

BANK FOR INTERNATIONAL SETTLEMENTS

**Report of the
Committee on Interbank Netting Schemes of the
Central Banks of the Group of Ten countries**

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Part A

Introduction and summary

Section 1: Introduction

1.1 In February 1989 the Report on Netting Schemes prepared by the Group of Experts on Payment Systems of the central banks of the Group of Ten countries (the Angell Report) was published by the BIS. At that time the G-10 Governors agreed to establish a high-level, ad hoc committee to analyse further the policy implications of cross-border and multi-currency netting arrangements identified by the Angell Report as being of particular concern to central banks collectively. Promoters of interbank netting schemes had been requesting the views of central banks individually on projects which appeared to have implications for a number of countries and it was hoped that the collective consideration of the issues raised by these schemes might provide a basis for common responses by the G-10 central banks. This Report contains the analysis of netting conducted by the Committee on Interbank Netting Schemes together with the Committee's policy recommendations.

1.2 The Angell Report presented an analysis of the credit and liquidity risks experienced by participants in bilateral and multilateral netting arrangements for both interbank payment orders and forward-value contractual commitments, such as foreign exchange contracts. The Report also identified a number of broader policy issues. These included the effects of netting on the integrity of interbank settlement arrangements, on the conduct of monetary policy, and on trading behaviour in interbank markets. Particular concern was expressed for the complications posed for the allocation of supervisory responsibilities and the effective oversight of cross-border netting systems.

1.3 The Committee's work has confirmed the general analysis of the credit and liquidity risks associated with netting schemes that is contained in the Angell Report as well as the main policy concerns for central banks which the Report identified. In general terms, the Committee has recognised various advantages that netting can have in terms of improving both the efficiency and the stability of interbank settlements, by reducing costs and risks, provided that certain conditions are met. However, the relative lack of experience with different types of netting arrangements - particularly proposed systems for multilateral netting of foreign exchange contracts - has made it difficult for the Committee to analyse all of their likely consequences. Nevertheless, the Committee has concluded that the shared policy objectives of central banks do provide a sufficient basis for common policy responses to the development of cross-border and multi-currency netting systems.

1.4 The Committee's analysis and policy recommendations are summarised in this Part A of the Report. Part B describes the policy objectives that central banks have in common with respect to these netting systems, presents the Committee's analysis of the impact of netting on credit and liquidity risks and on the level of systemic risk and describes the broader implications of netting arrangements for central banks and supervisory authorities. Part C presents the Committee's recommended minimum standards for the design and operation of cross-border and multi-currency netting and settlement schemes. Part D presents principles for cooperative central bank oversight of these schemes. A list of the members of the Committee is contained in an annex.

Section 2: Summary of analysis

2.1 Central banks have shared policy interests both in the efficiency and stability of interbank payment systems and, more generally, in the efficiency and stability of the financial system as a whole. In particular, all central banks have an interest in limiting the level of systemic risk in the

banking system while encouraging improvements in the efficiency of interbank markets and the settlement systems which support these markets. Central banks also seek to maintain the effectiveness of the policy instruments used to pursue their ultimate objective of the stability of their currency and to ensure their continued ability to oversee developments in the markets through which monetary and exchange rate policies are implemented.

2.2 By reducing the number and overall value of payments between financial institutions, netting can enhance the efficiency of domestic payment systems and reduce the settlement costs associated with the growing volume of foreign exchange market activity. Netting can also reduce the size of credit and liquidity exposures incurred by market participants and thereby contribute to the containment of systemic risk.

2.3 Effective reductions in exposures, however, depend upon the legal soundness of netting arrangements in producing binding net exposures that will withstand legal challenge. The concept of netting, in the broadest sense, is given effect under the law of all G-10 countries. But binding net exposures may not be achievable by all banks in all circumstances. For example, cross-border netting arrangements raise choice-of-law and conflict-of-law questions that cannot be easily resolved. Establishing a sound basis for the assertion of net exposures will, therefore, require thorough legal preparation by the participants in netting schemes and by netting providers.

2.4 If, instead of achieving reductions in actual credit and liquidity exposures which participants would experience in the event of a counterparty default, netting merely obscures the level of exposures, then netting arrangements have the potential to contribute to an increase in systemic risk. Moreover, even when actual exposures are reduced, multilateral netting systems can shift and concentrate risks in ways that could increase systemic risk by increasing the likelihood that one institution's failure will undermine the condition of others. The degree of systemic risk in multilateral systems depends on the strength of the incentives for the netting provider and the participants to manage and contain their exposures and on their capacity to absorb losses in the event of a default.

2.5 The Committee considered different possible risk-management procedures for multilateral netting systems, particularly in relation to proposals now being developed by bankers to establish multilateral systems for foreign exchange contracts. At one end of the spectrum are arrangements under which all risks would be borne and managed by the provider of the netting service or central counterparty. Participants in such systems might be required to post collateral or margin to secure fully the system's exposure to them. At the other end of the spectrum are completely decentralised arrangements under which, in the event of a participant's default, credit losses associated with its net position vis-à-vis the central counterparty would be allocated on a pro-rata basis among the surviving participants. Under such arrangements the principal risk-control mechanism would be participants' bilateral limits on their exposures to other participants.

2.6 In principle either centralised or decentralised arrangements, or some combination of the two, should provide credit and liquidity safeguards that would ensure the systems' abilities to manage exposures and complete settlements. A centralised, collateral-based approach appears likely to provide somewhat greater protection against systemic risk but it would do so at the cost of the use of the necessary collateral, which would then become unavailable for other purposes. A purely decentralised approach would avoid that cost and would maintain incentives for participants to manage their own exposures but without the same level of assurance of the system's ability to ensure the completion of settlement. A decentralised approach to the allocation and management of risks, however, could be combined with a collateral facility to ensure the satisfaction of participants' loss-sharing obligations in the event of a crisis.

2.7 By altering settlement costs and credit exposures, these proposed multilateral netting systems for foreign exchange contracts could alter the structure of credit relations and affect competition in the foreign exchange markets. But the lack of any actual experience with such systems makes it difficult to predict the impact which any particular system would have on activity in the foreign exchange markets or on the stability of the financial markets generally.

2.8 The principal concern for monetary policy with respect to netting systems results from the possibility that a system's risk-management procedures may be inadequate and, thereby, contribute to

systemic risk or financial fragility in a way that would impede the attainment of monetary policy objectives. Netting per se, however, is unlikely to impair the effectiveness of the instruments of monetary policy in the long run, although the operation of netting systems could, at certain times, complicate the daily conduct of monetary management in some countries. In particular, it may be difficult for a central bank to oversee effectively the liquidity-management practices of a cross-border or multi-currency netting system that is located abroad but the operation of which affects settlement practices in its domestic, interbank funds market.

2.9 More generally, the development of truly trans-national interbank settlement arrangements, made possible by the application of advanced communications and data-processing technologies, has permitted a separation of the netting or clearing process among a group of banks in one financial centre from the final settlement of their net positions in another. This geographic division of functions which have traditionally been integral parts of domestic payment and settlement systems complicates the task of assessing the impact of particular systems on market practices and systemic risk.

Section 3: Summary of policy recommendations

3.1 Based on its analysis, the Committee believes that the common interests of central banks in the development of internationally-related netting arrangements demonstrate a need for collective policy responses. Specifically, the Committee has identified shared interests in ensuring, firstly, that netting schemes are designed and operated with adequate attention to the prudent management of credit and liquidity risks and, secondly, that there is effective central bank oversight of the impact of netting schemes on market behaviour and systemic risk.

Minimum standards for netting schemes

3.2 A direct means of achieving central banks' common objectives of containing systemic risk and moral hazard, while encouraging improvements in the efficiency of interbank settlements, is to ensure that private interbank netting and settlement systems are designed and operated so that the participants and the service providers have both the incentives and the ability to manage the associated credit and liquidity risks. As a first step toward ensuring the adequacy of the risk-management practices of private interbank netting arrangements, the Committee has agreed upon minimum standards for the design and operation of cross-border and multi-currency netting schemes. These minimum standards are set forth below and are repeated in Part C of this Report with supporting explanations.

- I. Netting schemes should have a well-founded legal basis under all relevant jurisdictions.
- II. Netting scheme participants should have a clear understanding of the impact of the particular scheme on each of the financial risks affected by the netting process.
- III. Multilateral netting systems should have clearly-defined procedures for the management of credit risks and liquidity risks which specify the respective responsibilities of the netting provider and the participants. These procedures should also ensure that all parties have both the incentives and the capabilities to manage and contain each of the risks they bear and that limits are placed on the maximum level of credit exposure that can be produced by each participant.
- IV. Multilateral netting systems should, at a minimum, be capable of ensuring the timely completion of daily settlements in the event of an inability to settle by the participant with the largest single net-debit position.
- V. Multilateral netting systems should have objective and publicly-disclosed criteria for admission, which permit fair and open access.

VI. All netting schemes should ensure the operational reliability of technical systems and the availability of back-up facilities capable of completing daily processing requirements.

3.3 The primary responsibility for ensuring that netting and settlement systems have adequate credit, liquidity, and operational safeguards rests with the participants. The presentation of these minimum standards by central banks in no way diminishes this responsibility. On the contrary, it is the Committee's intention to heighten awareness of the risks associated with netting and settlement systems and of the need for their prudent management by market participants. Moreover, these are *minimum* standards that all schemes should meet; they are not a statement of best practices to which schemes should aspire.

3.4 There are clearly several ways of prudently managing the risks associated with netting and settlement mechanisms. The standards are intended to be sufficiently flexible to permit market participants to adopt different risk-management techniques. Their presentation is designed to indicate both the issues that market participants should address and the standards against which their different approaches should be measured. The Committee's intention is to encourage market participants to develop systems that can contribute both to improving efficiency and reducing risk.

3.5 The Committee's work has focused on netting and settlement arrangements for interbank payment orders and for foreign exchange transactions and the suggested minimum standards have been drafted with these particular instruments and netting systems for them in mind. But these standards may also provide a useful starting point for the consideration of risk-management procedures for funds settlements associated with clearing arrangements for other financial instruments.

3.6 In establishing minimum conditions, the Committee's intention is to preserve the freedom of individual central banks to apply higher standards where necessary. This should help to contain moral hazard and provide flexibility for central banks to ensure that interbank settlement arrangements in their own currency are consistent with the central bank's market practices. For example, the Committee believes that it would be highly desirable for systems to be able to withstand multiple defaults and that such structures should be encouraged by central banks whenever possible.

Principles for cooperative central bank oversight

3.7 Central banks oversee developments in their domestic interbank markets and in the payment and settlement systems that support these markets. In their capacities as the ultimate providers of interbank settlements and as lenders of last resort, central banks have a special interest in the credit and liquidity management practices of banks, as well as the settlement arrangements that link their credit and liquidity exposures within the domestic banking system, in order to assess banks' abilities to withstand adverse developments without the need for recourse to extraordinary central bank support. This "oversight" of the domestic payment system serves to co-ordinate the various functions of the central bank and may also involve a *coordination of the responsibilities* of the monetary and supervisory authorities.

