, are likely to occur only at the margin if central banks were to accept foreign collateral on a routine basis. The implications of the acceptance of foreign collateral in an emergency would be limited.

2.5 Legal constraints

Cross-border collateral arrangements often present complex legal issues and can result in varying degrees of legal uncertainty, posing risks that individual central banks should consider if they seek to enter such arrangements. Chief among these issues are questions about the enforceability of collateral agreements and the nature of the security interests they create. It should be noted that legal risk does not vary with the frequency or nature of usage of cross-border collateral (ie whether collateral is used in routine or emergency-only situations). In either case, complex questions about legal certainty arise and it is imperative that central banks be familiar with the risks posed by the jurisdictions that may govern the transaction and understand the risks that they face.

While these legal questions can involve complex analysis when the laws of only one jurisdiction are applied, in cross-border collateral arrangements the complexity is compounded because the laws of several jurisdictions will probably be relevant. By way of example, a central bank, in country A, may accept collateral from a branch, located in country A, of a bank, headquartered in country B, in the form of securities issued by country C and held through an intermediary located in Country D. Exercising diligence on the critical legal issues noted above will in the first instance require that a central bank determine which law governs which issue. The laws of the various jurisdictions, however, may provide different and conflicting answers. As a result, obtaining any degree of legal certainty - about how those laws actually work together or how they will be interpreted by any relevant legal jurisdiction - may be difficult and quite expensive.

Settlement finality is a particularly relevant legal issue in a cross-border context where securities are held in book-entry form through different jurisdictions. The clarity and the certainty of when finality is reached must be ensured. In particular, central banks must be certain that collateral taken in credit operations is available without any undue delay when a default occurs. Among European Union (EU) countries, EU legislation clarifies these issues and ensures a high level of confidence, but, in more complex cross-border situations, such confidence is likely to be more difficult to achieve. The remaining level of risks is likely to differ depending on the type of arrangements used.

Central banks must also take into account the degree of legal risk associated with cross-border collateral arrangements in terms of custody. The involvement of multiple settlement intermediaries in multiple legal jurisdictions increases the risk of potential loss of the securities held in custody in the event that the intermediary becomes insolvent, acts negligently, commits fraud, or suffers an operational breakdown.

2.6 Other constraints for central banks

Prior to accepting foreign collateral, central banks must also consider costs associated with cross-border collateral arrangements and the implications of regulation, taxation and exchange controls as well as operational risk. These issues would vary depending upon the specifics of the arrangement used and could have different implications for emergency-only versus routine lending facilities.

Whether cross-border collateral facilities are set up on a routine or on an emergency-only basis, the associated costs can be considerable. One aspect driving costs may be the potentially higher degree of technical sophistication and automisation of a routine arrangement, designed to cope with large volumes of daily transactions. Central banks should take into account the cost of setting up and administering a cross-border collateral arrangement, including the initial fixed costs of designing and implementing interfaces to the SSSs/CSDs/ICSDs where the collateral is held, the ongoing costs associated with internal monitoring and collateral valuation, and the costs associated with acquiring all the legal opinions that are needed to provide a central bank with a high assurance of a perfected, enforceable security interest in the collateral. Costs will differ according to the model(s) implemented for cross-border mobilisation of collateral (models are discussed in Chapter 3). Furthermore, a given cross-border collateral arrangement will not necessarily entail the same costs in every market in which it is implemented; rather, costs will depend upon the existing collateral framework in the country, its existing processes and procedures, and any existing "links" between markets/currency areas. Central banks that already use foreign market infrastructures for other activities, such as foreign reserve management, may find that the costs are more reasonable.

Costs associated with the implementation and operation of cross-border collateral arrangements would be more easily recovered under routine usage, assuming that counterparties made regular use of the facility and that a standard fee schedule were applied. It may be more difficult to recover the costs associated with cross-border collateral arrangements if the arrangements are used only in response to an emergency. It could, however, be possible to recover costs, at least partially, by charging counterparties on a contractual basis. Moreover, it may be that a scheme to be used only in an emergency might reasonably be less complex and sophisticated than a scheme to be used in normal circumstances, thus reducing costs considerably.

In addition to direct costs associated with the implementation of the facilities, there may be indirect costs resulting from adverse consequences for market conditions for domestic currency assets, particularly if collateral holdings are shifted from domestic currency into foreign currency assets. This negative impact may be greater if the foreign currency assets used as collateral are lodged in custody arrangements outside the domestic jurisdiction of the central bank providing credit. To the extent that the implementation of such arrangements is justified by financial stability considerations, full cost recovery from counterparties may not be strictly necessary. In addition, if arrangements are only used in emergency situations, central banks may have a greater tolerance for assuming residual risk, eg legal risk.

Issues relating to regulation, taxation and exchange controls also arise in cross-border securities transactions. Although these issues may be very complex, they could be crucial in evaluating the costs and risks of accepting foreign collateral.[20]

The increased use of foreign collateral can influence operational risk in two ways. On the one hand, taking foreign collateral can be viewed as a way to increase business continuity by providing an alternative source of collateral. On the other hand, operational risk might be increased by adding new vehicles for the delivery of collateral. This risk can be mitigated by using mechanisms that allow for greater automation but potentially implying higher cost. Furthermore, central banks should consider not only the resilience and business continuity of the cross-border arrangements, but also the business knowledge and expertise required to process and manage foreign collateral. Moreover, it could be beneficial if counterparties were also fully aware of processes and procedures.

If it is assumed that operational risk decreases the more often central bank staff use the procedures, then the reliability of a cross-border collateral arrangement will probably be greater if it is used on a routine basis. More intensive use would increase knowledge of the process and of the characteristics of foreign collateral - and in particular of external constraints related to the market infrastructure used

[20] For a more complete discussion of cross-border issues, see *Cross-border securities settlements*, BIS, March 1995.

to process those securities. However, participants might adjust their behaviour by economising on their collateral holdings (as described in previous sections) and by relying largely on the procedures in place, thus possibly reducing the effectiveness of such routine facilities in emergencies. A central bank should consider whether a routine arrangement that in practice is seldom used could cope with a sudden and large increase in volume. There is evidence that at least one low-volume cross-border facility has functioned well in a crisis. The Federal Reserve's cross-border arrangement at Clearstream does not typically process a large volume of transactions, but, in the days immediately following the 9/11 terrorist attacks, the volume of transactions processed through this facility increased by over 500%.

To increase the operational reliability of schemes designed for emergency-only purposes, the central bank may have to implement regular testing, most likely with counterparties. To the extent that a central bank and its counterparties already use the foreign infrastructure (eg for foreign reserve management), testing might be carried out less frequently and/or with a different focus.

A wider acceptance of foreign collateral on a routine basis may also, at the margin, be a way for a central bank to diversify the collateral assets held in its balance sheet and accordingly contribute to reducing risks associated with the concentration of assets (operational and financial). However, it should be noted that liquidation costs may be higher in the event of a creditor default, legal risk may be greater (as previously noted), and foreign exchange risk may be added onto market risk, which requires the central bank to manage its collateral portfolio more carefully, possibly at an additional cost, and to adjust its schedule of haircuts.

Finally, central banks may differ in their policy with regard to transparency of envisaged emergency lending arrangements towards market participants. Although a certain level of disclosure might be desirable, particularly to the extent that such arrangements require regular testing involving all relevant parties, it is important that increased transparency does not introduce moral hazard. One possibility might be to retain some ambiguity over the precise circumstances in which the emergency-only facility would be triggered.

3. Arrangements for the use of foreign collateral in intraday/overnight credit operations

This chapter describes some generic models to facilitate the cross-border use of collateral, and in particular those arrangements (i) requiring some action by the central banking community; (ii) facilitating the cross-border use of securities collateral, as opposed to cash-based collateral; and (iii) supporting both routine and emergency-only needs. It also describes some criteria that each central bank could use for the assessment of the various models taking into account their specific situation in legal, technical and economical terms. These criteria are intended to assist central banks in identifying those solutions best tailored to their particular circumstances, and to meeting the needs of their counterparties, when deciding whether and how foreign collateral might be accepted.

3.1 Five stylised arrangements for the use of cross-border collateral

Five generic arrangements are described: (i) correspondent central banking model (CCBM); (ii) guarantee model; (iii) links between securities settlement systems; (iv) remote access to a securities settlement system; and (v) collateral management system (CMS). The main differences between the models described reflect the extent to which:

- credit is released on the basis of the cross-border transfer of title of the underlying assets, or on the strength of a central bank guarantee (ie the guarantee model);
- the central bank accesses the market infrastructure directly (as in models of remote access to an SSS) or receives support from other entities (eg another central bank as in the CCBM) or infrastructure providers (eg a provider of global collateral management services like in the CMS, or links between SSSs);
- the model is operated on a centralised basis (CMS) or on a decentralised basis (CCBM, guarantee model and links).

Importantly, the models described are the essential "building blocks" of cross-border collateral arrangements, and might be applied in combination (indeed, in practice, this will often be the case). The following sections describe, for each model, the steps in the collateral delivery process, and issues arising in its practical implementation. Some examples of cases in which each model has been applied in practice are also given. A summary of the characteristics of each is provided in Annex 1.

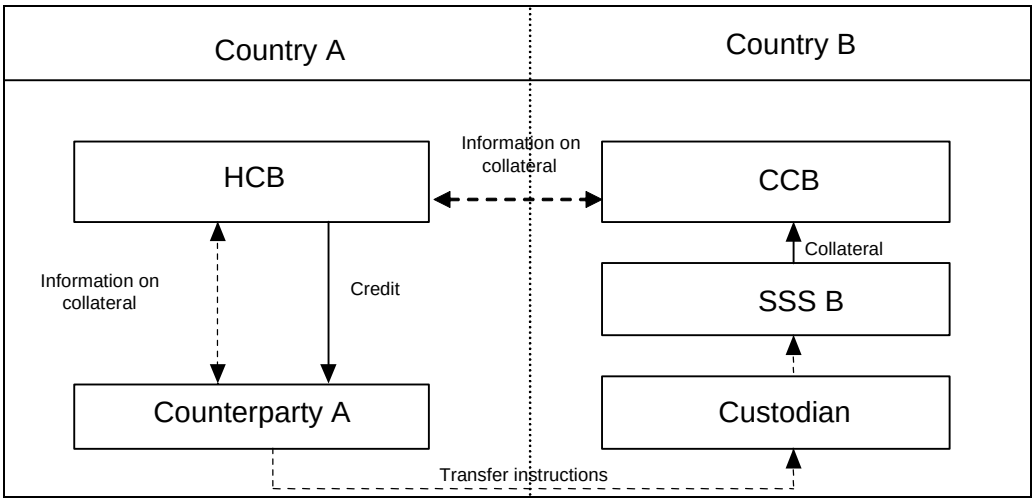
In each case, it is assumed that bank A, in country A, wishes to raise liquidity from its home central bank (HCB), using assets it holds in country B.