3.8 The development of cross-border and multi-currency systems demonstrates the need for a similar oversight function to be performed with respect to these systems which directly link the credit and liquidity exposures of banks in different countries. "International" financial trading activities traditionally have been settled through the correspondent services of "domestic" clearing and settlement systems. Although interbank payments in a given currency are still ultimately settled through accounts with the central bank of issue, the private sector is now developing truly trans-national interbank settlement systems which separate the netting or clearing process among a group of banks in one financial centre from the final settlement of their positions in another. Cross-border and multi-currency netting systems are examples of these developments that are of special concern to central banks because of their potential influence on the overall credit structure of financial markets and, particularly, of the foreign exchange and interbank funds markets.

3.9 The Committee recommends that central banks respond to this situation by agreeing to act in accordance with the principles set forth in Part D of this Report. In summary, these principles provide that:

- Netting systems should be subject to oversight by an authority that accepts primary responsibility to do so;
- There should be a presumption that the “host-country” central bank (in whose market the system is located or operating) will undertake this responsibility but that, in certain cases, it could be mutually agreed that another authority would undertake the primary responsibility;
- The responsible authority should review the design and operation of the system as a whole and consult with other central banks and supervisory authorities that may have an interest in the system’s prudent operation;
- Determination of the adequacy of the settlement arrangements should be the joint responsibility of the central bank of issue and the authority with primary responsibility; and that
- In the absence of confidence in the soundness of the design or management of a cross-border or multi-currency netting or settlement system, a central bank should discourage use of the system by institutions subject to its authority.

3.10 These principles apply to any netting or clearing system for payments or currency obligations that is located outside the country of issue of the relevant currency or currencies and are designed to serve at least three objectives. Firstly, their application should ensure that cross-border systems are subject to review “as systems” by a single authority with responsibility to consider the system’s impact in different countries. Secondly, they should provide a cooperative approach to ensure that the interests of different central banks and supervisory authorities are reflected in the oversight of any one system. Thirdly, co-operation between central banks should, in particular, help to preserve the discretion of individual central banks with respect to interbank settlements in their domestic currency.

Part B

Analysis of policy objectives and the implications of netting

Section 1: Common policy objectives of central banks

1.1 The main reason which has led banks to set up, or propose, netting arrangements for interbank payments and financial contracts is the desire to improve the efficiency of payment and settlement systems, i.e., to reduce the settlement costs and the credit and liquidity exposures they experience in financial transactions.

1.2 Central banks have common policy objectives with respect to netting systems. On the one hand, because of their interest in the efficient working of financial markets, they share market participants' interests in reducing settlement costs and credit and liquidity exposures. On the other hand, central banks also carry the responsibility for the integrity of the financial system as a whole and for the conduct of monetary policy. Their policies with respect to netting schemes therefore need to strike an appropriate balance between the requirements of market efficiency and of stability. In concrete terms this means that central banks are concerned to encourage developments that can increase the efficiency while maintaining and enhancing the integrity of the interbank settlement process. The wider interests of central banks are that this should not be achieved at the expense of the efficiency and integrity of the financial system generally and that changes in market practices and structures should not impair the effectiveness of either the instruments or the conduct of monetary policy.

The efficiency of interbank settlements and markets

1.3 Recent growth in the volume and value of interbank settlements, especially those associated with foreign exchange market activity, is straining the capacity of some existing interbank payment systems and of some central banks' own settlement services. Central banks have a general interest in promoting economies in the payment process through reductions in interbank payment flows, the associated transaction costs and interest expenses on correspondent balances. However, central banks are also concerned with the impact that changes in interbank payment and settlement systems may have on the structure and efficiency of the financial markets which these systems support. Central banks will be particularly interested in the impact such changes may have on the liquidity of foreign exchange and interbank markets and on competition among the participants in these markets.

Stability and the containment of systemic risk

1.4 The stability of interbank payment and settlement mechanisms is of critical importance to central banks. Disturbances in the settlement process can directly affect central banks as the ultimate providers of interbank settlements, as lenders of last resort to the banking system, and in their conduct of monetary policy. Central banks can seek to assure the stability of payment systems by an ongoing process of overseeing the prudence of the design and management of private payment and settlement arrangements as well as by the provision of their own payment and settlement services. In either case, the concern of central banks is to ensure that the credit and liquidity risks faced by participants are prudently managed and contained and not merely shifted to their other creditors or to central banks themselves.

1.5 This concern is a particular reflection of central banks' broader objective of limiting systemic risk in payment systems and financial markets. Systemic risk is the risk that the illiquidity or failure of one institution, and its resulting inability to meet its obligations when due, will lead to the

illiquidity or failure of other institutions. In the context of payment and settlement systems, the size and duration of credit and liquidity exposures experienced by financial institutions in the course of settling their transactions contributes to systemic risk because as these exposures increase so too does the likelihood that some institutions may be unable to satisfy their obligations. Systemic risk is also related to the relative propensity of payment and settlement systems to transmit exposures suddenly or unexpectedly from one participant to another - and from one market to other markets - in ways that increase the difficulty all participants will have in managing and containing their exposures.

1.6 Central banks also have a common interest in seeking to ensure that their efforts to limit systemic risk do not lead to undesirable risk taking by banks. Banks' incentives to control the riskiness of their activities could be weakened if a perception that central banks will absorb risks or take action to limit their systemic consequences is generated. Indeed, as the perceived likelihood of central bank support grows market participants may engage in increasingly risky activities.

1.7 The design and operation of private interbank netting and settlement systems may be particularly susceptible to this problem of "moral hazard". The number of participants in such systems and the scope of their activities may lead the market to presume that central banks would act to avert a system's settlement failure. As a result, the moral hazard involved in privately-operated interbank netting systems is that, because of the possible presumption that central bank support will be forthcoming, such systems may be designed without sufficient regard to the need for built-in mechanisms and incentives to control risks and deal with the consequences of a settlement failure.

The effectiveness of policy instruments

1.8 As markets and market practices evolve, central banks need to maintain the effectiveness of the means with which they discharge their responsibilities and pursue their policy objectives. The continued effectiveness of the instruments used in conducting monetary and exchange rate policy, both on a daily basis and in the long term, depends on central banks' ability to be aware of developments affecting the major participants in the interbank markets through which these policies are implemented. Thus, all central banks, whether or not they participate directly in banking supervision, have a continuing interest in the prudent management by individual banks of their credit and liquidity exposures and in the effectiveness of bank supervisory practices.

Section 2: Impact of netting on credit, liquidity and systemic risk

2.1 By reducing the number and overall value of payments between financial institutions, netting can enhance the efficiency of national payment systems and reduce the settlement costs associated with the large and growing volume of foreign exchange transactions. At the same time, netting can reduce the size of credit and liquidity exposures incurred by market participants and, thereby, contribute to the containment of systemic risk.

2.2 But netting can also contribute to an increase in systemic risk. This may be the case if, instead of achieving reductions in participants' true exposures, it merely obscures the level of exposures. Effective reductions in actual exposures depend on the legal soundness of a netting scheme. But even when actual exposures are reduced, multilateral netting systems may shift and concentrate risks in ways that will increase systemic risk by increasing the likelihood that one institution's failure will undermine the financial condition of others. Containing this aspect of systemic risk depends on both the netting provider and the participants being aware of the sources and extent of their exposures, on the strength of their incentives to contain these exposures and, ultimately, on their ability to absorb losses in the event of a default.

Effects on costs and the measurement of exposures

Bilateral netting

2.3 Bilateral netting has been applied recently to spot and forward foreign exchange and swap contracts. In general, it can reduce bilateral payment flows to net amounts and, thereby, reduce operational costs and liquidity needs. By reducing the reciprocal amounts to be settled on each value date for foreign exchange contracts, for example, bilateral netting can also reduce the size of the cross-currency settlement risks which a bank incurs when it pays out funds in one currency before receiving payment in another. Finally, bilateral netting arrangements can lower a bank's counterparty credit exposure by permitting netting of unrealised losses against unrealised gains on outstanding forward contracts in the event of a counterparty's closure.

2.4 "Netting-by-novation" agreements provide for individual forward-value contractual commitments, typically foreign exchange contracts, to be discharged at the time of their confirmation and replaced by new obligations forming part of a single agreement. Amounts due under a discharged contract will be added to running balances due between the parties in each currency at each future value date. This reduces the size of the payments to be made on each value date and their number to one per currency traded. In some markets participants may be able to achieve a reduction of more than 50% in total payments in all currencies, both in terms of value and volume. Routine liquidity needs and operational costs and risks are thereby reduced. By merging all of the transactions into a single agreement, covering the running accounts, the credit exposure that would be faced in respect of forward commitments in the event of a counterparty default can be reduced to a single net amount. This could be expressed as the discounted present value of the sum of the *reciprocal future* payments called for in the running accounts, and could also be expressed as the discounted present value of the net of unrealised gains and losses on all of the obligations included in the netting contract. In some countries, similar results can be obtained through the use of a "current account" agreement.

2.5 "Master agreement", which have been principally applied to foreign exchange and interest rate swap contracts, also permit the incorporation of a number of individual contracts between two parties into one legal agreement and, thereby, bring about a similar, single net-credit exposure with respect to forward commitments. In contrast to what occurs in the case of novation, the individual transactions are not "blended" into running accounts but retain their specific terms, rates and maturities so that they can be individually assigned or terminated. Master agreements can include provisions for the netting of payments on value dates.

2.6 In some jurisdictions, a liquidating authority of a failed financial institution, in seeking to maximise the assets of the estate of the closed institution available to its general creditors, can engage in "cherry picking" by performing only those forward contracts that are profitable to the estate while repudiating those contracts that are unprofitable. The contracts that have become unprofitable to the estate are precisely those that are profitable to the closed institution's counterparty. If the authority were successful in cherry picking, the counterparty's credit exposure could be the sum of the "gross" exposures on its profitable contracts.

2.7 But if the counterparty has a legally enforceable netting agreement, the liquidating authority is obligated either to perform all of the transactions included (or to undertake payment of all of the amounts owed on the running accounts) or to default on the entire agreement. The counterparty's credit exposure in event of default is not the gross exposure on its profitable contracts but the "net" cost of replacing all the obligations (or payments) due under the agreement – summed across currencies and value dates – an amount equivalent to the balance of unrealised gains and losses on all forward commitments (or all payments made and received).

Multilateral netting systems

2.8 Multilateral interbank netting systems have so far been principally applied to payment orders. These systems typically represent an extension of the traditional correspondent banking service of making book transfers. However, commercial banks are actively developing proposals to establish organised multilateral netting systems for spot and forward foreign exchange contracts now traded in

the “over-the-counter” interbank markets. Although their proposals are not yet fully developed, three groups of bankers – in Canada, Europe, and the United States have made considerable progress in the last year and they have begun to share information.

2.9 Netting on a multilateral basis is arithmetically achieved by taking the sum of each participant’s bilateral net positions with each of the other participants. This produces a single multilateral “net-net” position. When the netting is conducted through a central entity which is legally substituted for the original counterparty to each payment or contract, the net-net position will, in fact, constitute a bilateral net position between each participant and the central counterparty.

2.10 In payment netting systems participants with net-debit positions will be obligated to make a net-settlement payment to the central counterparty who, in turn, is obligated to pay those participants with net-credit positions. The net-credit and net-debit positions of all participants sum to zero. Thus, if any participant is unable to meet its net-debit position, the central counterparty incurs a corresponding short-fall.

2.11 In forward contract netting systems the relationship of the central counterparty to each participant would be similar in many respects to that established under bilateral netting-by-novation agreements. Once a contract entered into by two participants is confirmed and accepted by the central counterparty, it would be discharged and the amounts due under it would be added to running accounts between the central counterparty and each participant. In the event of a participant’s default, the central counterparty would face a forward credit exposure equal to the replacement cost of the entire stream of payments due under the accounts. It might also face liquidity and cross-currency settlement exposures at the time of the default.

2.12 Both forms of multilateral netting can bring about substantial reductions in payment flows and liquidity needs and, if they are legally binding, in the level of credit and liquidity exposures faced by the participants. Although the effects depend upon settlement and trading patterns, private payment netting systems can evidently reduce the value of settlement payments and the number of payments by 80% or more from what would be needed for gross settlements in certain cases. Multilateral contract netting systems may be able to achieve similar results with respect to the value and volume of settlement payments and, at the same time, reduce the level of forward credit exposure on included foreign exchange transactions to a comparable extent.

2.13 It should be noted that these reductions relate only to the aggregate liquidity demands and credit losses to be covered by the central counterparty or shared in some way among the surviving participants, in the event of a participant’s default, compared to the sum of individual exposures that would have occurred on the same set of transactions in the absence of netting. Whether an individual surviving participant would experience smaller liquidity demands or credit losses on the same set of transactions would depend on the structure of the netting system and its particular loss-allocation procedures.

2.14 For example, if loss-sharing rules mutualise the losses from any one participant’s failure among all surviving participants, either on the basis of equal shares or of overall trading volumes, then participants are exposed to losses caused by the failure of other participants with whom they may have had only limited bilateral dealings or even none at all. This reflects a shifting of a portion of the risks from those participants that traded with a defaulting party to others who did not.

2.15 Moreover, as discussed below in Section 3, if use of multilateral netting induces or permits participants to expand their trading activities significantly, net exposures conceivably could return to, or even exceed, the level of (gross) exposures that existed in the absence of netting.

Cross-currency settlement risks

2.16 By reducing the reciprocal amounts due on a set of foreign exchange contracts, netting can reduce the size of the cross-currency settlement exposures entailed in separate settlements of the different currencies. According to some market participants, “Herstatt” risk - named for the 1974 failure of Bankhaus Herstatt - accounts for more than half of the credit exposure incurred in their foreign exchange trading. The desire to reduce these exposures provides banks with a strong incentive

to adopt netting. But while the size of these exposures can be reduced, neither bilateral nor multilateral netting arrangements can eliminate cross-currency settlement risk entirely.

2.17 The duration of Herstatt exposures is particularly long in the case of currency pairs for which there is no overlap between the hours of operation of the central banks of issue or their respective domestic payment systems. However, cross-currency settlement exposures are also faced in the settlement of any currency pairs in the absence of organised mechanisms for simultaneous final settlement of the different currencies. While a multilateral foreign exchange contract netting system could greatly reduce the amounts to be settled, it would concentrate cross-currency settlement risk on the central counterparty, which would have to manage Herstatt exposures to each of the system's participants.

Third-party effects

2.18 Netting can be perceived to operate to the disadvantage of the unsecured creditors of a failed participant relative to those of other netting participants. This view is based on an ex post analysis from the perspective of the shareholders, other investors and depositors of a participant that has been closed. But in an ex ante analysis of the credit risks incurred by all unsecured creditors of netting participants, before the fact of any one institution's insolvency, the reduction in exposures experienced by all netting participants will benefit all of their unsecured creditors - even if, in the event of one participant's closure, it also benefits some at the expense of others. Moreover, it can be argued that in the absence of netting the unsecured creditors of surviving participants tend to be disadvantaged relative to those of a failed institution.

2.19 By preventing a liquidating authority from cherry picking among a closed institution's profitable and unprofitable forward contracts, legally enforceable bilateral netting reduces the magnitude of the credit losses experienced by the institution's netting counterparties. There is a zero-sum relationship between this reduction in credit losses for netting participants and the increased risk of loss to their other unsecured creditors. But it appears that in the majority of the G-10 countries a bank should be able to assert and successfully defend some form of statutory or common-law right of set-off that would produce a similar net exposure even in the absence of a written agreement. In these countries bilateral netting agreements provide added certainty of the result of net exposures, in the event of a counterparty's closure, and may also provide for the routine netting of payment flows between counterparties; other creditors will be no worse off.

2.20 The significant reductions in credit exposures produced for participants in multilateral netting systems go a step further. To the extent that there are reductions in the size of the aggregate loss to be shared by the surviving participants - by offsetting what would be the net claims of the estate of the defaulting participant on some participants against other participants' net claims on the estate - multilateral netting necessarily reduces the assets of the estate of the closed participant and, thus, increases the losses to be shared by its other unsecured creditors. This adverse effect could be exacerbated to the extent that obligations to the central counterparty are collateralised with high-quality assets of the closed participant.

2.21 But by reducing credit and liquidity exposures experienced in trading and dealing activities, legally binding bilateral and multilateral netting should benefit netting participants and all of their unsecured creditors in several ways. As mentioned above, on an ex ante basis netting should benefit the whole class of unsecured creditors of participants even if, in the event of an insolvency, it disadvantages some relative to others. Moreover, the reductions in exposures relative to capital should, ceteris paribus, reduce the likelihood that disturbances outside the netting scheme will lead to any one participant's insolvency. The reductions in exposures should also reduce the risks of secondary defaults within the group of netting participants and, thus, contribute to a reduction in systemic risk.

2.22 Moreover, if the combined effect of the ongoing reduction in the size of exposures together with the limitation on the liquidator's ability to cherry pick, as well as any use of collateral, increases overall credit risks to some unsecured creditors then, over time, at least institutional investors should be expected to demand compensation in the form of higher returns. This would depend, however, on

the availability of information on both the extent of netting and on the use of collateral, as well as on the willingness of banks to engage in differential pricing.

The importance of legal enforceability

2.23 The Committee's analysis confirms the view, expressed in the Angell Report, that netting schemes only reduce credit and liquidity exposures if they have a sound legal basis. Any netting scheme which provides for the settlement of net balances, on large numbers of transactions, can reduce the participants' day-to-day operating costs and routine liquidity needs. But only if the net amounts are legally binding in the event of a counterparty's closure will the participants experience reductions in their true credit and liquidity exposures.

2.24 The concept of netting, in its broadest sense, is given effect under the law of each of the G-10 countries. Bilateral master agreements and either bilateral netting-by-novation or current account agreements are likely to be enforceable in all eleven countries. Thus, where a properly-prepared written netting agreement has been established, the surviving party's credit exposure in the event of a counterparty's closure would be the balance of unrealised gains and losses on all included transactions. (As indicated above, in the majority of G-10 countries the same net-credit exposures are likely to occur even in the absence of a written netting agreement.)

2.25 Multilateral payment netting through a central counterparty is likely to produce legally binding net positions (i.e., "net-net" positions) against the central counterparty, in the event of a participant's closure, in the majority of the eleven countries. This result, however, is unlikely in those countries where the expected application of bankruptcy law retroactively renders transactions of a closed institution ineffective after 0.00 a.m. on the date it is ordered closed. However, in all eleven countries multilateral netting of forward foreign exchange contracts through a central counterparty is likely to be legally enforceable in the event of a participant's closure, with the exception only of those contracts entered into on the date of the closure in those countries with a "zero-hour" bankruptcy rule.

2.26 In each country various conditions must be met for the net amounts to be binding, firstly, between the parties and, secondly, upon the liquidating authority of a closed counterparty. In no country should it be assumed that exposures will be the balance of unsettled payment orders made and received or of unrealised gains and losses unless the participants take some steps to try to make them so. Moreover, binding net exposures may not be achievable by all banks in all factual circumstances. cross-border netting arrangements, for example, between banks chartered or located in different countries, raise choice-of-law and conflict-of-law questions that cannot be easily resolved. Indeed, a complete resolution of these remaining uncertainties may only be possible through the harmonisation of the relevant national laws. Thus, notwithstanding the foregoing general conclusions on the likely legal effectiveness of netting arrangements, establishing a sound basis for the assertion of net exposures will require thorough legal preparation by the participants and netting scheme providers and may not be possible in all instances.

2.27 Should financial institutions come to rely for the purposes of setting dealing and other credit limits, or for managing their liquidity, on exposures produced by netting arrangements that are not legally enforceable, the participants will face credit and liquidity exposures significantly - possibly many times - larger than they expected in the event of a counterparty default. Thus, netting schemes that are not legally effective (or have no legal basis) and which induce participants to rely on net figures while exposures remain at gross levels will serve to increase the risk of secondary defaults.

Systemic risks in multilateral netting systems

2.28 Even when legally effective in producing net exposures, multilateral netting systems also have the potential to increase systemic risks because they concentrate risks on the central counterparty. If a system is able to manage and contain prudently its exposures to the participants, and to the extent that in the event of one participant's default it is able to continue to satisfy its obligations to the others, then the system's operation will contribute to a reduction in the level of exposures experienced by

participants and also to a reduction in the level of systemic risk. If these conditions are not met the system's operation will increase the likelihood that the credit or liquidity problems of one market participant will suddenly and negatively affect the condition of others. Moreover, the concentration of risks on the central counterparty exposes all participants to the risk that the central counterparty itself may fail.

2.29 The Angell Report concluded that realisation of the overall risk-reduction potential of multilateral netting critically depends on the "financial condition" of the central counterparty. This reflected an assumption that all risks would be borne and managed by the central counterparty, as is the case in systems with "centralised" risk-management procedures similar to those employed by the clearing organisations associated with options and futures exchanges. In such arrangements, the central counterparty typically requires participants to post collateral or margin to secure fully the system's exposure to each of them. Collateral requirements also serve to place limits on the level of participants' activities. In centralised payment netting systems, a bank providing the netting service may not require all participants to post collateral and may regard open exposures as a part of routine correspondent credit facilities. In either case, the participants are not able to contain exposures to individual counterparties and have no incentive to do so. As a result, the ability of the system as a whole to withstand the default of individual participants, or other adverse developments, depends entirely on the risk-management procedures of the central counterparty and its financial ability to absorb losses.

2.30 Both payment and contract netting systems can employ an alternative, "decentralised" approach in which participants retain significant responsibilities for risk management. Multilateral netting against the central counterparty would be used to produce legally binding net positions. But in the event of a participant's default, credit losses associated with its net position vis-à-vis the central counterparty would then be allocated on a pro-rata basis among the surviving participants based on their bilateral dealings with the defaulter. Participants would have an incentive to set bilateral limits for their exposures to other participants and these could constitute the principal risk-control mechanism.

2.31 The viability of this type of system, not specifically addressed in the Angell Report, depends less on the "financial condition" of the central counterparty itself than on the ability of the participants to manage and satisfy their "contingent obligations" to the central counterparty under the loss-sharing formula. Even so, a degree of centralised risk management by the central counterparty would be necessary to ensure that the sum of the bilateral credit exposures, permitted under a participant's counterparty limits, was commensurate with its financial resources.

2.32 In principle both the centralised and decentralised approaches to risk management can be designed to include credit and liquidity safeguards that should ensure the system's ability to manage its exposures and complete daily settlements. The centralised approach relies on the central counterparty alone to manage all exposures and either on its own assets or on collateral posted by participants to ensure the system's ability to satisfy its obligations. The decentralised approach relies principally on a combination of loss-sharing rules and self-administered exposure limits to give participants the incentives and capabilities to manage their own exposures and, therefore, relies ultimately on the participants to satisfy their contingent obligations in the event of a crisis. Of course, in practice, most systems are likely to incorporate some elements of both models.