3.1.1 Correspondent central banking model

Under this arrangement, national central banks act as custodians ("correspondents") for the HCB in respect of assets located in their local depository or SSS. Figure 2 illustrates the generic process.

Figure 2

Correspondent central banking model



The implementation of this model requires the cooperation of the interested central banks. As it largely relies on the existing market infrastructure, limited additional investment would be required. Indeed, the most significant investment would be in legal opinions and internal operational resources. The core processes (such as the valuation of collateral and exchange of information) would typically be performed by either the correspondent central bank or the HCB depending on the particular agreement. Therefore, once the collateral is transferred successfully to the account of the respective correspondent central bank, credit could be granted independently from the availability of the market infrastructure. This is a particular benefit when collateral is predeposited. Moreover, the decentralised structure of such models provides additional risk mitigation in case of the outage of a specific SSS, since other national SSSs, which were not impacted, could be used for the provision of collateral. It should be noted that the application of this central bank-operated solution could potentially "crowd out" the emergence of either private sector solutions or those relying on actions/investments by infrastructure providers.

The model addresses routine collateral needs by typically requiring counterparties to predeposit a certain amount of collateral assets in custody with the CCB at all times. Settlement timetable constraints and processing lags might undermine "real-time" application of the model, although investment of resources to enhance and perhaps standardise processing practices at the HCB and CCB could improve its effectiveness in meeting time-critical or emergency liquidity needs.

Several countries have already implemented correspondent central banking arrangements to support the cross-border use of collateral: (i) the CCBM, operated as in Figure 2, has been applied within the Eurosystem (and the broader TARGET area); (ii) the bilateral arrangements between Sweden, Denmark and Norway; and (iii) the bilateral arrangement for emergency situations between the United Kingdom and the United States (see Box 1 below).

Box 1

Emergency cross-border use of collateral: the Bank of England's acceptance of US Treasury securities as collateral in exceptional circumstances

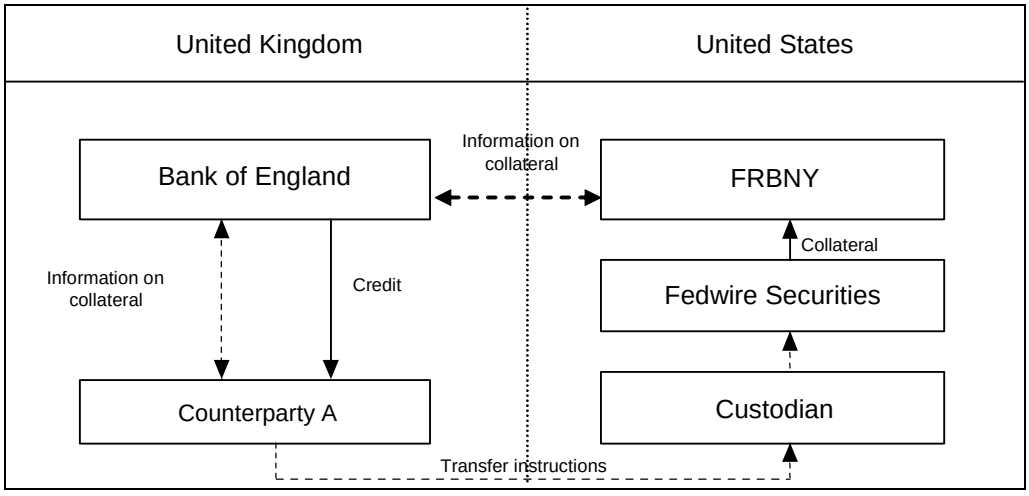
The Bank of England announced in its Operational Notice of November 2004 (subsequently updated in February 2005) that it may, in exceptional circumstances, extend its eligible collateral list to include US Treasury securities. The precise trigger for such an extension remains at the discretion of the Bank of England and, should such an event arise, market participants will be informed via the Bank's wire service pages. To date, this arrangement has not been used, although testing has taken place with counterparties and settlement banks such that it could be rapidly executed in the event of an emergency.

The arrangement is an application of the correspondent central banking model (CCBM), described in this chapter, with the Federal Reserve Bank of New York (FRBNY) acting as custodian for the Bank of England.

The process is outlined in the figure below. Counterparties and settlement members will deliver securities, free-of-payment, into the Bank of England's account at the FRBNY, having first provided the Bank with details of the securities they intend to deliver. The cash leg of the repo - the release of liquidity to the counterparty/settlement bank, less the appropriate haircut - will then be effected by the Bank of England upon confirmation from the FRBNY that the securities have been received. On maturity of the repo, the counterparty/settlement bank will repay the borrowed funds to the Bank of England, who will then instruct the FRBNY to return the securities, free-of-payment.

Delivery of US Treasuries to the Bank of England in exceptional circumstances

Use of eligible assets deposited in the United States by a counterparty established in the United Kingdom in order to obtain credit from the Bank of England.

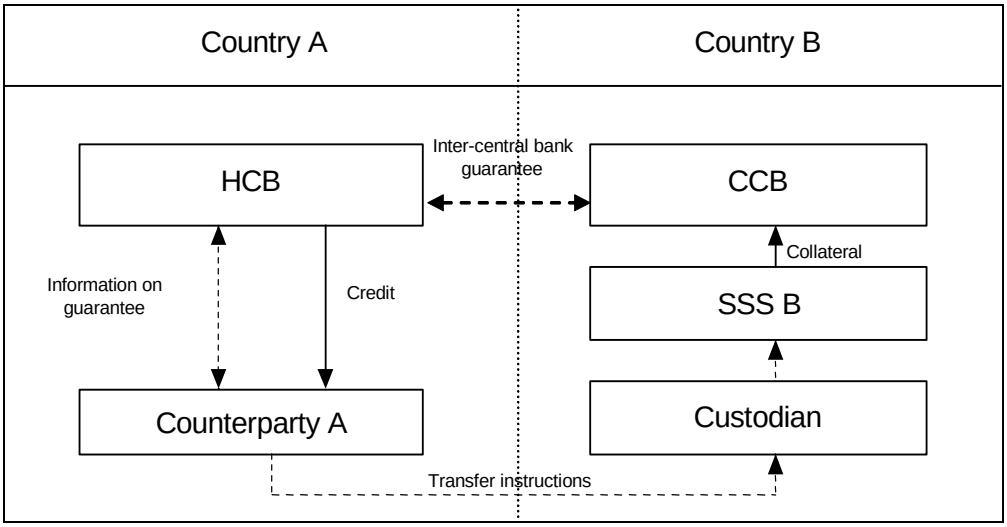


3.1.2 Guarantee model

Under this arrangement, national central banks act as guarantors for each other in respect of assets deposited in their local depository or SSS. Technically speaking, this model is similar to the CCBM described above. (It presents the same features as far as scope, implementation and feasibility are concerned.) Figure 3 illustrates the generic process.

Figure 3

Guarantee model



Having previously informed the HCB, counterparty A instructs its custodian in country B (or SSS B directly) to deliver securities to the correspondent central bank's (CCB's) account at SSS B, on the basis of which the latter issues a guarantee to the HCB. SSS B settles the relevant securities and the CCB issues the guarantee. Once settlement has been effected in SSS B, the CCB values the collateral and issues a guarantee to the HCB, triggering the provision of liquidity by the HCB to counterparty A.

Importantly, the legal instrument backing this arrangement is a guarantee from the CCB on the value of collateral received. This instrument does not require the actual cross-border transfer of title to the collateral assets, but rather the issuance of a cross-border inter-central bank guarantee. Otherwise, the model is similar to the CCBM and again relies only on central bank cooperation and access to the existing market infrastructure.

The guarantee model has currently been implemented in two cases: (i) the Scandinavian Cash Pool (SCP) operated in Sweden, Denmark and Norway; and (ii) marginally within the Eurosystem for specific assets (some bank loans).

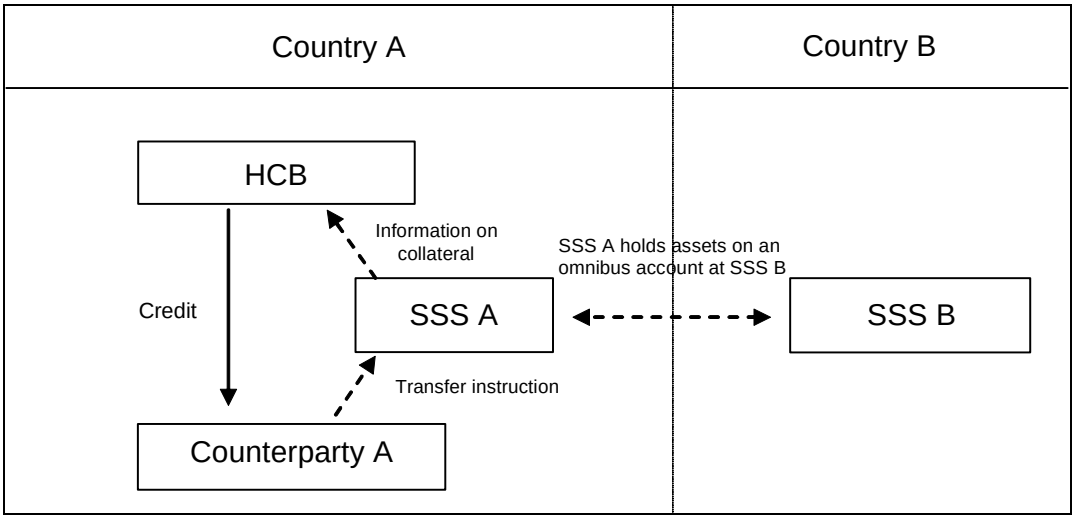
3.1.3 Links between securities settlement systems

Under this arrangement, the HCB and its counterparts use an SSS "linked" to one or more SSSs. A link between two SSSs allows a participant in one SSS to hold securities issued in another SSS without being a participant in the latter. With links, the cross-border relationship is between the SSSs: they open omnibus accounts with one another.[21] Figure 4 illustrates the generic process.

[21] Our focus here is on direct links. In practice, so-called relayed links might be employed, ie arrangements involving the interposition of one or more SSSs between the SSS in which the securities are issued and that in which the collateral is ultimately received. In addition, indirect links or operated direct links might also exist; these arrangements involve the interposition of a custodian, or the use of a custodian as operator of the link. Each variant of the links model described here has different implications for legal, operational, settlement and custody risks.

Figure 4

Links between securities settlement systems



In a first step, counterparty A receives securities issued in SSS B into its account at SSS A (via the omnibus account of SSS A at SSS B). This transfer may take place via direct memberships in each SSS, indirectly (through a custodian) or via a transfer from another counterparty. In a second step, counterparty A delivers the collateral to the account of its HCB at SSS A. Once settlement has been effected in SSS A, the HCB releases liquidity to counterparty A.