2.33 In general terms, however, the centralised, collateral-based approach does appear likely to provide somewhat greater protection against systemic risk because the very presence of the participants' collateral or other assets will help to ensure the system's ability to absorb credit losses and manage its liquidity needs. But this is at the cost of the use of the necessary collateral. A purely decentralised approach, on the other hand, would avoid the costs of collateral and provide greater incentives for participants to manage their own exposures.

2.34 While a decentralised approach to the allocation and management of credit exposures is certainly feasible, it is not certain that a completely decentralised approach to the management of a netting system's liquidity risk (which allocated pro-rata shares of a short-fall on the settlement date) could be prudently implemented in the multi-currency environment in which a multilateral foreign

exchange contract netting system would operate. Nevertheless, decentralised risk-management systems could be constructed which would include collateral facilities to guarantee the performance of the participants' contingent obligations. Such systems could combine the beneficial incentive effects of decentralised risk management while maintaining the necessary assurance of settlement.

Section 3: Broader implications of netting

3.1 The widespread use of netting schemes by major international banks has the potential to change both trading behaviour in the foreign exchange markets and interbank settlement practices in domestic funds markets.

Market implications of contract netting

General effect on foreign exchange markets

3.2 The potential for netting to reduce credit risks may need to be viewed in a dynamic context. The reduction in participants' credit exposures, and also in their settlement and processing costs, will reduce the incremental cost of additional transactions. This may prompt netting scheme participants to expand their trading activities which, in turn, would tend to deepen the markets. The impact of bilateral netting, undertaken by individual counterparty pairs, may be only marginal and would affect the foreign exchange market gradually. But the introduction of a multilateral netting system, particularly if it included a significant number of market participants or included the major market makers, could have both a more immediate and more significant impact.

3.3 The resulting increase in market liquidity could affect price volatility, but the direction and magnitude of the effect is not obvious a priori. Some believe that greater liquidity may encourage trading strategies that result in increased volatility. Others believe that more liquid markets can more readily absorb imbalances between supply and demand and may therefore tend to be less volatile. Extensive theoretical and empirical studies of a number of markets have not resolved this issue and the Committee has not attempted to do so. But given central banks' interest in avoiding instability of exchange markets, uncertainty about the likely impact of multilateral netting on market volatility is clearly a matter of concern.

3.4 Even if market participants do not expand their overall level of activity, the reduction in credit exposures to netting counterparties could induce firms either to concentrate their trading activities on a few major counterparties or to expand the level of their credit exposures in other markets. Increased concentration of trading would be particularly likely if, in the absence of netting, the constraint imposed by hitting trading limits had forced firms to seek a wider range of counterparties. Some market participants have indicated that this is the case and that the potential for further trading with preferred counterparties is an important incentive to adopt netting.

3.5 Alternatively, reductions in credit exposures incurred in foreign exchange trading could induce participants to shift credit and capital resources to entirely different markets. Although credit exposures in some activities may be reduced because of netting, the expansion of other activities could leave a bank's overall level of credit risk unchanged.

3.6 However, a major source of risk in trading foreign exchange, and related products covered by netting arrangements, will continue to be the position or market risk experienced by market participants. Thus, banks' needs to control their exposure to movements in interest rates and exchange rates should continue to be the main brake on overall activity.

Impact of multilateral contract netting systems

3.7 The Angell Report expressed the view that the introduction of multilateral netting systems for foreign exchange transactions could alter significantly the structure of interbank credit

relationships in the foreign exchange market and, thereby, change the character and nature of the market itself. The Committee's further analysis indicates that centralised, collateral-based systems, on the model of the clearing organisations employed by options and futures exchanges, would be likely to have this effect. Use of a decentralised approach to credit risk management, however, would tend to preserve the current structure of credit relations but would raise other issues.

3.8 The introduction of an exchange-style clearing organisation, with centralised risk management and the collateralisation of exposures, would transfer the responsibility for credit decisions away from market participants to the central counterparty. At the same time, it would impose collateral requirements as the principal limit on counterparty credit exposures.

3.9 Although the initial efforts to promote multilateral netting systems for foreign exchange, analysed in the Angell Report, contemplated the use of a centralised, collateral-based system, schemes now envisaged by groups of bankers entail varying degrees of decentralisation of risk allocation and risk management. Because losses would be allocated among the surviving participants on the basis of their bilateral dealings with a defaulting participant, surviving participants would continue to have the incentive to make credit judgements about their counterparties. Bilateral credit limits would thus remain a significant risk-control mechanism.

3.10 In the absence of any actual operating experience with the proposed systems, it is not easy to compare in the abstract the likely impact of the centralised and decentralised approaches on activity in the foreign exchange markets. The centralised approach would weaken the existing type of bilateral credit discipline in the foreign exchange market while the decentralised approach would tend to preserve it. But the centralised approach would impose a different type of risk management and collateral requirements which could also serve as a brake on exposures and the level of activity.

3.11 Banks may perceive the decentralised approach as avoiding the cost of posting the collateral on which the centralised approach relies for limiting credit exposures. However, even in a decentralised system some collateral or pool of assets is likely to be needed to secure credit lines for the system's liquidity management and to ensure its ability to repay any borrowings. As mentioned in Section 2, it has not been established that a purely decentralised approach to liquidity management would be viable in all currencies. In other words, a collateral-based approach to liquidity risk management may be necessary even in a system with a decentralised approach to credit risk management. Thus, it is not obvious, a priori, how much smaller the collateral requirements would be in decentralised systems.

3.12 Any requirement to pledge assets to secure obligations that are not currently secured in the foreign exchange markets would increase demand for the eligible assets. If the total market for the assets held as collateral were small, there could be a reduction in the depth of the secondary market and unwelcome price effects at times when the collateral was pledged or liquidated. In some countries any substantial effect in reducing the availability of collateral in the banking system for other purposes, including the securing of central bank credit, could be viewed as a cause for concern by the authorities.

3.13 If multilateral netting significantly reduced transactions costs and counterparty risks, participation could prove to be essential to compete as a market maker in foreign exchange. If membership standards allowed for broad access competition could be enhanced. However, if membership were restricted in some way, the creation of a multilateral netting system could adversely affect competition.

Implications for central banking and supervisory practices

Monetary policy and systemic disturbances

3.14 Interbank payment and settlement arrangements provide the basic mechanism for the exchange of monetary value among financial institutions and, as such, are fundamental components of each country's banking and monetary system. Large-scale netting arrangements are likely to become

important parts of the interbank settlement process and, thus, have the potential to influence both the structure and behaviour of the markets through which monetary policy is conducted.

3.15 In principle, netting outside of a domestic payment system that reduces the volume of payments within that system might be expected to reduce demand for the settlement medium - which in interbank markets is usually reserves held with the central bank. In practice, the effect of netting on the demand for bank reserves in the country of issue will be heavily dependent on institutional arrangements. To the extent that banks hold overnight reserve balances with the central bank in excess of amounts needed to meet reserve requirements, the demand for excess reserves could be reduced as could the demand for overnight central bank credit. As a result, in countries with operating objectives for bank reserves minor adjustments of both the objectives and reserve-supplying procedures might need to be taken by the central bank.

3.16 The operation of a large-scale foreign currency netting system could have an effect on the conduct of monetary policy in countries other than the country of issue if it tended to increase the attractiveness of the currency being netted in relation to other currencies - particularly in relation to the domestic currency in the country hosting the system. Again, any effect on the demand for reserve balances and other implications would depend on institutional arrangements. But any effects are likely to be small and to occur gradually, giving the central banks concerned time to respond.

3.17 In some countries the daily conduct of monetary policy could become more difficult if the timing and procedures used for the payment of net-settlement positions created a large and highly time-specific demand for reserve balances when net debtors or their correspondents were required to deliver funds to the account of the settlement agent. The central bank of issue might need to take this into consideration in the timing of its market operations, particularly if the effect of the settlement procedures was felt late in the day and was likely to affect demand for reserve balances.

3.18 The principal concern for monetary policy, however, stems from the possibility that the inadequacy of a netting system's risk-management procedures could contribute to systemic risk or financial fragility in a way that impeded the attainment of monetary policy objectives. An unresolved settlement could have a direct impact on overnight or short-term money-market interest rates or oblige the central bank to engage in reserve-supplying operations that ran counter to long-term policy objectives.

3.19 A central bank might be insufficiently informed on the operation of a netting system operating in its currency outside of its borders. In particular, it might lack knowledge of the system's settlement procedures or of the procedures to be invoked in the event of a settlement failure. Although the resulting lack of transparency might not affect the routine conduct of monetary policy it might limit the central bank's ability to respond promptly in an appropriate way in the event of a crisis. The ability of the central bank of issue to influence the design and risk-management practices of systems operating abroad might also be relatively limited.

Trans-national systems and national oversight

3.20 The lack of transparency of "off-shore" netting to the central bank of issue is one aspect of a wider problem confronting central banks and supervisory authorities. The application of communications and computer technologies to banking services has made possible the geographic dispersion of the functions of netting or clearing, on the one hand, and the ultimate settlements in a given currency, on the other. Although multilateral netting systems directly link the credit and liquidity risks and risk management of banks in different countries, there is no one central bank or supervisory authority in a natural position to consider the overall soundness and prudential adequacy of these systems.

3.21 The functions in the netting process include those of the communications provider, the netting provider or central counterparty, the bank(s) acting as settlement agent(s) in the country (or countries) of issue, and the participants. At a minimum, cross-border netting systems involve a division of functions between two countries: the netting provider and the participants will be located in one country and the settlements will be conducted by their foreign offices or correspondents in the

country of issue. However, a proper assessment of the systemic risk implications will require consideration of the netting process and its internal risk safeguards as well as the adequacy of the settlement arrangements in the country of issue and the system's failure-to-settle procedures.

3.22 The process of netting payment orders may not be at all apparent to bank supervisors. The gross payments processed through a netting system are unlikely to be reflected in the accounts of the participants or the netting provider. Normally bank examiners would not "see" the netting process, or the size of the exposures and contingent obligations which participants may be incurring, unless they looked at records of electronic payment instructions made and received. Similarly, if there is a single settlement agent, the net-settlement payments will routinely sum to zero and pass-through the agent's books and accounts.

3.23 Any potential problems caused by a lack of co-ordination among national authorities could be exacerbated by the development of multi-currency systems. Implementation of one or more of the proposed multilateral systems for foreign exchange contracts would create a new type of financial intermediary that would play a central role in the foreign exchange markets and an important role in the national payment systems of each country whose currency is eligible for netting. The failure or illiquidity of such an intermediary would have systemic consequences by imposing losses on all of its participants or by creating liquidity pressures in the money markets for each of the included currencies."

Part C

Minimum standards for the design and operation of cross-border and multi-currency netting and settlement schemes

Central banks' policies with respect to private interbank netting and settlement systems need to strike an appropriate balance between the requirements of market efficiency and of stability. A direct means of achieving such a balance is to ensure that such systems are designed and operated so that the participants and the netting providers have both the incentives and the ability to manage the associated credit and liquidity risks. As a first step towards ensuring the adequacy of the risk-management procedures of private interbank netting arrangements the Committee has agreed upon the following minimum standards which all cross-border and multi-currency netting schemes should meet. As minimum standards they are not a statement of best practices to which schemes should aspire and individual central banks retain the discretion to apply higher standards where necessary. This should help to provide flexibility for central banks to ensure that interbank settlement arrangements in their own currencies are consistent with the central banks' own practices.

The presentation of these minimum standards in no way diminishes the primary responsibility of participants in netting and settlement systems for ensuring that these systems have adequate credit, liquidity and operational safeguards. On the contrary, it is the Committee's intention to heighten awareness of the risks associated with netting and settlement systems and of the need for their prudent management and also to provide criteria against which risk management techniques designed by market participants can be judged.

Minimum standards for the design and operation of cross-border and multi-currency netting and settlement schemes

- I. Netting schemes should have a well-founded legal basis under all relevant jurisdictions.
- II. Netting scheme participants should have a clear understanding of the impact of the particular scheme on each of the financial risks affected by the netting process.
- III. Multilateral netting systems should have clearly-defined procedures for the management of credit risks and liquidity risks which specify the respective responsibilities of the netting provider and the participants. These procedures should also ensure that all parties have both the incentives and the capabilities to manage and contain each of the risks they bear and that limits are placed on the maximum level of credit exposure that can be produced by each participant.
- IV. Multilateral netting systems should, at a minimum, be capable of ensuring the timely completion of daily settlements in the event of an inability to settle by the participant with the largest single net-debit position.
- V. Multilateral netting systems should have objective and publicly-disclosed criteria for admission which permit fair and open access.
- VI. All netting schemes should ensure the operational reliability of technical systems and the availability of back-up facilities capable of completing daily processing requirements.

I. Netting schemes should have a well-founded legal basis under all relevant jurisdictions

1.1 Both the provider and the participants of any netting scheme should ensure that its legal characteristics are examined to determine their enforceability and consequences. At the same time, participants should examine all of the scheme's legal documentation in order to identify each of the direct and contingent obligations which they would incur as a result of their participation.

1.2 In particular, when assessing counterparty credit and liquidity exposures, participants in netting arrangements should not rely upon such exposures being the balance of unsettled payment orders made and received or of unrealised gains and losses unless they have reasoned legal opinions that, in the event of a legal challenge, the relevant courts and administrative authorities would find their exposures to be the net amount under: (a) the law of the country in which the counterparty is chartered and, if the counterparty is a branch of a foreign bank, then also under the law of the jurisdiction in which the branch is located; (b) the law that governs the individual transactions subject to the netting scheme; and (c) the law that governs any contract or agreement necessary to effect the netting. Such opinions should be periodically reviewed to determine the effect of any relevant changes in law. These opinions should also be available to the authorities responsible for supervising the participants' financial soundness.

1.3 These conditions are cumulative. Unless a netting scheme is found to be legally effective under each of above-mentioned laws the participants should not rely upon their exposures being the balance of unsettled payment orders made and received or of unrealised gains and losses. In some cases, all of the relevant laws may be of a single legal jurisdiction. In other cases, it may be difficult to evaluate the rights and obligations of the parties because of the need to determine which countries' laws govern. As a result, this cumulative test effectively requires a "worst-case" analysis. For example, in the case of a bank branch operating in a foreign jurisdiction, if the netting is effective under the host-country laws but not the bank's home-country laws, then the effectiveness of the netting should not be relied upon.

1.4 If participants in multilateral systems intend to rely on the multilateral net positions as reflecting either their credit or liquidity exposures, special attention will need to be given to the legal status of the netting provider or central counterparty so as to ensure that the multilateral net positions would withstand a legal challenge. At the same time, the netting provider or central counterparty will need to consider the legal position of each participant.

II. Netting scheme participants should have a clear understanding of the impact of the particular scheme on each of the financial risks affected by the netting process

2.1 Different types of schemes for the netting of financial obligations seek to net different elements of financial risk. A necessary precondition for the sound use of any netting scheme is that the participants have a clear understanding of the different impact which the scheme may have on each of their credit and liquidity exposures.

2.2 In general terms, netting schemes can be applied to two categories of financial obligations. There are schemes for the netting of financial contracts which typically involve reciprocal commitments for future payments in the same or different currencies, such as spot and forward foreign exchange and interest rate and currency swap contracts. Netting schemes can also be applied to payment orders, denominated in a single currency, without regard to the underlying transactions.

2.3 To assess the impact of a netting scheme, participants should first have a thorough understanding of the credit and liquidity risks associated with the obligations to be netted. They should then carefully consider the impact of the netting scheme on each of these risks. Examples of some of these risks and the different ways they can be affected by different netting schemes are given below.

Credit and liquidity risks

2.4 On forward contractual obligations which involve reciprocal commitments, such as foreign exchange contracts, it is important to distinguish the forward replacement cost credit risks which exist prior to the settlement date from those credit risks which occur on the settlement date itself. If a bank enters into a forward foreign exchange contract with a counterparty who subsequently defaults prior to the settlement date, it can be assumed that the bank would not pay out the currency it was obligated to deliver without any expectation of receiving the return currency payment from the counterparty. However, the counterparty's failure to perform may cause a hedged position to become an open position in the market. To close this position, the bank would have to replace the currency payments and receipts (which are in default) by entering into a replacement contract with a third party. Even in the absence of hedging, the loss of a contract could mean that the bank suffers the loss of unrealised gains on its original position.

2.5 At the time that a foreign exchange contract is initiated it can be replaced at almost no cost because the exchange rate specified in the contract presumably is close to the prevailing market rate. But after time has elapsed and rates have changed, the market value of the currency receivable under the contract may well exceed the market value of the currency payable. The present value of the difference between the market value of the currency receivable and the currency payable is the contract's forward replacement cost. The potential forward replacement cost associated with a foreign exchange rate contract depends upon the volatility of both the relevant exchange rate and interest rates, through their influence on present values.

2.6 The credit risk associated with forward replacement cost - or *forward replacement cost risk* - usually increases with the term to maturity of the contract because potential changes in foreign exchange rates become larger with the passage of time. Spot contracts entail a limited amount of forward replacement cost risk while long-dated forward contracts can entail substantial replacement cost risk. Because the direction of changes in exchange rates is uncertain, both parties to a foreign exchange contract are exposed to forward replacement cost risk.

2.7 On the settlement (date), the magnitude and distribution of credit risks will be quite different from those of forward replacement cost risk. Foreign exchange contracts typically require currency payments to be made in the country of issue of each currency. If the hours of operation of the national payment systems of the currencies do not overlap, then one of the counterparties to the contract must pay out one currency prior to receiving payment of the other. Even if the hours of operation do overlap there is usually no means available for assuring the simultaneous final and irrevocable settlement of both currency legs of a foreign exchange transaction. During the interval between the settlement of each leg, the party that has made the first payment risks losing the full value of the second in the event that the counterparty were to default on its obligation. This credit risk at settlement - or cross-currency settlement risk - is generally known as *Herstatt risk* after the 1974 failure of the Bankhaus Herstatt.

2.8 For example, given the time differences between the Tokyo and New York business days, a party that sells Japanese Yen in exchange for US dollars must irrevocably pay out the Yen approximately eight hours before it receives payment in US dollars. (However, this gap can be as long as 18 hours.) During this period between payment of Yen and receipt of US dollars, the party that has paid Yen is exposed to the loss of the full principal value of the US dollar payment. In theory this credit risk is asymmetric. The counterparty due to receive Yen is exposed only to forward replacement cost risk because it presumably would not pay out US dollars in the event that the other party were to default on its obligation to pay Yen. In practice, however, banks may not be able to monitor settlements being completed through correspondent accounts in sufficient time to withhold payments and will only become aware of counterparty defaults when account information is available the next day. Where this is the case, both parties will have a Herstatt exposure. But banks with intra-day information processing capabilities may be able to avoid Herstatt exposures in some currency pairs.

2.9 In contrast to the reciprocal payment obligations under foreign exchange contracts, individual payment orders exchanged between banks may or may not give rise to actual credit risks. Whether they do so will depend on the nature of the relationship between the two banks and other actions they may take. In any arrangement for the delivery of payment orders that are subsequently to

be settled in an agreed medium of exchange, the receiving party (the payee) bears an exposure with respect to the sending party (the payor) until the settlement is completed. When the payor is also the debtor on an underlying transaction, the exposure incurred by the receiving party is an expression of its exposure as creditor. However, when the two parties are correspondent banks, or acting on behalf of others, then the exposure is just the expectation of payment. In this case, by simply receiving a payment order, a party does not expose itself to any credit risk. But it may take further steps in reliance upon the receipt of settlement for the payment order, for example, by granting a customer an irrevocable credit in the expectation that the payment order will be settled; if settlement is not completed, the bank will have incurred a credit risk with respect to the sending party (payor) of the payment order.

2.10 The receiver of a payment order, and both counterparties to a foreign exchange contract, are exposed to *liquidity risks* at settlement. All financial institutions have incentives to minimise their holdings of relatively low-yielding transactions balances. Consequently, if an anticipated settlement payment is not received, an institution may need to borrow or liquidate assets in that currency to offset the short-fall in its transaction account. Of course, at the time that a settlement payment fails to occur, the party expecting the payment may not know whether it is experiencing only a liquidity exposure, resulting from a delay in payment, or a credit exposure, resulting from the counterparty's default.

2.11 If, in the settlement of a foreign exchange contract, for example, a counterparty default is detected before a bank pays out its currency obligation, liquidity risk may still exist. In this case, although the non-defaulting bank would experience a deficit in the currency receivable this would be offset by a surplus in the currency payable. But, as a matter of liquidity management, in order to cover the deficit in one with the surplus in the other, either a same-day foreign exchange transaction or a combination of a two-day borrowing transaction and a normal spot trade would be required. These transactions may be difficult, if not impossible, to complete late in the business day. For example, a bank expecting to deliver US dollars against the receipt of Yen - which are not, in fact, delivered - may not be able to sell (its "surplus") US dollars or borrow Yen late in the Tokyo business day in order to meet its need for Yen that same day. It faces liquidity risk even though it faces little or no credit risk and the amount subject to risk is always the full principal amount of the payment to be received.

Impact of netting schemes on credit and liquidity risks

Netting of bilateral forward credit exposures

2.12 Some netting schemes are intended solely to reduce to a single net-credit exposure the forward replacement costs associated with a number of individual transactions with a given counterparty by including them under a single legal agreement. The obligation of each party to the other, under such netting or master agreements, is to perform all of the included transactions. In the event of a counterparty's default on this overall obligation, the surviving party's forward credit exposure would be the cost of replacing the sum total of the transactions included under the agreement. This would normally be expressed as the sum of the discounted present values of the unrealised gains and losses on all included transactions.

2.13 In the absence of a legally enforceable netting agreement, in some jurisdictions the liquidating authority of a failed institution may be able to choose whether to affirm or disaffirm individual transactions which the closed institution had concluded with a given counterparty. In effect, the liquidating authority would be able to perform those contracts that are profitable to the estate of the closed institution and to default on those contracts that are unprofitable. Counterparties on the latter contracts would then be ranked as unsecured general creditors of the failed institution.