The model requires the establishment of links by the SSSs, which must be able to justify the necessary investments on business grounds. Therefore, the most significant investments would be the legal and infrastructural costs, incurred primarily by the SSSs, in initially establishing the links. Although the principal responsibility for legal opinion lies with the SSSs involved, the HCB would also be advised to perform the necessary due diligence before relying on such a link. Given that the establishment of links must be justified by the SSS on business grounds, there may be a mismatch between those links in which the SSS is willing to invest, and those desired from a central bank perspective. The HCB has to establish efficient operational processes, and train its staff to value and manage foreign collateral.

To the extent that the links between the SSSs become critical in payment system members' liquidity management in the domestic market, central banks might wish to exercise influence in terms of the operability, robustness and security of these links.

An advantage here is that, once free-of-payment settlement has been effected across the link, the intraday process is equivalent for both foreign and domestic collateral.[22] Settlement timetable constraints and time zone frictions may, however, contribute to processing delays.

Today, within the Eurosystem, 59 links between EU SSSs are eligible for cross-border use of collateral.

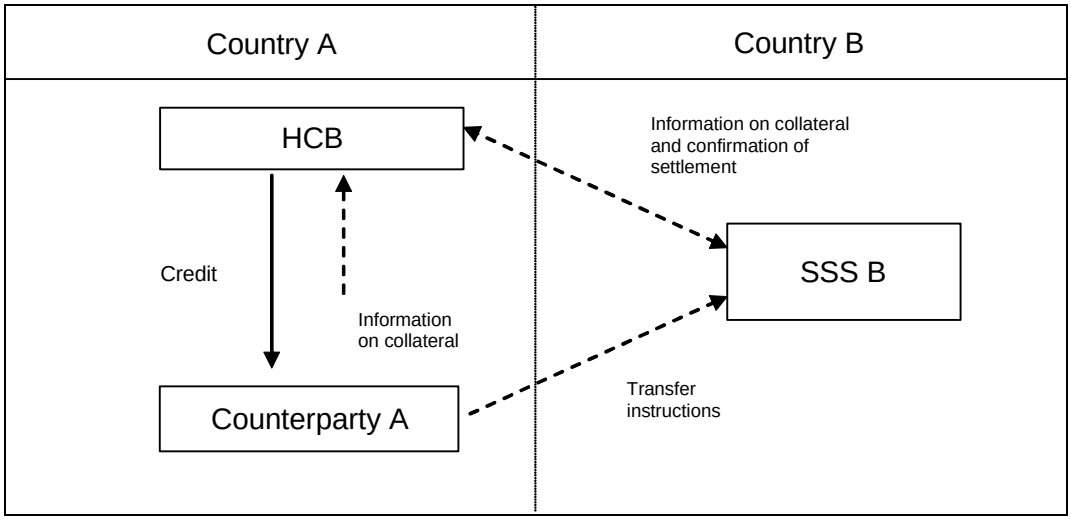
3.1.4 Remote access to a securities settlement system

Under this arrangement, both the HCB and its counterparties directly access a foreign-located SSS in which the collateral is available. An important variant of this model, often applied in practice, combines remote access with links, but the description below focuses on the remote access "building block" alone. Figure 5 illustrates the generic process.

[22] Including DVP at this stage, if normally applied for domestic securities.

Figure 5

Remote access to a securities settlement system



Counterparty A instructs its custodian in country B (or SSS B directly) to deliver securities to the HCB's account at SSS B. SSS B settles the transaction for the relevant securities. Once settlement has been effected in SSS B, the HCB releases liquidity to counterparty A.

The model relies on the existing market infrastructure but requires that the HCB acquire significant knowledge about the functioning of foreign SSSs. Therefore, it may imply additional operational costs for the HCB. Besides, from an infrastructural perspective, an additional remote access link must be established and ongoing costs will arise from the use of the foreign SSS for both the HCB and commercial banks.

As in the case of the links model, a specific policy issue might arise if a foreign SSS became crucial for liquidity arrangements in the home country. The HCB could either rely on bilateral contacts with the overseer of the SSS (and possibly establish a memorandum of understanding to be informed/involved in the oversight of the arrangement) or seek to establish a special contractual framework with the foreign SSS.

Routine needs may be met by collateral securities held in custody at the foreign SSS. However, the application of this model to meet real-time demands, particularly in an emergency, may again be undermined by settlement timetable constraints and processing lags. A further barrier to pure emergency application of this model may be the requirement for significant knowledge of the functioning of the foreign SSS, which can perhaps be best acquired through routine use.

Although in principle central banks may have remote access to several SSSs, in practice the business case exists today only for remote access to the ICSDs, Euroclear Bank and Clearstream Banking Luxembourg, since these are the two systems in which a large amount of foreign collateral is centralised. The case for remote access to these ICSDs may be stronger still when remote access is combined with links. However, central banks opting for remote access might consider the extent to which their choice sends a signal to the market, and invites a challenge on "level playing field" grounds.

Several countries have implemented remote access to support cross-border use of collateral, sometimes combined with links: (i) Bank of England (BoE) accounts at Euroclear Bank and Clearstream Banking Luxembourg; (ii) Federal Reserve accounts at Euroclear Bank and Clearstream Banking Luxembourg; (iii) Riksbank accounts at Euroclear Bank; (iv) furthermore, some central banks of the Eurosystem[23] (Central Bank of Ireland and the Netherlands Bank) currently use this facility for remote access to Euroclear Bank.

[23] Generally, remote access to SSSs is prohibited in the Eurosystem. However, the Governing Council approved a few well founded and strictly limited exceptions, such as in the case of the Central Bank of Ireland, which uses Euroclear Bank to

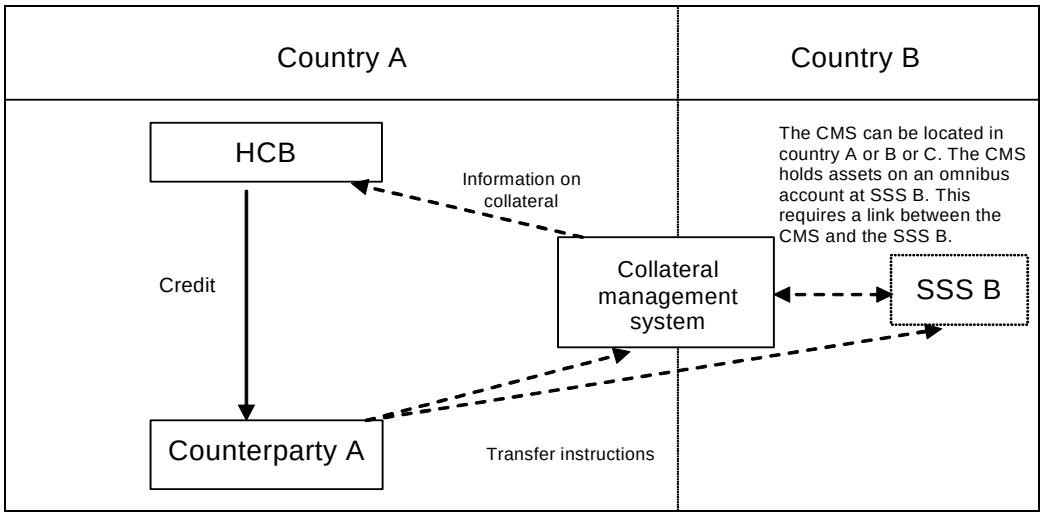
3.1.5 Recourse to a collateral management system (CMS)

Under this arrangement, the HCB and its counterparties rely on a CMS. The CMS can take the form of a collateral pooling system operated by a central bank, or a tripartite collateral service (pledge and/or repo) operated by an SSS or a custodian. Depending on the operator, the CMS could offer services for collateral issued in one or more countries. The CMS would become a global collateral pool if accessed by more than one HCB.

The CMS can be located in the home country of the HCB or abroad. In either case, the CMS has to open an omnibus account with the SSS in which the collateral is located (essentially a link between the CMS and the SSS). If the CMS were located abroad, the HCB would face similar legal and operational risks as for a case of remote access to an SSS. If the CMS were operated by another central bank, this central bank would have to open accounts not only for the HCB but also for its counterparties. Figure 6 illustrates the generic process.

Figure 6

Recourse to a collateral management system



Counterparty A instructs SSS B to transfer the collateral assets to the CMS (eg an SSS located in country A). The assets would usually be held in an omnibus account of the CMS at SSS B. Then, counterparty A instructs the CMS to post the assets to the HCB account at the CMS. Once this transaction is settled, the HCB triggers the provision of liquidity to counterparty A.

The economic burden for setting up the infrastructure lies primarily with the CMS operator, although legal and technical costs will be also borne by the HCB. If more than one HCB participates in the same CMS, the investment cost can be shared among a greater number of entities. The model is rather costly and, therefore, unless it exists for other commercial purposes, it could be uneconomical for emergency-only application. Some central banks may view these costs as worthwhile, if they feel that this fosters financial stability. Also, some central banks may be able to charge these costs back directly to the banks that use the facility.

As in the case of the links and remote access models, delegation of collateral management to a CMS operator might lead to undue dependence on a particular infrastructure provider or system. Therefore, the HCB must be able to rely on the quality and resilience of the infrastructure and processes of the

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transfer Irish government bonds as collateral for its credit operations due to the fact that the national SSS ceased operations some time ago. In fact, in this case the Eurosystem speaks of “access abroad” rather than of “remote access” due to the political implications of “remote access”, among which level playing field concerns are the most important. Similarly, with the acquisition of some national SSSs by Euroclear, there were some exceptions made for central banks that typically used these national SSSs for their collateralisation purposes, virtually granting a form of “grandfathering” in order not to hamper traditionally evolved business relationships. Nevertheless, central banks are free to establish a direct membership in a foreign SSS for their own reserve management business.

CMS operator. A contractual agreement including service level agreements would usually form the basis of the HCB's arrangement with the CMS. If the CMS were located in the home country, the contractual agreement might be supplemented by oversight or supervisory powers; if located abroad, the HCB might wish to enter into a bilateral arrangement with the foreign oversight authority. As in the case of remote access with links, the central bank would also need to be aware of any signal it might send in its choice of CMS operator, potentially raising level playing field concerns.

The HCB and the counterparties need to have access to the CMS to instruct the collateral movements. The counterparties have to predeliver enough collateral to the CMS to ensure that collateral is available in the system on demand. Asynchronous settlement timetables and time zone frictions may constrain processing, undermining the real-time efficiency of the process. Once the collateral is in the CMS, DVP settlement is possible (subject to access to the relevant central bank accounts).

Examples of the collateral management system are as follows, each variously combined with remote access and/or links: (i) Swiss National Bank (SIS SegaInterSettle AG as collateral management system operator, combined with links; see Box 2 below); (ii) Federal Reserve accounts at Clearstream Banking Luxembourg CMS with remote access and links; and (iii) Eurosystem with the collateral management system Xemac (Clearstream Banking Frankfurt).

Box 2

Routine cross-border use of collateral: the Swiss National Bank's acceptance of euro securities

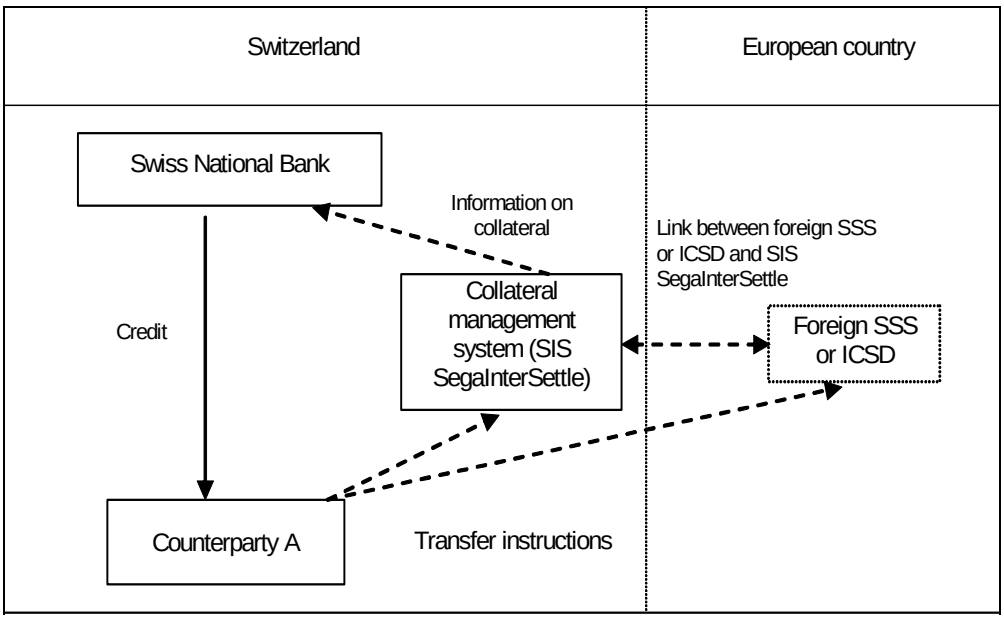
The Swiss National Bank (SNB) accepts foreign collateral for both intraday and monetary policy repos on a routine basis. Foreign collateral includes securities denominated in euros (Treasury securities issued by the governments of Germany, Austria, the Netherlands, Belgium, France or Spain, and German Jumbo Pfandbriefe meeting certain criteria) and collateral denominated in Swiss francs but issued by a non-Swiss issuer. Currently, foreign collateral is used for over half of the monetary policy repo transactions.

The rationale for accepting foreign collateral is threefold. First, the accepting of foreign collateral arose in response to a request from banks, as the Swiss economy is relatively small in contrast to the importance of its currency and the size of its financial market. Second, accepting foreign collateral specifically helped attract foreign banks to participate in repo transactions, thereby increasing the number of counterparties available to the SNB. Third, accepting foreign collateral helped facilitate the development of an interbank repo market, which relies to a large extent on the eligible securities list defined by the SNB.

The specific arrangement of the SNB for accepting foreign collateral is based on a CMS provided by SIS SegaInterSettle (SIS), the Swiss SSS. Foreign collateral can be transferred to the SNB account at SIS via links between SIS and the relevant foreign SSS or ICSD. The CMS then allows for full standardisation and automation, straight through processing, daily marking to market of collateral and DVP settlement, thereby minimising the risks and manual interventions involved in repo transactions.

Delivery of euro securities to the Swiss National Bank in routine circumstances

Use of EUR securities to obtain CHF liquidity from the Swiss National Bank



3.2 Analysis of the alternative arrangements

Each of the generic arrangements described in Section 3.1 above has different implications for cost, risk and operational efficiency. Section 3.2.1 seeks to identify a set of key performance criteria for cross-border collateral arrangements, which may be applied in the case of both routine and emergency-only facilities. Section 3.2.2 provides some examples of how the criteria for assessment might be applied to the building block models detailed above.

3.2.1 Criteria for assessment

The list of criteria considered in this analysis is not exhaustive, but encompasses the most crucial measures of infrastructure performance in a G10 cross-border context from the perspective of individual central banks. The selected criteria and metrics for assessment are as follows:

(i) *Processing speed:* This criterion considers how quickly a bank can obtain liquidity from the central bank: the processing time from transfer instruction to the relevant SSS/CMS to receipt of liquidity. A useful metric in this regard is the number of manual steps in the process and the number of intermediary agents involved.

(ii) *Accessibility of the arrangement:* The essential issues here are how quickly, easily and safely banks can access the arrangement.

(iii) *Overcoming time zone frictions:* To the extent that there is an insufficient overlap between the operating hours of central banks, SSSs and CMSs across regions, the cross-border use of collateral may be hampered by time zone frictions. Arrangements may thus be assessed on the basis of their ability to overcome such frictions.

(iv) *Geographical coverage:* Each model has the potential to achieve full geographical coverage, but the models differ with regard to control over the decision to establish a connection. The metric applied here is the extent to which the central bank can exercise such control.

(v) *Resilience and risk management:* This criterion captures the reliability of the arrangement and its resistance to operational, or other, shocks, as well as governance and incentives to invest in risk-mitigating technology.

(vi) *Knowledge/staffing:* The key issue here is the extent to which central banks can accommodate the arrangement with minimal additional investment in knowledge or staff. Important here will be the number of new functions that will have to be performed by central bank staff.

(vii) *Acceptability to market participants/economic feasibility:* This final criterion considers the acceptability of the particular choice of arrangement to market participants, reflecting issues such as: (i) the extent to which use of the arrangement can be accommodated within the ordinary course of commercial banks' business; (ii) level playing field concerns; and (iii) the cost of implementing and using the arrangement, taking into account both the total cost of implementation and operation and how this might ultimately be passed on to users.

One important criterion not treated here is "legal soundness", given the view that, irrespective of the particular arrangement employed, a professional opinion would be sought to establish the legal enforceability of the collateral mechanism across the specific jurisdictions in question. However, it should be taken into consideration that the efforts may considerably vary subject to eg the number of intermediaries involved or jurisdictions tackled by a specific scheme, sometimes even leaving legal issues unsolved and, therefore, giving rise to a residual risk.

3.2.2 Relevant factors in assessment against these criteria

It is recognised that the performance of each arrangement will depend crucially on the way in which it is implemented (and whether the particular building blocks are implemented individually, or in combination); its interaction with existing infrastructural arrangements; and the particular complexion of the local banking sector. For example, whether the central bank has existing arrangements in place, and where its settlement banks tend to hold their securities, are just two of the crucial factors in the assessment process. Hence, no attempt has been made here to present a direct comparison of these arrangements; rather, the intention is simply to highlight some potentially important factors in the context of an assessment against these criteria.

Each of the generic models can be applied in routine as well as emergency situations, and their relative performance against many of the criteria is likely to be similar. The principal differences perhaps arise in the knowledge/staffing and acceptability/economic feasibility criteria. First, if routine use is envisaged, it becomes more feasible to make investments in people/processes, and to consider more sophisticated or costly arrangements. And to the extent that routine usage relaxed the cost constraint, encouraged increased investment in systems and process efficiency, and addressed the same potential participants as an emergency-only scheme, all models could potentially achieve enhanced performance in an emergency scenario. Nonetheless, it may be that less sophisticated, or "dirtier", versions of each model might be considered sufficient for cost/benefit reasons and in particular if envisaged for purely contingency purposes.

It is also likely that routine cross-border use of collateral would elicit behavioural responses from banks and these might differ according to the particular arrangement introduced, and the way in which it was implemented. For example, routine cross-border use of collateral, via remote access or CMS, if implemented in combination with links, might encourage increased centralisation in banks' collateral holdings. This would have two important implications. On the positive side, increased centralisation of collateral holdings would render these arrangements more efficient in the event of a crisis, and perhaps enhance their broad market acceptability. On the flip side, however, increased centralisation would increase the level of dependence on the remote (I)CSD or CMS service provider, possibly inducing concentration risk concerns. This highlights the importance of business continuity planning, in terms of both the infrastructure's own contingency arrangements, and central banks' assessments of the substitutability of collateral delivery vehicles.

In the following discussion, any other differences that might arise between application in routine and that in emergency scenarios will be highlighted.

(i) Processing speed

The arrangements best fulfilling this criterion will be those relying on the fewest steps in the processing chain and the most direct communication channels.

For example, in the case of remote access and CMS, as long as the securities are available in a counterparty's account at the relevant SSS or CMS provider, they can be delivered quickly and efficiently to the account of the central bank.[24] Again, it should be recognised that these arrangements will often be implemented in combination with links, and hence the processing speed will depend on the extent to which securities have been presettled across the link, or whether the particular links in question allow for close to real-time settlement or rely on infrequent batch processing. A full assessment against this criterion would therefore require a detailed evaluation of the relevant links. The CCBM and guarantee models have an additional step in the processing chain, and hence the processing efficiency of the central bank-based models may again rely on the extent to which securities have been predeposited with the correspondent central bank.

Processing speed may be particularly important in the context of emergency scenarios, especially when a systemic crisis hits, or when a crisis has the potential to be become systemic (ie when a bank suffering an idiosyncratic shock is sufficiently large within its market to pose a systemic threat). The more rapidly liquidity can be injected into the system, the more swiftly systemic stability can be restored. Hence, an evaluation of the extent to which optimal performance in emergency situations requires predepositing may be important in this regard. Alternatively, arrangements for emergency situations which rely directly on a readily available collateral pool (eg a commercial bank's trading portfolio) would make predepositing obsolete and could therefore achieve superior performance in times of crisis.

(ii) Accessibility of the arrangement

The most "accessible" arrangements are likely to be those that rely on processes equivalent to those employed for domestic securities. The important consideration here is where the collateral is held. In this regard, all of the generic models, with the exception of the links model, or the CMS model, if implemented domestically with links, rely on the maintenance of holdings with an overseas SSS, often

[24] The time taken to carry out securities valuation and risk control processes should also be considered here.

via a custodian. This may, therefore, introduce an additional layer of complexity (particularly with multiple connections). It may also introduce an additional source of risk: custody risk.

Custody risk has two dimensions: (i) legal risk, and in particular possible conflicts of law (from which we abstract in this analysis); and (ii) the risk of being unable to access the assets when needed for collateralisation purposes. For the mitigation of the latter risk(s), it is essential that the (I)CSD has been satisfactorily assessed - in particular against the CPSS-IOSCO *Recommendations for securities settlement systems*. In this respect, there would be no meaningful differentiation between the models.

(iii) Overcoming time zone frictions

Each model, to a varying degree, relies on the settlement timetables/operating hours of the SSS holding the securities. To the extent that the CCBM or guarantee models were implemented with predepositing, however, this issue might be addressed, although staff at the CCB might still need to be available out-of-hours.