2.14 A surviving counterparty is therefore exposed to the possibility that the liquidating authority will perform those contracts on which the survivor will experience a loss (those on which the estate of the failed institution will experience a gain) and default on those contracts on which it would have experienced a gain (those on which the estate would have experienced a loss). Thus, in the absence of an effective netting arrangement, if the liquidating authority were successful in asserting its claims, the surviving counterparty's credit losses would equal the "gross" amount of the credit exposures on its

profitable contracts, rather than the “net” difference between this amount and the amount of the corresponding forward replacement cost exposure which the failed institution had on the surviving counterparty.

2.15 For example, suppose that at the time of default the surviving counterparty had two outstanding forward foreign exchange contracts with the failed institution and that, at prevailing exchange and interest rates, it would cost the survivor US\$ 100 to replace the first contract but it would cost the liquidating authority US\$ 80 to replace the second. In seeking to maximise the assets of the closed institution, the liquidating authority might attempt to enforce the second contract but repudiate the first. If the authority were successful, the surviving counterparty would be exposed to a loss of US\$ 100 (the gross exposure). However, if the counterparty had a legally enforceable master agreement or overall netting contract with the failed institution covering both transactions, it could prevent such selective enforcement or “cherry picking” of profitable positions. As a result, the surviving counterparty’s exposure would be the net-replacement cost of the two contracts combined or US\$ 20 instead of US\$ 100.

2.16 However, such bilateral netting arrangements may not include any provision for the netting of the payment flows which occur between the counterparties on the value dates of the underlying transactions. If this were the case, on the day of a counterparty’s default, the surviving party would still be exposed to Herstatt risk on the gross level of settlement payments for value that day. Moreover, both counterparties would routinely experience liquidity demands and liquidity risks on the gross amount of payments to be made on all of their individual transaction.

Netting of bilateral payment flows

2.17 Some schemes are designed solely for the netting of payment orders in a single currency and have no effect on forward credit exposures. Under these arrangements, two parties may agree to the netting of payment orders issued to and by one another for a given value date. The payment orders themselves may represent the settlements of different types of transactions both between the two parties as principals and also on behalf of customers. As payment orders are exchanged they would be legally extinguished and replaced by a single running balance due to or from one counterparty to the other which would be the only sum remaining to be settled between the parties.

2.18 These arrangements can reduce the routine liquidity demands and the aggregate liquidity and credit risks, in the relevant currency, associated with the settlement of the included payment orders. However, this form of single-currency payment netting does nothing to reduce the Herstatt risk associated with the settlement of cross-currency obligations and may even increase this element of risk. For example, if payments in settlement of only one currency leg of a cross-currency contract are included in a payment netting, the other currency legs might remain to be settled on a gross basis. Depending upon the timing of the netting as a legally binding calculation and of the subsequent settlement of the single-currency net amounts, in relation to the timing of the gross settlement of the other currency payments, the duration and character of the Herstatt risk could be changed.

Netting-by-novation and current-account arrangements

2.19 Other netting schemes achieve a reduction in the level of forward replacement cost risks and also of cross-currency settlement and liquidity risks. Netting-by-novation agreements, and similar arrangements such as current account agreements, provide for forward-value contractual commitments to be replaced by new obligations under a single netting agreement in which a running balance will be due between two parties in each currency for each future value date. Individual foreign exchange contracts between two parties, for example, will be discharged at the time of their confirmation when the amounts due will be added to the running accounts under the agreement. On each value date, only single sums in each currency - due to or from each counterparty - remain to be settled. (This not only describes the bilateral arrangement entered into by pairs of counterparties but, also, the bilateral relationship between a clearinghouse and each of its participants in those multilateral netting systems where the clearinghouse becomes a substituted “central counterparty” to each of the transactions entered into by the members.)

2.20 These netting arrangements reduce the number of payments to be made on each value or settlement date to the number of currencies traded between the counterparties (or between the participants and the clearinghouse). They also reduce the level of the routine liquidity demands in each currency to the single net amount as well as the level of the liquidity exposure. While Herstatt risk remains, the level of this exposure will be reduced.

2.21 All of the net amounts due on the future settlement dates form part of a single contract. Where legally enforceable against a liquidating authority, in the event of a counterparty default there will be a single, net forward replacement cost exposure representing the discounted present value of the sum of the amounts due across currencies and value dates. While taking a different legal form, novation and current account arrangements produce the same results as master agreements with respect to forward credit exposures while simultaneously reducing payments flows and liquidity risks. (Where explicit provisions for the netting of payments in each currency due on settlement dates are added to master agreements, the overall risk reduction results of each approach will be identical.)

2.22 It is particularly important to note that, under both the master agreement and novation or current account agreement approaches, although the level of credit exposure may be reduced from that which would be experienced in the event of cherry picking, the possibilities of a future change in exposure remain. Thus, the fact of forward replacement cost risk is unchanged by netting and participants in netting schemes will need to monitor and limit both their current exposures and the potential for an increase in their future exposures.

Position or advisory netting

2.23 There are also arrangements for the “netting” of payment orders or settlements of forward contracts which have no legal significance and produce no reduction in credit or liquidity exposures. By providing for the routine settlement of net amounts, these forms of netting may induce participants to place an unfounded reliance on the net amounts to be settled and, thereby, lead to an increase in risks.

2.24 Position netting systems for payment orders provide an example of these risks. These arrangements (which can be either bilateral or multilateral) may rely solely upon the reversing of all payment orders to and from a participant that is unable to settle the net amount due at the end of the day. Such netting arrangements provide for reductions in operating costs and permit a reduction in routine liquidity demands. But there is no corresponding reduction in actual credit and liquidity exposures. Participants may naturally come to place an unfounded reliance on their net-settlement positions as reflecting the extent not only of liquidity demands but of their liquidity risks. Indeed, this reliance is an inherent part of the netting process and is essential for the economising of settlements: participants initiate payment orders in anticipation of the successful netting of the orders made against those received. As a result, in the absence of other safeguards, position netting systems may induce participants to take on liquidity exposures and credit exposures considerably in excess of what they are capable of dealing with in a crisis.

III. Multilateral netting systems should have clearly-defined procedures for the management of credit risks and liquidity risks which specify the respective responsibilities of the netting provider and the participants. These procedures should also ensure that all parties have both the incentives and the capabilities to manage and contain each of the risks they bear and that limits are placed on the maximum level of credit exposure that can be produced by each participant.

3.1 In netting schemes that are strictly bilateral the counterparties are necessarily responsible for all of the risks they bear as a result of their own activities. If a bilateral scheme has a sound legal basis, and both parties have a clear understanding of the nature and extent of the risks they bear, each party should have sufficient incentives to manage and contain those risks.

3.2 Multilateral netting systems which provide for the netting of financial contracts or payment orders among a number of participants and produce legally binding net positions necessarily have a

bilateral element. This is the relationship between each participant and the clearinghouse or central counterparty, the expression of which is the multilateral net – or “net-net” – position of each participant. But all multilateral systems also necessarily involve a multiplicity of relationships which make possible the shifting of risks both among participants and between the participants and the central counterparty or netting provider. In particular, multilateral systems which rely on the substitution of a central counterparty involve the additional risk that the central counterparty itself could fail, imposing losses on all of the system’s participants. Thus, in order to contain systemic risks, all multilateral netting systems need to have procedures that identify, quantify and allocate each of the risks and that clearly define the responsibility for managing these risks.

3.3 The most basic issue to be addressed is the division of risk-management responsibility between the clearinghouse, central counterparty, or netting provider and the participants. A range of approaches to this issue can be thought of as reflecting different degrees of centralisation of risk allocation and risk management. In a fully centralised system, the netting provider would directly take on all risks associated with the system and undertake all aspects of risk management. It may alternatively be possible for some responsibilities to be decentralised so that the participants would have both the incentives and the ability to take an active part in risk management. However, in any risk-management structure, it is critical that there be a strong link between the ability to contain risks and the incentives to do so.

3.4 Multilateral systems should also be able to ensure that the credit exposures of the central counterparty, produced by the activities of each participant, are kept well within each participant’s financial resources. In systems with centralised risk- management, this will be undertaken by the netting provider in the management of the system’s direct exposure to each participant. But even in decentralised systems, where participants have responsibilities for the management of counterparty credit exposures, it will be necessary for the netting provider to place some form of overall limits on participants’ exposures in order to ensure that their total exposures remain within reasonable levels.

Centralised risk management

Contract netting systems

3.5 Systems for the multilateral netting of forward financial obligations, such as over-the-counter foreign exchange contracts, could be designed on a centralised model similar to that typically employed by the clearing organisations associated with options and futures markets. The central counterparty or clearinghouse would become the counterparty on each contract executed and confirmed by any two participants. Each original counterparty would then bear an exposure to the central counterparty and vice versa but would no longer bear any direct exposure to other participants. To limit its own exposures, the central counterparty could require each participant to post collateral in an amount at least equal to the full extent of the central counterparty’s exposure to that participant.

3.6 In doing so, the central counterparty would, in effect, place a ceiling on each participant’s exposures equal to the collateral posted. The collateral, in turn, would need to be greater than or equal to the sum of (a) the current cost to the central counterparty of replacing all of its outstanding contracts with the participant; (b) a cushion to cover potential increases in the net-replacement cost; and (c) Herstatt exposures at settlement arising from commitments by the central counterparty to make payments in some currencies prior to receipt from that participant of payments in other currencies for the same value date. The central counterparty would not accept a contract for netting if doing so would increase its exposure to a participant, measured as a sum of these components, to an amount in excess of the value of the participant’s posted collateral. Even so, movements in exchange or interest rates, subsequent to acceptance of a contract, might leave the central counterparty with an uncollateralised exposure before it could require the participant to post further collateral. In the event of a default, the central counterparty could promptly close out all of the defaulting participant’s outstanding positions by entering into offsetting contracts with other market participants. Collateral posted by the defaulting participant would be liquidated as necessary.

3.7 Under this sort of arrangement, all responsibilities for risk management reside with the central counterparty who limits the risks through the imposition of collateral requirements. Each participant “prepays” for the risk of its own default by posting collateral. But this cannot ensure that the central counterparty would never incur a loss in excess of a defaulting participant’s posted collateral. In a period of large movements in exchange rates immediately followed by failure of a participant, for example, there might be a loss to the central counterparty beyond that covered by the participant’s collateral.

3.8 In a centralised system, to the extent that such excess losses could not be borne by the central counterparty’s own capital or reserves, they would need to be allocated to the surviving participants and charged against their collateral contributions. If the loss-sharing allocation were based on participants’ overall level of business with the system, these further losses would, in effect, be “mutualised” among the surviving participants. In such a system, participants would have no direct means of controlling the level of their contingent loss-sharing obligations associated with the default of particular other participants. As a consequence, the prudence and viability of this approach depends upon the central counterparty’s ability to place binding limits upon participants’ exposures to keep them within the amount of posted collateral.

Payment netting systems

3.9 Systems for the multilateral netting of payment orders in a given currency can also be designed on the basis of centralised risk management. Such systems could conceivably be structured on the same basis as centralised contract netting systems, with each participant posting collateral equal to the size of its daily settlement position. It is unlikely, however, that all participants’ exposures in payment netting systems could be fully collateralised because of their large size. In practice, cross-border payment netting systems have tended to develop as an extension of the traditional correspondent banking service of providing book transfers between accounts. In these systems, participants deliver instructions to debit their accounts and credit a counterparty’s account. Where risk management is completely centralised, the central counterparty would guarantee the settlement of the end-of-day net positions.

3.10 Under such netting-provider guarantee arrangements, the only exposures requiring management are the bilateral ones between the central counterparty and the individual participants. The management of these exposures would necessarily be undertaken by the central counterparty. In the event of a net-debtor participant’s inability to settle its end-of-day position, the central counterparty would take on both the liquidity exposure and the credit losses, satisfying the full amount of funds owed to participants in net-credit positions from its own credit and liquidity resources. Individual participants would have no need, and thus no incentive, to manage or limit the risks.

3.11 The viability of such systems would depend crucially upon the financial condition of the central counterparty which would need to have sufficient resources at its disposal, in the form of its independent credit standing (or, possibly, assets pledged by participants), to ensure settlement. The central counterparty would also need the ability to place binding limits on the net-debit positions which participants could incur so that participants’ net-settlement obligations would remain well within their financial resources. In the absence of such an ability to set limits on net-debit positions the central counterparty would be unable to manage and contain the exposures it bears.

Decentralised risk management

Contract netting systems

3.12 Multilateral systems for the netting of financial obligations, such as foreign exchange contracts, could also be designed to require a degree of ongoing risk-management responsibility directly by the participants. Individual participants would retain significant responsibilities for credit decision -making. Bilateral credit limits, rather than collateral requirements, would be the basic mechanism for limiting counterparty credit exposures. Such decentralisation of risk-management

responsibilities among the participants could supplement, but should not completely replace, the need for the central counterparty to manage and contain the level of each participant's obligations to the system.

3.13 In this type of system the fundamental netting process would remain unchanged. Pairs of participants would originate transactions. Once confirmed, the central counterparty would be substituted as the counterparty on the transaction to each of the original trading parties. But while the central counterparty would bear the direct exposure on each transaction, and thus also maintain a running net position with each participant, in the event of a participant's default any resulting credit losses associated with its net-position against the central counterparty would be allocated among surviving participants on the basis of their bilateral dealings with the defaulting party. The central counterparty would not need to impose collateral requirements as a mechanism to limit direct exposures. Instead, each participant would have a strong incentive to set separate bilateral credit limits for every other participant.

3.14 Instead of participants "prepaying" for the possibility of their own default, as in a centralised, collateral-based system, survivors would have a contingent obligation to bear the credit losses from a counterparty's failure. Multilateral netting would ensure that, in the event of one participant's failure, the loss to be allocated among the surviving participants would be no greater than, and generally would be less than, the sum of the bilateral net exposures to the defaulting participant. Thus, the loss to be allocated to a surviving participant generally would be less than, and would not exceed, its bilateral net exposure to the defaulting participant.

3.15 However, in addition to the bilateral credit limits on counterparty exposures, a degree of centralised risk management would also be necessary. In particular, because the central counterparty would be relying upon the surviving participants to cover credit losses in the event of a default, it would need to assure itself that the surviving participants are capable of satisfying their contingent obligations under the loss-sharing agreement. To do so, the central counterparty would need to set limits on the level of participants' contingent obligations that are consistent with their financial resources.

3.16 The central counterparty will also need to assure itself that each participant has the financial resources to satisfy the sum of both its contingent obligations and its direct obligations. Although participants would be expected ultimately to bear the losses from a counterparty's default, and therefore be expected to limit and contain the level of their own counterparty exposures, the central counterparty would also need to place an upper limit on participants' total obligations - both direct and contingent. If acceptance of an additional contract by the central counterparty would create net exposures in excess of this limit, the central counterparty would need to be able to reject or delay acceptance of the contract in order to keep exposures within appropriate limits. Alternatively, the central counterparty could require participants to post collateral to cover the amount of any exposure that would exceed their limits.

3.17 In setting overall limits on the combination of participants' direct and contingent obligations, the central counterparty would need to decide whether to anticipate the default of only a single participant. At a minimum, each participant should be expected to be able to satisfy its own direct obligations plus its contingent obligations in the event of the default of the participant to whom it has its largest counterparty exposure. Alternatively, the overall limit could apply to each participant's direct obligations plus the contingent obligations it would incur in the event of the default of two or more other participants.

3.18 However, if there were any serious doubt as to the individual participants' abilities to satisfy promptly the full amount of their total obligations (up to their overall limit) in the event of a crisis, consideration would need to be given to the appropriateness of requiring collateral to support participants' contingent obligations. Such a requirement could still be consistent with a decentralised approach to risk management provided that it did not also entail a collateralisation of participants' direct obligations.

3.19 Moreover, whatever the level of the participants' limits, all systems should have specific procedures for the allocation of losses in the event of multiple defaults. As in the case of a single

participant's failure, such loss-allocation rules should take into account the effects on the participants' incentives to manage their exposures. Various approaches are possible. The sequential application of rules that allocate losses on the basis of bilateral dealings would tend to provide the strongest incentives. Rules that distribute losses from multiple defaults on the basis of the surviving participants' overall activity would tend to mutualise these losses and provide weaker incentives for participants to manage their exposures.

Payment netting systems

3.20 A similar sharing of both risk and risk-management responsibilities may also be possible in multilateral systems for the netting of payment orders in a single currency. In the event of a participant's inability to settle its net-debit position, the resulting short-fall could ultimately be borne by the other participants on the basis of a pro-rata distribution. However, if such losses were to be allocated to participants - thereby providing them with an incentive to manage these risks - then, in contrast to contract netting systems, the system itself would need to give participants the technical capability to limit these exposures.

3.21 In payment netting systems participants are exposed to settlement risks with respect to payment orders sent to them by other participants. If a participant defaults on its settlement obligation, and if this exposure is to be allocated among the surviving participants on the basis of their bilateral positions with the failed participant, the remaining participants' contingent obligations would be represented by their share of the payment orders sent by the failed participant. It is the activity of other participants' sending payment orders which would give rise to contingent obligations under the loss-sharing agreement and it is this activity that receiving participants would need to be able to limit.

3.22 In contract netting systems, however, which typically involve two-sided trade confirmation procedures, counterparty exposures only arise when two participants enter into a trade. Participants can limit their exposures to a given counterparty by ceasing to enter transactions with that party. As a result, although it may be desirable, it is not absolutely necessary for contract netting systems to provide participants with the technical capacity to limit bilateral exposures on a real-time basis. But this is not the case in payment systems.

3.23 Payment orders may be in settlement of bilateral dealings between the counterparties or they may be payments for customer business. Moreover, payments received may not even be for the account of a bank's own customer but for a correspondent's customer. For participants in payment netting systems to be able to limit the level of their exposures, the system itself will need to provide them with the technical capability to set real-time limits on the level of payments they receive from other participants.

3.24 In principle, the strongest incentives to control exposures are provided by allocating losses in strict proportion to bilateral exposures with a defaulting party. But participants in payment systems are incapable of directly controlling the actual level of bilateral exposure which is determined by the level of payments sent by the other party. Thus, as a practical matter, a loss-sharing formula based upon the bilateral limits which participants set for one another will provide the most effective link between incentives and capabilities to manage risk in payment netting systems.

3.25 Provided that the system gives participants the direct capacity to limit their bilateral exposures within the netting process, decentralised arrangements for risk management in payment netting systems should be quite similar to those necessary in multilateral contract netting systems. Once again, because the netting provider will be relying upon the surviving participants to absorb the short-fall caused by a participant's default on its settlement obligation, the netting provider will need to assure itself that each participant has the financial resources to satisfy the sum of its direct settlement obligation plus its contingent obligations. To do this, the netting provider will need to establish binding overall limits on participants' direct and contingent obligations.

3.26 Both the timing and the nature of the settlement and the failure-to-settle procedures are particularly important for payment netting systems which settle on a same-day basis. Moreover, the process of completing daily settlements and of managing the liquidity risks associated with settlement,

in conjunction with the procedures for the allocation of any losses, are vitally important to the soundness of any multilateral netting system. Because of this, it is necessary for the design and operation of both centralised and decentralised approaches to risk-management to take into account the necessary procedures for ensuring the timely completion of settlement.

IV. Multilateral netting systems should, at a minimum, be capable of ensuring the timely completion of daily settlements in the event of an inability to settle by the participant with the largest single net-debit position.

4.1 All netting systems should establish settlement and failure-to-settle procedures that will ensure the timely completion of daily settlements in each of the currencies accepted in the system. As a minimum condition, in the event of a failure to pay by the participant with the largest single net-debit position, the netting provider or central counterparty and the participants should be able to ensure the satisfaction of the remaining participants' direct and contingent obligations for settlement that day within the normal constraints of the money markets in which settlement occurs. In most cases this will require the permanent availability of specifically-identified credit and liquidity resources. Furthermore, although this minimum condition is something that all systems should satisfy, it is highly desirable for systems to be able to withstand multiple defaults.

4.2 Three factors should be considered in the design and operation of settlement and failure-to-settle procedures: (a) the size of the positions to be settled; (b) the resources available to complete the settlement; and (c) the time available to adjust positions and to mobilise available resources. Each of these factors need to be assessed in relation to one another. Thus, in general terms, the larger the size of the positions to be settled (and therefore, in decentralised systems, the larger the size of surviving participants' contingent loss-sharing obligations in the event of a default) and the shorter the time to adjust positions, the greater will be the need for credit and liquidity resources to be explicitly set aside in advance. Correspondingly, the smaller the net-settlement positions and the greater the length of time within the money-market day for adjustments in positions, the less need there may be for specified and pre-established credit and liquidity resources to assist in the completion of settlements. However, consideration may also need to be given to other factors, such as the level of peak intra-day positions. Moreover, in the design and management of particular systems, each of these factors will need to be assessed not only in relation to one another but also in relation to the normal requirements and practices of the relevant money markets.

4.3 In single-currency netting systems the size of the liquidity short-fall produced by a participant's inability to settle its net-debit position will be equal to the size of the ultimate credit exposure which would exist if the settlement failure were the product of the institution's failure. Procedures for the management and allocation of liquidity exposures can exactly parallel those for credit exposures. This is not the case in multi-currency systems. In particular, liquidity exposures could exist in multi-currency systems in the absence of any credit risks. Thus, the design of settlement and failure-to-settle procedures for multi-currency systems must address a wider and a more complicated set of risks.

Single-currency systems

Centralised liquidity-risk management

4.4 Assurance of the timely completion of daily settlements could be completely undertaken by the provider of a single-currency payment netting system. Indeed, such an assurance of settlement would be implicit in any netting-provider guarantee of credit risks. The assurance of settlement would be based upon the netting provider's own resources in relation to the size of the participants' positions to be settled. However, the netting provider could require participants to post collateral to provide some or all of the necessary resources. In either case, to satisfy the minimum condition, the available credit and liquidity resources would have to be at least equal to the largest net-debit position

permitted. Procedures for settlement would also have to give the netting provider sufficient time to draw on the resources in the event of a participant's inability to settle.

4.5 Alternatively, a netting provider could guarantee same-day settlement by absorbing the liquidity risk posed by a participant's inability to satisfy its direct obligation on the settlement date, but with any resulting credit losses to be allocated among the system's surviving participants on the following day. Each participant's contingent obligation to cover credit losses would be based upon a pro-rata distribution of the failed participant's unsettled net position, while the netting provider would be expected to manage and cover any liquidity short-fall during the settlement.