Without predepositing, it is necessary that at least one (I)CSD (or remote CMS) is open at the time the shock hits, and, in the case of the links arrangement, at least two (unless securities have been presettled across the link). Therefore, the operating timetables of the relevant systems will be a key determinant here, and any moves by (I)CSDs to extend or synchronise operating hours would improve performance against this criterion.

(iv) Geographical coverage

In the cases of the central bank-based models, geographical coverage is clearly at the discretion of the central bank(s) involved and so can be achieved "on demand". Equally, to the extent that central banks can arrange multiple remote access or CMS connections, these models too can achieve full coverage.[25] For models involving links, however, coverage is mainly a business decision for the local SSS, and hence one step removed from central bank policy.

(v) Resilience and risk management

There is no inherent reason why each model could not achieve optimal robustness and resilience, including appropriate investment in risk-mitigating technology: an appropriate governance and oversight regime could be imposed to ensure this.

(vi) Knowledge and staffing requirements

From the perspective of knowledge and resourcing, the most attractive arrangements will be those requiring minimal additional investments. Where the arrangements being assessed are to be "kept on the shelf" for contingency purposes, central banks will be sensitive to the associated cost/resource implications.

For a central bank with a purely domestic capability and dealing only with the local SSS, a links alternative may be attractive in this regard, for in this case securities settled across the link would be processed in the same way as domestic securities. Hence, existing staff could potentially run the function. However, some knowledge would need to be acquired to the extent that the central bank retained a responsibility for securities valuation and corporate actions, etc. Remote access also implies that the central bank must acquire local knowledge in a market in which it has sought direct participation, which might be costly or impractical if implemented on an emergency-only basis, but also on a routine basis if the facility is not used.

Perhaps more attractive in this regard would be the guarantee model, in which it is not necessary for the HCB to process individual collateral securities; rather, it processes only a single "guarantee value". And in the case of the CCBM, the CCB would typically take on the burden of valuation and corporate actions, although much depends on the precise way in which the model is applied. Equally, some bilateral central bank relationships may already exist, which could be applied in a CCBM-type model, thereby generating some exploitable synergies.

[25] Although implementation and maintenance of multiple remote access is a rather theoretical option as the costs implied were considerable, if not prohibitive.

Possibly most efficient from a knowledge and staffing perspective would be a full-service CMS alternative, in which all processing, valuation, corporate actions and general day-to-day management of collateral were outsourced to the service provider. However, each central bank might want to assess carefully whether and to what extent it was willing to outsource these functions to a private sector entity, possibly accepting a loss of control and knowledge and causing a certain level of dependence on a specific service provider (not only in respect of operational resilience but also eg in terms of functions supplied and fees charged).

(vii) Acceptability to market participants/economic feasibility

Those arrangements offering full unrestricted access at low cost will best fulfil this criterion. In this regard, the links model relies only on the central bank's existing interface with its local SSS, and the latter's existing network of links to other SSSs. Furthermore, all banks with access to the local SSS for domestic securities will also have access to this arrangement and hence it can easily be accommodated in the bank's processes. Therefore, no "level playing field" issues arise. For the central bank models, entirely new bilateral (or multilateral) arrangements must be established, where not already in place, including full delineation of responsibilities, duties and processes; but once these new arrangements are in place, costs and access should not be prohibitive.

In the case of remote access and from a private market participant's perspective, however subject to the SSS in question, no new infrastructure might be required, which might make this option more attractive. However, against this, a central bank would have to establish a direct cross-border connection to the (I)CSD in question and probably make considerable investment in new systems/processes. Similarly for CMS, establishing a new arrangement would probably also require some adaptation of central bank procedures, which, particularly if for contingency only, might be difficult to justify economically. Indeed, if implemented for emergency-only use, acceptability to market participants might be low for these models if central banks sought full (or significant) cost recovery.

Furthermore, the remote access and CMS arrangements could potentially introduce "level playing field" concerns to the extent that they might be seen to favour market participants operating directly in the relevant markets (see Section 2.4). Indeed, if one considers how such arrangements might be implemented in practice - eg remote access to an ICSD with a network of links to other markets; or recourse to an ICSD's tripartite service (CMS) - one might perceive a bias in favour of a specific ICSD and in favour of those banks centralising their global collateral holdings at the ICSD in question.

4. Potential central bank actions

There are different views among central banks regarding the need for cross-border collateral arrangements, reflecting individual central bank and market circumstances. Some central banks consider that the strongest immediate case may be made for emergency-only facilities, given the relatively low level of direct foreign participation in their payment systems and the fact that banks in their countries did not appear to have a pressing need for routine cross-border arrangements. Other central banks have asserted that there is a case for routine cross-border collateral arrangements, particularly to support internationally active banks' participation in systemically important payment systems (eg those banks that are actively involved as direct participants in home and away markets). Many of these central banks have already taken action in this regard. Moreover, some market initiatives are under way. In this respect, the Committee took note of the initiative of the Payments Risk Committee to propose some private sector solutions that will facilitate intraday liquidity management for internationally active banks.[26]

Given the different needs and arrangements among the G10 central banks, an "à la carte approach" seems to be the appropriate response at this stage. However, further cooperation between central banks may be desirable as it potentially offers instruments to: (i) make the actions of individual central banks more effective; (ii) address possible common needs (eg responding to emergency liquidity situations); and (iii) ensure readiness to respond to future challenges.

The CPSS recognises that, at present, some central banks are seeking or may plan to accept cross-border collateral and will cooperate with other central banks to do this in an efficient and effective manner. Such facilities may be used for routine or emergency credit, or both, depending on the central bank.

It should nevertheless be stressed that each central bank can choose the approach best suited to its particular circumstances, ie each should decide independently whether to establish additional arrangements and, if so, on both the scenario for the potential application of measure and the specific instruments to be used.

On this basis, the following set of potential central bank actions can be identified, with each central bank tailoring its specific actions to the circumstances of its domestic market and to any existing framework between the two currency areas to be "connected":

- supporting central banks' partners in implementing a cross-border arrangement of their choice, where appropriate. For instance, central banks may determine a framework for sharing assessments of critical infrastructures (eg (I)CSDs, links), establishing inter alia the purpose and content of the information exchanged. Another possibility is coordinating responses and information exchange by central banks in the event of a severe emergency situation;
- acceptance of additional categories of foreign collateral by some central banks, through either existing or new cross-border collateral arrangements (at least for contingency use).

Furthermore, to foster the enhancement of market infrastructures and to facilitate progress towards smoother and more efficient cross-border use of collateral, central banks, perhaps in cooperation, might also take actions to promote:

- risk mitigation in collateralisation practices;
- interoperability between existing infrastructures.

In the remainder of this chapter, these potential actions will be further elaborated.

[26] See *Global payment liquidity: private sector solutions*, PRC, Report by the Global Payment Liquidity Task Force, October 2005.

4.1 Areas for potential cooperation and coordination among G10 central banks

Given the differing collateralisation practices in the G10 central banks, there would be some benefit in further developing cooperation and coordination among the G10 central banks. This does not mean that these practices should be fully harmonised; rather, central banks might seek to deepen their cooperation in order to facilitate the elimination of operational obstacles to safe and efficient cross-border arrangements. Most of the actions will depend on bilateral agreements between national central banks; however, there might be a few points for which they might wish to consider a joint approach.

Where feasible, the central banks should be encouraged to investigate the following measures:

- supporting central banks' partners in implementing a cross-border arrangement of their choice, where appropriate. For instance, central banks may determine a framework for sharing assessments of critical infrastructures (eg (I)CSDs, links), establishing inter alia the purpose and content of the information exchanged. Another possibility is coordinating responses and information exchange by central banks in the event of a severe emergency situation;
- adopting relevant international communication procedures and standards when possible. This measure is also reflected in Recommendation 16 of the CPSS-IOSCO *Recommendations for securities settlement systems*, "Communication procedures and standards". While in the report the recommendation primarily addresses the (I)CSDs, in this context it would also have validity for central bank procedures, especially in a CCBM or guarantee arrangement;
- creating awareness of the operating and cutoff times of the various relevant systems;
- exchanging "best practice" between G10 central banks (eg sample contracts for various cross-border collateral arrangements);
- promoting harmonisation of corporate events and tax treatment to facilitate the cross-border use of certain securities, and in particular to mitigate risks associated with their use as collateral on a cross-border basis. Some procedures are in place to avoid double taxation, but they are complex and not harmonised, either in the way in which they are processed or in terms of the interactions between the various parties involved (counterparties, central banks acting as custodians/collateral-takers and market infrastructure). An initiative in this field is being undertaken within the framework of the European Commission, which has set up the clearing and settlement fiscal compliance (FISCO) expert group.

Additional measures might, with a longer-term horizon, be envisaged to foster increased harmonisation, or at least convergence, in the above-mentioned practices. Whether this is desirable and meets an actual market demand needs to be evaluated independently by each central bank. Potential areas of convergence include:

- coordination of eligible collateral lists, even if only in times of crisis;
- gravitation towards more similar risk control frameworks and valuation procedures;
- implementation of common tools for managing collateral.

These harmonisation measures would help to facilitate access to central bank liquidity across the G10 markets. They would also mean that a substantial share of foreign collateral would become eligible, at least in the event of a crisis, in all the G10 countries. Of course, some differences in the risk control frameworks would remain in that specific additional haircuts for foreign exchange risks would be applied, depending on the currency of denomination of securities collateralised relative to the currency in which liquidity was provided.

4.2 Acceptance of additional categories of foreign collateral

When looking at the G10 cross-border collateral arrangements currently in place, the most notable features are the widespread acceptance of euro-denominated collateral across the G10, and the acceptance of a full range of G10 collateral in the United States. Other selected arrangements exist for the receipt of foreign collateral in Switzerland, the United Kingdom and Sweden. Table 1 summarises the existing cross-border linkages within the G10.

Discussions with internationally active banks revealed that a number of additional linkages between G10 currency areas would be desirable, particularly for contingency purposes. A subset of such arrangements is already in place and currently used for routine purposes, as can be seen in Table 1, but some banks suggested that there might be value in adding facilities to connect the major financial centres and major currency areas, at least in case of emergency.

In addition, as discussed in the context of the performance criteria introduced in Chapter 3, existing routine arrangements should allow for speedy and efficient collateral transfer and a sufficient level of resilience so as to be accessible also in emergency situations. In this respect, it would also have to be assessed carefully whether there were other restrictions that might prevent routine arrangements from being used in an emergency, such as differing participants under routine and emergency conditions. Efficient connections to the United States seem to be particularly important to the commercial banking community as extraordinarily high liquidity demands in the United States late in the day could require the short-term transfer of European or Asian collateral to the United States to raise that liquidity. This also reflects that many banks perceive the US close-of-business as their "global end-of-day".[27]

Table 1

Existing cross-border collateral linkages

Collateral from:	To:						
	Canada	**Euro area**[1]	**Japan**	**Sweden**	**Switzerland**	**UK**	**US**
Canada		No	No	No	No	No	Yes - R/E (RA/CMS)
Euro area	No		No	Yes - R/E (RA/ Guarantee/ CCBM[2])	Yes - R/E (CMS/links)	Yes - R/E (CCBM/RA)	Yes - R/E (RA/CMS)
Japan	No	No		No	No	No	Yes - R/E (RA/CMS)
Sweden	No	No	No		No	No	Yes - R/E (RA/CMS)
Switzer-land	No	No (but links)	No	No		No (but links)	Yes - R/E (RA/CMS)
UK	No	No (but links)	No	No	No (but links)		Yes - R/E (RA/CMS)
US	No (but links)	No	No	No	No	Yes - E (CCBM)	

[1] There is extensive cross-border use of collateral within the Eurosystem, with widespread recourse to a multilateral CCBM arrangement, and more limited recourse to guarantee, links, remote access and CMS models. [2] Not currently used for the euro area, but rather with Norway and Denmark. R/E: denotes arrangements available for routine and emergency purposes; these are prearranged and precommunicated arrangements, which can be used readily for established central bank credit operations. E: denotes emergency-only facilities. RA: denotes remote access facilities. CMS: denotes collateral management systems. CCBM: denotes correspondent central banking models.

4.3 Improving cross-border collateralisation practices

Two types of actions could be envisaged in order to help further mitigate risks in the field of cross-border use of collateral: actions on legal aspects and on the availability of systems.

[27] Running in the opposite direction, some European banks suggested that a USD-EUR linkage might allow extraordinary late-in-the-day liquidity demands in Europe to be met in the US Treasury market, a much more liquid market at that time of the day.

Legal issues

As discussed in Chapter 2, legal issues might be a significant constraint in ensuring the enforceability of cross-border collateral arrangements. Beyond the necessary legal assessment of any arrangements ahead of implementation, work on harmonising legal practices related to collateralisation should be encouraged. A good example of such harmonisation is the work undertaken in the European Union on the establishment and implementation of the EU Settlement Finality and Collateral Directives. These directives have facilitated harmonisation of practices in collateralised operations, while simplifying procedures to pledge or transfer collateral.

Further work in the legal area is under way, eg in the European Union, following the Giovannini reports. This includes the EU Legal Certainty Project, which is seeking to identify legal issues such as finality in the transfer of interests in securities held through an intermediary, agreement on terminology and definitions, and how dematerialisation of securities is effected in the European Union.

Along the same lines, in September 2002 UNIDROIT initiated a project on "Harmonised substantive rules regarding indirectly held securities". This project is considering the modernisation and harmonisation of key aspects of substantive law relevant to the cross-border holding and transfer of securities held through intermediaries.

In addition, the Hague Securities Convention seeks to identify which law determines legal rights related to securities held through financial intermediaries, such as custodian banks, securities settlement systems and securities depositories. The Convention proposes the PRIMA (Place of the Relevant Intermediary) approach, which would enable each intermediary and its immediate account holder to agree on the relevant law as a matter of contractual choice (subject to certain restrictions).

The G30 report *Global clearing and settlement: a plan of action* also refers to the need to improve legal certainty.

In the same vein, one might envisage the development of standardised G10 legal documentation, eg for central bank guarantees, which could help to mitigate some of the legal issues referred to in Section 2.5. The use by central banks of master agreements such as those already developed in the international market, eg the GMRA/ISMA or the EMA, would harmonise the legal aspects of the collateralisation mechanism adopted by the central banking community, thereby restricting legal uncertainty to issues of underlying jurisdictional conflict. Indeed, such a master agreement approach would allow the establishment of a standard for most of the legal and technical aspects of such operations (for instance, closeout netting clauses; the approach to collateral valuation; settlement operations). However, central banks should carefully assess whether existing private sector agreements adequately address their specific requirements and safety needs. Therefore, a comprehensive and thorough legal analysis of such agreements would be indispensable.

The availability of systems

In the context of the resilience and risk management criterion identified in Section 3.2, there is considerable merit in taking steps to ensure a high level of quality and efficiency in the market infrastructure. It requires that the key infrastructures used to process collateral and payments related to intraday credit operations in G10 countries meet the highest standards in terms of regulatory requirements and business practices, including resilience and business continuity. These requirements are well established and outlined, in particular, in the CPSS-IOSCO *Recommendations for securities settlement systems* (and in the associated assessment methodology) and in the CPSS report on *Core Principles for Systemically Important Payment Systems*. Adherence to such standards requires that an adequate general oversight of these systems is ensured.

In particular, ensuring a high level of availability would also require that such arrangements were tested on a regular basis in order to ensure their operability in an emergency situation. Widespread routine use might provide for constant testing of the basic operability of such arrangements. However, in order to ensure business continuity in case of emergency, testing should also be carried out, involving those entities that might access these facilities only in an emergency situation but would not use them in routine conditions, even if this were possible.

4.4 Promoting interoperability

The infrastructures involved in cross-border collateral arrangements should enhance their procedures to ensure maximum safety, speed and efficiency. Intraday use of collateral to raise liquidity in an

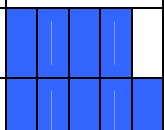
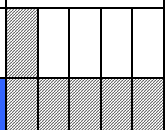
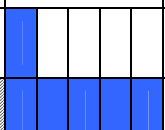
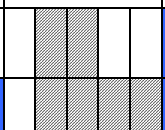
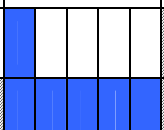
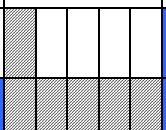
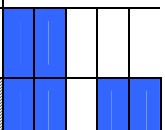
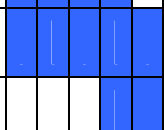
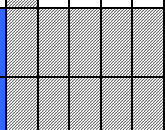
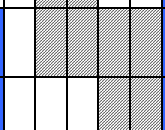
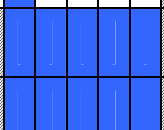
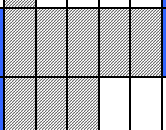
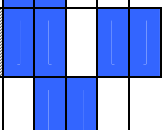
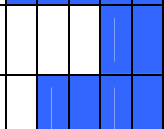
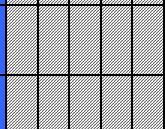
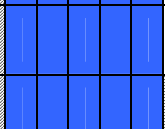
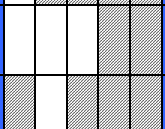
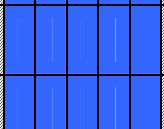
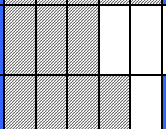
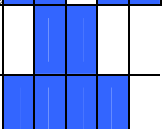
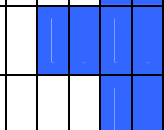
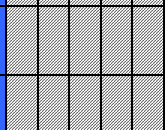
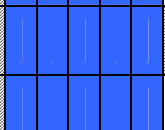
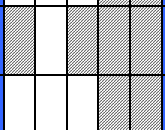
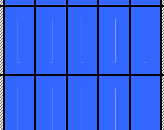
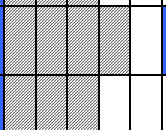
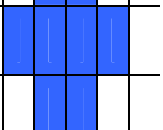
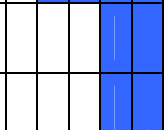
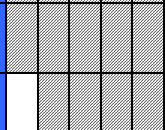
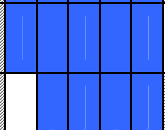
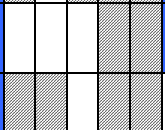
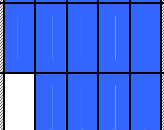
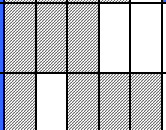
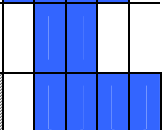
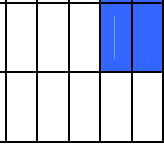
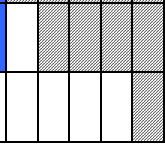
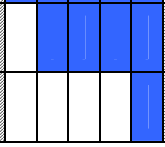
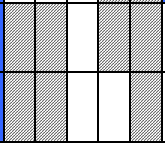
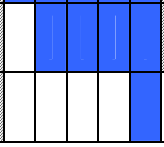
emergency situation requires both a high level of availability of systems and access to (close to) real-time settlement services. In particular, the use of links between (I)CSDs has often been found to be too slow to be feasible in the event of a contingency. The following actions might be considered:

- Typically, in order to generate intraday liquidity, market participants need to access both the securities and the payment infrastructure. At a local level, in accordance with local practices, synchronisation of the opening hours and cutoff times for settlement instructions and/or cash payments has been achieved in order to ensure the smooth functioning of the market. However, synchronisation of operational processes across all G10 countries has never been envisaged; neither has this ever been analysed in a systematic way. At the time of implementation of CLS, the synchronisation of payment system processes was addressed, and some payment systems adapted their operating hours to meet the requirements of the CLS pay-in schedule. Further synchronisation of the payment and securities settlement processes of the G10 countries might be one way to optimise the efficiency of existing infrastructures, while economising on the need to introduce/implement new infrastructures/procedures. One of the major challenges in this context is overcoming the time zone frictions that exist between the American, European and Asian time zones.

Table 2 below, gives an overview of the operating hours of G10 payment and securities settlement systems.[28] More specifically, the table presents a direct mapping of G10 SSSs' operating hours to those of each G10 large-value payment system. In each case, the table highlights the degree of overlap in operating hours, ie the proportion of a payment system's operating hours during which each SSS is also operating and therefore where collateral is potentially reachable. Comparison across systems reveals that, notwithstanding considerable overlap, there remains clear scope for further synchronisation, particularly where time zone frictions are greatest. It should be stressed that the aim of this table is to provide information on the constraints existing before setting up a solution (CCBM, links described in Chapter 3) and does not imply that the correspondence of operating hours necessarily means access to the securities and payment infrastructures.

Table 2

Time zone frictions

Collateral deliverable:	To (local time): Japan PS 9:00-19:00	Euro area PS 7:00-18:00	Sweden PS 7:00-17:00	Switzerland PS 17:00 (SD–1)-16:15	UK PS 6:00-16:20	Canada PS 0:30-18:30	US PS 21:00 (SD–1)-17:00
Japan SSS							
Euro area SSS							
Sweden SSS							
Switzer-land SSS							
UK SSS							
Canada SSS							
US SSS							

PS: denotes payment system. SD: denotes settlement date.

[28] The opening/closing hours and cutoff times for customer payments and bank payments are described in more detail in Annex 3.

Each rectangle represents roughly a fifth of a PS's operating hours.

- The implementation of (close to) real-time settlement processes could considerably speed up the processing of transactions and increase system capacity and would probably promote the interoperability of systems, thus alleviating differences in operating hours. This could be achieved either with procedures based on RTGS processes (ideally offering DVP model 1,[29] or FOP real-time processes) or with multiple batch processing. In order to fully exploit the benefits of such procedures, linkages between systems would have to be implemented in a manner that allows full use of these high-speed settlement capacities, eg using continuous settlement cycles and including optimisation processes and liquidity-saving features. Furthermore, such linkages should be based, as far as possible, on automated procedures and use resilient communication means. Similarly, such linkages should be as direct as possible, without the intermediation of third parties, which might delay processes in the event of a shock or introduce undue credit risk. However, the cost and benefits of such features would have to be assessed carefully since the implementation of such procedures might imply considerable efforts by all participants concerned, therefore calling for a strong business case.
- Increased transparency regarding payments and collateral movements (eg real-time information on the current status of individual payments and collateral transfers) would allow banks to use existing collateral and liquidity more efficiently. This would potentially increase the private sector's capacity to deal with unexpected peak liquidity or collateral mismatches and therefore strengthen payment system resilience. Furthermore, comprehensive information and extensive knowledge could increase the awareness of detrimental behaviour by market participants in terms of liquidity management practices, thus further promoting market-driven solutions and potentially reducing the overall demand for liquidity or collateral, respectively.

[29] For a detailed discussion of the settlement models in securities settlement systems, see *Delivery versus payment in securities settlement systems*, BIS, September 1992.

Annexes

Annex 1: Summary of generic models for cross-border collateral arrangements

Annex 2: Summary of existing arrangements

Annex 3: Operating hours of selected large-value payment and securities settlement systems

Annex 4: Members of the working group

Annex 1:
Summary of generic models for cross-border collateral arrangements

Feature	Correspondent central banking model	Guarantee model	Links between SSSs	Remote access to an SSS	Collateral management system
Emergency and routine application of the model	The model can support intraday and overnight liquidity needs in both routine and emergency circumstances. Routine needs can be met through the preplacement of a core of collateral assets with the CCB. Settlement timetable constraints and processing lags might undermine application of the model to meet time-critical needs.	The model can support intraday and overnight liquidity needs in both routine and emergency circumstances. Routine needs can be met through the preplacement of a core of collateral assets with the CCB. Settlement timetable constraints and processing lags might undermine application of the model to meet time-critical needs.	The model can support intraday and overnight liquidity needs in both routine and emergency circumstances, though the SSS is unlikely to establish dormant links. Routine needs can be met by the pretransfer of a core of collateral assets to the home SSS. Absence of real-time links, settlement timetable constraints and processing lags might undermine application of the model to meet time-critical needs.	The model can support intraday and overnight liquidity needs in both routine and emergency circumstances, though required knowledge of foreign processes and procedures might be best acquired through routine usage. Settlement timetable constraints and time zone frictions can also undermine ”real-time” application of the model.	The model can support intraday and overnight liquidity needs in both routine and emergency circumstances, though high setup costs might preclude maintenance of a dormant facility. If combined with links, constraints can occur in the delivery of collateral securities to the CMS if the links to other SSSs do not operate in real time or if time zone issues exist.
Responsibilities	The CCB is responsible for a custodial service. All risks and rights associated with those assets beyond these custodial services remain with the HCB.	The CCB issues a guarantee to the HCB. The CCB is responsible for procedures and actions associated with the safekeeping of the collateral assets. Further, the CCB monitors collateral values and informs the HCB of material changes in the guarantee’s value.	All risks and rights associated with the collateral assets remain with the HCB. At the very least, the domestic SSS is responsible for orderly cross-border settlement of the collateral assets, but responsibility for valuation, corporate actions and other ancillary duties generally rests with the HCB.	All risks and rights associated with the collateral assets remain with the HCB. At the very least, the foreign SSS is responsible for orderly settlement of the collateral assets, but responsibility for valuation, corporate actions and other ancillary duties generally rests with the HCB.	The CMS is responsible for the settlement of securities and all procedures and actions associated with the safe-keeping of collateral assets, monitoring of values and risk management.

Feature	Correspondent central banking model	Guarantee model	Links between SSSs	Remote access to an SSS	Collateral management system
Legal framework	Based on a contractual relationship between the HCB and CCB. Legal opinion must be sought on enforceability of the collateralisation mechanism across borders.	Based on a contractual relationship between the HCB and CCB. Actual cross-border transfer does not take place, but legal issues can arise from the cross-border inter-central bank guarantee.	Based on domestic legal arrangements. However, appropriate evaluation of legal risks related to the robustness and enforceability of the links must be carried out in advance.	Based on a contractual relationship between the HCB and foreign SSS. Legal opinions are required to ensure enforceability of the collateralisation mechanism across borders.	Based on a contractual relationship between the HCB, counterparties and CMS operator. Legal opinion must be sought on enforceability of the collateralisation mechanism across borders.
Operational issues	Procedures to be agreed between the CCB and HCB. Settlement timetables at the local SSS may be a constraint. The arrangement may be introduced with varying degrees of automation.	The CCB and HCB must agree on the set of procedures for guarantee. Settlement timetables at the local SSS and processing lags between the CCB and HCB may be a constraint.	Relies on the HCB's domestic procedures with its local SSS. Settlement timetables at the SSSs, time zone frictions and varying efficiency of links may introduce operational constraints.	The HCB must conduct procedures and actions to safekeep the foreign collateral in its account. Relies on efficient and reliable remote access to the foreign SSS. Settlement timetables at the foreign SSS (or, if combined with links, any SSS to which it may be linked) and time zone frictions may introduce operational constraints.	Procedures to be agreed between the HCB, counterparties and CMS. Relies on efficient and reliable infrastructure and procedures at the CMS. If combined with links, the settlement timetable at the SSSs to which the CMS is linked, varying efficiency of such links and time zone frictions may introduce operational constraints.
Implementation	Relatively simple to implement, requiring only the cooperation of the interested central banks and links to existing infrastructure.	Relatively simple to implement, requiring only the cooperation of the interested central banks and links to existing infrastructure.	Links implemented at the discretion of the SSS, based on an evaluation of the business case. Though domestic processes are applied, the HCB must accumulate the know-how to manage foreign collateral securities.	Relatively simple to implement from an infrastructural perspective as only a remote access is required. However, the HCB must become familiar with processes at the foreign SSS and accumulate the know-how to manage foreign collateral securities.	Relatively simple to implement from an HCB perspective if a CMS operator exists. The CMS operator is responsible for the infrastructure and operational setup; the HCB only requires an adequate interface with the CMS.

Feature	Correspondent central banking model	Guarantee model	Links between SSSs	Remote access to an SSS	Collateral management system
Economic viability	Relies on existing infrastructure. Investments required in legal opinion and internal resources. Some IT investments might be required to automate processes, if it is intended to ensure a minimum level of performance.	Relies on existing infrastructure. Investments required in legal opinion and internal resources. Some IT investments might be required to automate processes, if it is intended to ensure a minimum level of performance.	Limited investments required by the HCB, though due diligence on links must be carried out. Some resource cost in accumulation of know-how to manage foreign securities. Model implemented only if the SSS considers the link to be economically viable.	Limited investment required by the HCB, though legal costs borne in setting up remote access account. Some resource cost in gaining familiarity with foreign procedures and accumulation of know-how to manage foreign securities.	Limited investment required from the HCB (only interface to the CMS). However, high CMS service costs may lead to higher usage costs for the HCB and counterparties than for other models.
Policy specifics	No specific policy issue, as the model relies on existing infrastructure and local know-how. However, potential to crowd out private sector initiatives.	No specific policy issue, as the model relies on existing infrastructure and local know-how. However, potential to crowd out private sector initiatives.	Links between SSSs may become critical for the functioning of the domestic market for liquidity. Enforcement and control of minimum standards for these links might be limited.	The foreign SSS may become critical for liquidity arrangements in the home country. However, oversight instruments and the influence of the HCB over the foreign SSS might be limited.	The CMS is critical for liquidity arrangements in the home country. However, oversight instruments and the influence of the HCB over the CMS might be limited.

Annex 2:
Summary of existing arrangements

Arrangement	Eligible securities	Scope	Motivation	Usage
Eurosystem				
CCBM	All Eurosystem-eligible assets	Intraday and overnight; routine and emergency	To ensure equal treatment of all Eurosystem counterparties, ie that all eligible collateral can be used by all counterparties whatever the collateral and its location.	High (EUR 250 billion - 35% of Eurosystem collateral deposited)
Links	All Eurosystem-eligible assets	Intraday and overnight; routine and emergency		Low compared to CCBM (EUR 40 billion - 5% of Eurosystem collateral deposited)
Guarantee model	Some non-marketable Eurosystem-eligible assets	Intraday and overnight; routine and emergency		Has occurred only a few times since 1999, for very small amounts
Remote access	Some eligible assets held in ICSDs	Intraday and overnight; routine and emergency	In addition to the above motivation, to facilitate the mobilisation of some category of collateral directly held in the ICSDs.	Seldom (a few EUR billion - less than 1% of Eurosystem collateral deposited)
CMS (XEMAC - collateral management services operated by Clearstream Banking Frankfurt)	All Eurosystem-eligible securities issued in Germany and some foreign marketable debt instruments held in Clearstream Banking Frankfurt through links with other SSSs.	Intraday and overnight; routine and emergency (for German counterparties)	In addition to the links, to reduce the amount of administrative monitoring and to facilitate the use of foreign debt instruments (together with domestic ones).	Amount of foreign collateral is small

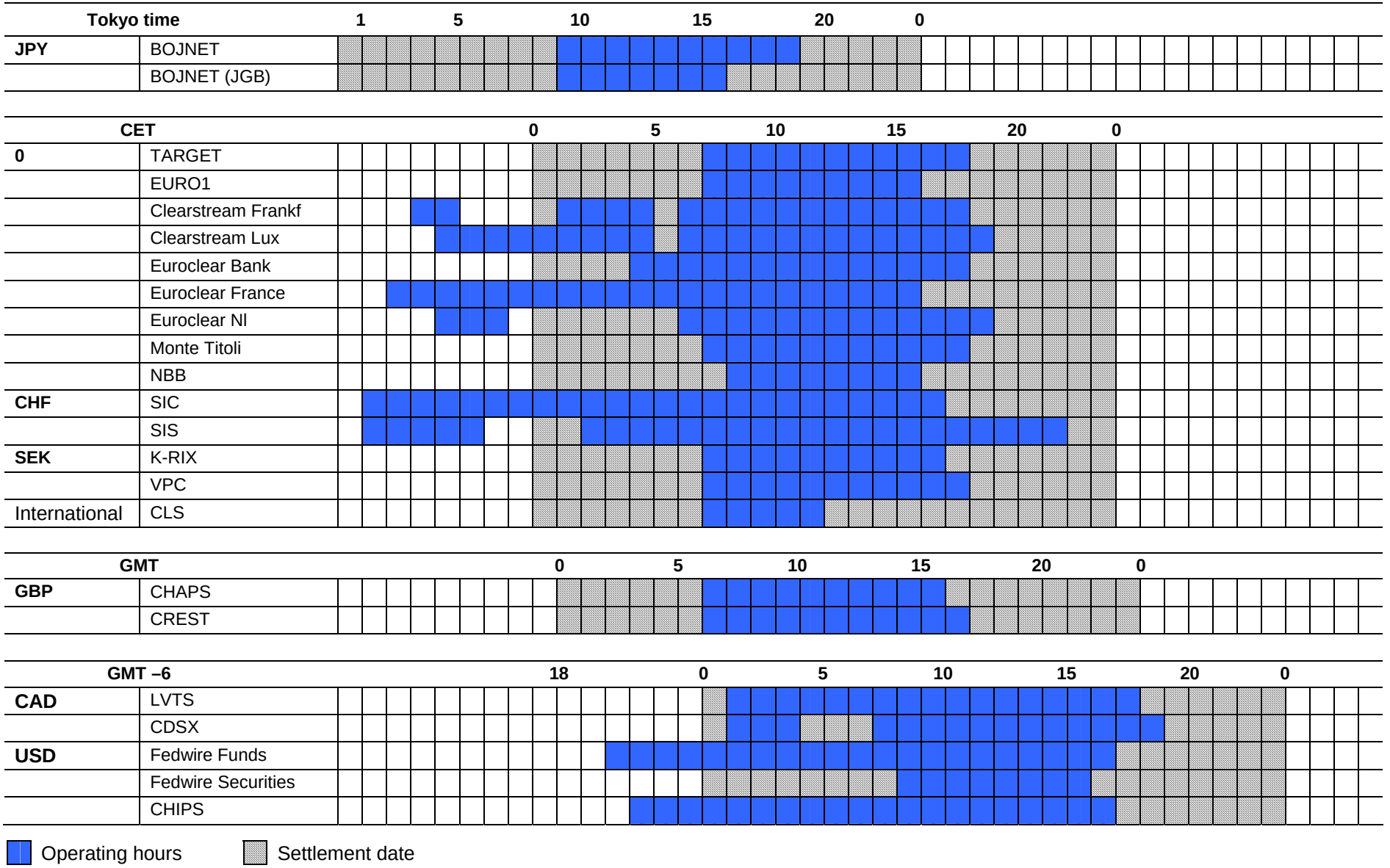
Arrangement	Eligible securities	Scope	Motivation	Usage
Sweden				
CCBM	Euro area debt instruments. Danish and Norwegian government securities.	Intraday and overnight; routine and emergency	Given a highly integrated banking system across the Scandinavian region, these arrangements were designed to support an integrated approach to collateral management and to connect to the Eurosystem.	Low-Medium
Guarantee model (Scandinavian Cash Pool)[1]	DKK and NOK cash	Intraday only; routine and emergency	The prime motivation was to support counterparties' time-critical liquidity needs - notably for CLS pay-ins. This motivation favoured a fully automated solution, which avoided the processing lags inherent in the existing bilateral arrangements.	Medium
Remote access	Any eligible foreign debt security that either is issued in Euroclear Bank or issued in another CSD and registered in Euroclear Bank through a link that is found safe and reliable by the Riksbank.	Intraday and overnight; routine and emergency	Introduced as a response to counterparties' requests that foreign government bonds and international bonds usually held in accounts with Euroclear be accepted as collateral.	Medium (excluding collateral posted for monetary policy repos and for credit operations in euros)
Switzerland				
CMS (tripartite repo service operated by SIS SegaInter-Settle AG, combined with links)	Both domestic and foreign securities are delivered through the tripartite repo service. Foreign collateral can be securities denominated in euros issued by Germany, Austria, the Netherlands, France, Belgium and Spain; or German Jumbo Pfandbriefe that fulfil certain criteria.	Intraday and overnight; routine and emergency	Introduced as a response to counterparties' requests that foreign government bonds be accepted. Accepting foreign collateral also made it possible to increase the number of counterparties for monetary policy transactions and to facilitate the development of an interbank repo market.	High (around 60% of total collateral posted)

[1] Special features exist for euro cash paid to the Riksbank through TARGET, introduced as a response to counterparties' request to (i) utilise intraday deposits with the Riksbank, and (ii) have an efficient arrangement for covering extraordinary liquidity demands

Arrangement	Eligible securities	Scope	Motivation	Usage
United Kingdom				
CCBM	Eurosystem-eligible euro-denominated sovereign securities rated at least AA-/Aa3.	Intraday and overnight (though with some settlement timetable constraints for late open market operations); routine and emergency	The extension of the eligible list for sterling operations to include euro-denominated assets was intended to assist the smooth conduct of the Bank's open market operations and payment system activity, and to help ensure that the Bank's operations and those of its counterparties develop(ed) in parallel with the euro area.	High (typically 75% intraday*/45% OMO) * Excludes intraday liquidity generated in the SSS via self-collateralising repos.
Remote access	Internationally issued sterling-denominated EEA sovereign/supranational assets. Internationally issued Eurosystem-eligible euro-denominated sovereign/supranational securities rated at least AA-/Aa3. HM Government euro- and US dollar-denominated securities. Bank of England euro-denominated bills and notes.	Intraday and overnight; routine and emergency	To ensure that the eligible securities could be used to support monetary policy operations and payment system activity. As these instruments were issued directly into Euroclear Bank/Clearstream Banking Luxembourg, it was considered efficient and convenient to receive them directly into accounts held at the ICSDs.	Low (5% intraday)
Bilateral	US Treasuries	Emergency-only	The Bank of England was keen to ensure that arrangements were in place to receive the larger part of the universe of high-quality assets that settlement banks and OMO counterparties might conceivably be holding in the event of an adverse shock to the system. With vehicles already in place to receive Eurosystem-eligible assets (CCBM) and international bonds (remote access), this facility was a natural extension.	Not yet used
The Bank of England also accepts euro cash collateral. Euro cash may be mobilised via TARGET and then used to back sterling liquidity for use in CHAPS Sterling.				

Arrangement	Eligible securities	Scope	Motivation	Usage
United States				
Remote access (to Euroclear Bank)	Sovereign bonds and Brady bonds which are at least investment grade and Jumbo Pfandbriefe which are at least AAA-rated. Issues can be in USD, AUD, CAD, CHF, GBP, JPY, DKK, SEK and EUR.	Intraday and overnight; routine (given processing lags, likely to be impractical to meet emergency needs)	Established just before Y2K so as to allow banks to pledge foreign collateral on a contingent basis. The primary motivation in making these arrangements permanent was the Fed's desire to give foreign banks more flexibility in using the discount window and to lower the all-in costs of establishing backup short-term funding in US dollars.	Low (around 1% of total collateral posted)
CMS (tripartite collateral services provided by Clearstream Banking Luxembourg)				Low (around 0.5% of total collateral posted)

Annex 3:
Operating hours of selected large-value payment systems and securities settlement systems



	System	Operating hours (local time)	Latest cutoff time (local time)
Canada	LVTS	00:30-18:30	18:00 for customer payments; 18:30 for bank payments
	CDSX	00:30-19:30	16:00 close for DVP settlement; 19:30 for trade settlement; available from 04:00 to 07:00 for batch processing only
Euro area	TARGET	07:00-18:00	17:00 for customer payments; 18:00 for bank payments
	EURO1	07:30-16:00	16:00
	Clearstream Banking Frankfurt	**Night-time processing 1** 19:00 (SD–1)-21:00 (SD–1) **Night-time processing 2** 01:30-05:30 **Daytime processing** 06:00-18:00	**Night-time processing 1** 19:00 (SD–1) for both DVP and FOP settlement **Night-time processing 2** 05:30 for both DVP and FOP settlement **Daytime processing** 17:30 for DVP and 18:00 for FOP settlement
	Clearstream Banking Luxembourg	**Night-time processing** 20:30 (SD–1)-05:00 **Daytime processing** 06:00-19:00	**Night-time processing** 20:30 (SD–1) for both internal and bridge transactions with Euroclear **Daytime processing** 18:00 for internal and 13:30 for bridge transactions with Euroclear
	Euroclear Bank	4:00-17:45	
	Euroclear France	20:00 (SD–1)-17:00	
	Euroclear Netherlands	20:00-23:00 (SD–1) and 06:00-17:30	
	Monte Titoli	7:00-18:30	
	NBB SSS	8:00-16:15	Possibility to collateralise between 16:30 and 17:30 for intraday credit and monetary policy operations
International	CLS	07:00-12:00	06:30
Japan	BOJNET	9:00-19:00	14:00 for customer payments; 19:00 for bank payments
	BOJNET (JGB)	9:00-16:30	

	System	Operating hours (local time)	Latest cutoff time (local time)
Sweden	K-RIX	07:00-17:00	Participants have agreed not to send payments after 16:00 without bilateral agreement
	VPC	07:00-18:00	
Switzerland	SIC	17:00 (SD–1)-16:15	15:00 for customer payments; 16:00 for bank payments
	SIS	02:00-21:30	
United Kingdom	CHAPS Sterling	06:00-16:20	16:00 for customer payments; 16:20 for bank payments
	CHAPS Euro	06:00-17:00	16:00 for customer payments; 17:00 for bank payments
	CREST	06:00-16:45	14:55 for standard DVP settlement; 16:45 for FOP settlement (after standard DVP settlement has closed, so-called deliveries-by-value (DBVs) also take place, which allow members to lend (borrow) securities against cash overnight)
United States	CHIPS	21:00 (SD–1)-17:00	
	Fedwire	21:00 (SD–1)-18:30	17:00 for payments to foreign central banks and international agency accounts; 18:00 for customer payments; 18:30 for settlement payments
	Fedwire Securities	08:30-15:30	15:15 for interbank originations (DVP and FOP); 15:30 for interbank reversals (DVP and FOP). After the interbank reversal period has closed, participants may reposition collateral FOP until 19:00.
	DTC	06:00-23:00	15:20 for DVP settlement; 18:30 for release of collateral by pledgor; 18:45 for FOP settlement

SD: denotes settlement date.

Annex 4:
Members of the working group

In producing this report, the Committee on Payment and Settlement Systems was greatly assisted by the working group it set up, whose members are listed below.

Chairperson (European Central Bank)	Koenraad de Geest (until December 2004) Daniela Russo (from January 2005)
National Bank of Belgium	Simone Maskens
Bank of Canada	Ronald Allenby
European Central Bank	Marc Bayle Karine Themejian (from June 2005)
Bank of France	Frédéric Hervo
Deutsche Bundesbank	Jochen Metzger Martin Treinies
Bank of Italy	Lucia Veneziani
Bank of Japan	Takashi Hamano (from July 2005) Tomoyuki Shimoda (until June 2005)
Netherlands Bank	Simon Kappelhof
Sveriges Riksbank	Jan Schüllerqvist
Swiss National Bank	Philipp Haene
Bank of England	Mark Manning
Board of Governors of the Federal Reserve System	Jeffrey Marquardt Lisa Hoskins
Federal Reserve Bank of New York	Lauren Hargraves
Secretariat (Bank for International Settlements)	Luchia Christova

Significant contributions were also made by R Spence Hilton and Lawrence Radecki, both from the Federal Reserve Bank of New York.