4.6 In contrast to a full netting-provider guarantee system, credit risk would ultimately be borne by the participants who would be expected to manage this on a decentralised basis; liquidity risk would be managed by the netting provider on a centralised basis. The viability of this arrangement would depend, firstly, upon the liquidity resources of the netting provider to assure same-day settlement and, secondly, upon the credit resources of the individual participants to absorb next-day credit-loss allocations. The netting provider would need to be able to set limits on each participant's "net-net" settlement position while the participants would need to be able to manage and contain their own credit exposures through bilateral limits.

Decentralised liquidity-risk management

4.7 It may be possible for a settlement short-fall to be allocated directly to the remaining participants on the settlement date. In this case, if a participant did not settle its net-debit position, the netting provider would allocate to each of the surviving participants a same-day, pro-rata share of this amount (assuming that the multilateral, net-net positions are legally binding). Participants would need to be capable of satisfying the full amount of both their direct and contingent obligations on the settlement date and, therefore, would also need the ability to manage and contain each of these exposures.

4.8 Particular care would need to be taken in assessing the soundness of a same-day, decentralised allocation of liquidity and credit exposures. For example, it is apparent that such a same-day allocation would be an inappropriate means of ensuring the timely completion of settlement if it occurred only at the very end of the business day because the timing would limit the remaining participants' ability to adjust their positions in the money market. But such an arrangement could be appropriate if the failure-to-settle procedures were implemented sufficiently early in the business day to ensure that the remaining participants had adequate time to adjust their positions prudently. Depending upon the size of their contingent obligations and the timing of the procedures, it might be appropriate for participants to set aside a quantity of highly-liquid assets equal to their maximum contingent obligations. However, still consistent with a decentralised approach to liquidity-risk management, the participants themselves could be responsible for using these assets to secure additional funding in the market to complete settlement.

4.9 There are several decentralised approaches to liquidity-risk management that would clearly fail to satisfy the minimum conditions of ensuring the timely completion of daily settlements while at the same time maintaining the necessary incentives and capabilities for participants to manage and contain their risks. For example, the liquidity short-fall resulting from a participant's inability to satisfy its net-debit position could be directly "passed-through" to those participants who were in a net-credit position on that day. Alternatively, in the event of a participant's inability to settle, the netting provider could simply delay the completion of settlement until the next day. In either case, it could be planned for the short-fall to be recovered the next day from the defaulting participant or, if necessary, reallocated pro rata among the surviving participants. In both cases, participants could be exposed to liquidity risks produced by the default of a participant with whom they may have had no direct dealings and, thus, would have no direct means of managing and containing their liquidity risks. This might actually lead to an increase in liquidity risks compared to what would exist without netting.

4.10 In the absence of a central counterparty that would be substituted on each payment order included in the netting process, the multilateral "net-net" positions of the participants may not be legally binding. In this case, the short-fall resulting from a participant's inability to settle its net-debit

position might only be resolved by recalculating a new set of multilateral net positions for each of the remaining participants, removing from the calculation all payments made to and from the defaulting participant. In such a “reversal” or “unwind” procedure, the “contingent obligation” of a surviving participant would not be its pro-rata share of the defaulting participant’s net-net position based upon its bilateral position with that participant but, instead, would be equal to the full amount of its bilateral position. If the position were a bilateral net-credit, due from the defaulting participant, it would no longer be available to off-set bilateral net-debit positions which the surviving participant had with other participants.

4.11 Under such position or advisory netting arrangements, settlement depends upon each participant’s ability to manage each of its bilateral positions and the multilateral netting is only advisory - reflecting the level of neither credit nor liquidity exposures. But because routine liquidity demands are reduced, the netting process encourages participants to manage their liquidity positions on a multilateral net-net basis even though their actual exposures are likely to be much higher. In the light of this mismatch and the possibility that such a reversal of payments could lead to a sudden and sizeable change in the remaining participants’ settlement obligations, as the sole mechanism for managing the risks of a participant’s inability to settle, a reversal process cannot be viewed as an acceptable means of ensuring the timely completion of daily settlements.

4.12 It may nonetheless be possible for a reversal procedure to be made consistent with the need to ensure the participants’ abilities to complete the settlement of their adjusted positions by applying a further multilateral limit designed to contain the possible effect of a reversal of payments. In addition to the bilateral limits participants set for one another and the multilateral limits imposed on all participants’ net-net debit positions, a “reversal limit” could be imposed on the amount produced by subtracting each participant’s largest bilateral net-credit position from its multilateral net-net position. This is the amount which a participant would need to be able to settle as a result of a reversal and would be the equivalent of a limit imposed on the sum of participants’ direct and contingent obligations. Implementing such a real-time limit could be costly to the netting provider and appear to be a significant constraint on the efficiency of the netting process from the participants’ perspective. A reversal procedure which lacked such a mechanism for ensuring that the participants’ recalculated settlement obligations would remain within their credit and liquidity resources would fail to satisfy the minimum condition of ensuring the timely completion of settlement.

Multi-currency systems

4.13 The liquidity-risk management issues associated with multi-currency netting systems are particularly difficult and important. This results from the multiple liquidity risks to be managed and the complex relationship between the liquidity and credit risks. In particular, the central counterparty in a multi-currency system must manage the liquidity risks associated with the possibility of a participant’s failure in each currency accepted for netting. The central counterparty may face credit exposures equal to the amount of the liquidity exposure or not, depending upon the timing of the different currency settlements and the particular combination of the defaulting participant’s net-credit and net-debit positions.

4.14 In the daily settlement of the net positions produced by a multilateral netting system for foreign exchange contracts, for example, the central counterparty would face a sequence of net settlements in each currency accepted in the system. Thus, the system as a whole would face liquidity risks in each currency and the central counterparty would need to be able to ensure the timely completion of settlement in each currency.

4.15 At the same time, the system may face a credit exposure on the full amount of a participant’s net-debit position in one or more currencies. This would be the case where a participant, that was a net receiver of those currencies which settled earlier in a given calendar day, failed to pay its net-debit position (in one or more of the currencies which settled later in the day) and was subsequently closed. Having paid out the net-credit positions, but having failed to receive the net-debit positions, the central counterparty could face liquidity exposures in the latter currencies and credit exposures of an equal amount.

4.16 The central counterparty could also experience liquidity exposure but little or no credit exposure. For example, if a participant were a net debtor in a currency which settled early in the calendar day, such as the Japanese Yen, and a net creditor in a currency which settled later in the day, such as the US dollar, and it failed to pay its Yen net-debit position, the central counterparty might be able to hold back the payment of the US dollar net-credit position and, thereby, maintain a surplus of US dollars to offset the short-fall in the Yen. But even so, the central counterparty would face a liquidity short-fall in Yen and, in order to ensure the timely completion of the system's Yen settlement, would need to be able to borrow or acquire additional Yen funds before the close of Yen money markets and settlement systems for that day. Moreover, the long position in US dollars, not yet actually received from that day's US-dollar net-debtors, would not be directly available to secure additional Yen funds in Tokyo. Thus, even in the absence of credit risks, the central counterparty would need to be able to manage liquidity exposures in each currency.

Centralised collateral-based, liquidity-risk management

4.17 Multilateral netting systems which adopt centralised risk-management arrangements, based upon the collateralisation of credit exposures, could extend this approach to the management of liquidity exposures. A centralised approach to liquidity-risk management could also be combined with a decentralised approach to the overall management of credit exposures. In either case, the central counterparty would need to arrange committed lines of credit in each currency while also ensuring that it had sufficient assets to repay any borrowings necessary to complete settlement.

4.18 The necessary assets to ensure the central counterparty's ability to borrow in each currency, as well as its ability to repay any borrowing in the event of credit losses, could come from either or both of two sources: collateral requirements or the prepayment of net-debit positions. Collateral could be posted by participants in amounts sufficient to ensure the ability of the central counterparty to borrow funds equal to the largest, single, permissible net-debit position in each currency. In systems with collateral-based management of credit risks the additional quantity of collateral necessary might not be very large. A requirement for the prepayment of net-debit positions in each currency - in effect, cash collateral - a day or two prior to each settlement date, might also provide a quantity of assets sufficient to ensure the completion of settlements. In the event of a participant's non-payment, net-credit positions due to that participant in other currencies could be withheld. The surplus currencies would already have been received and, thus, would be available to secure borrowings in currencies where there was a short-fall. Moreover, non-receipt of payments to cover net-debit positions a day or two in advance of the settlement date would give the central counterparty advance warning of problems.

Decentralised liquidity-risk management

4.19 It may be possible for multi-currency systems to provide for a same-day, pro-rata allocation of a liquidity short-fall to the defaulting participant's trading counterparties in some of the currencies included in the system. In general terms, the arrangements in each currency would be similar to those which would apply in a decentralised approach to liquidity-risk management in single currency systems. Once again, the viability of such procedures would depend upon the ability of the participants prudently to adjust their positions within the constraints of the relevant money markets. This, in turn, would depend upon the size of the positions, the amount of time for making adjustments, and the participants' available credit and liquidity resources.

4.20 If this approach were to be adopted, participants' access to liquidity in *each* of the currencies accepted by the system would need to be carefully examined. Each participant would need to be able to set bilateral limits on the level of the liquidity exposure which it was willing to incur with respect to each other participant. Once again, because the system would be relying on the participants to absorb the exposures - in this case, the liquidity short-fall - the central counterparty would need to be able to set overall limits for each participant's total liquidity-sharing obligations. These limits on contingent liquidity obligations, however, would place yet another constraint on bilateral activity - in addition to limits on credit exposures.

4.21 The need for liquidity limits is another reflection of the difference between single-currency and multi-currency systems. In a single-currency system participants can set one limit on their contingent obligations, in the event of another participant's failure, which would cover both liquidity and credit exposures because these would be the same amount. But in multi-currency systems the liquidity exposure associated with a participant's failure to pay a net-debit position in one currency (which may or may not also reflect a credit exposure) will be quite different from the overall credit exposure on its position - including both forward replacement costs and Herstatt risks.

Comparison of liquidity-risk management techniques

4.22 Use of the fully collateralised approach would provide a strong assurance of the system's ability to complete daily settlements in the event of a participant's default. However, the posting of collateral or requiring the prepayment of net-debit positions (or some combination of the two) would replace liquidity risks associated with settlement with a new set of credit risks. For example, the central counterparty would presumably need to provide for the overnight investment of currencies that were prepaid so as to be able to give the participants some return on their prepaid funds. Choices would need to be made between investment in government securities, which would lower the credit risks but also increase the opportunity costs to the participants, and interbank placements, which would lower the opportunity costs but increase the credit risks.

4.23 If settlement volumes were large, participants would be likely to view the opportunity costs of full collateralisation of liquidity risks as a significant drawback. But such procedures would have the substantial benefit of making the cost of managing these exposures explicit and, thereby, increase the transparency of settlement risks. A major benefit of a prepayment requirement would be the elimination of Herstatt risks for the central counterparty. This would significantly reduce the total level of credit risks experienced by the system as a whole. Finally, provided that binding limits are placed on participants' daily settlement positions, to keep them within the level of available resources, the collateralisation approach to liquidity-risk management is the one most likely to meet the minimum condition of ensuring the timely completion of settlement.

4.24 In contrast, a completely decentralised approach to liquidity-risk management would impose no explicit costs of an ongoing nature in terms of the opportunity costs of posted collateral or prepaid funds. But in order to provide the same degree of assurance of the ability of the system as a whole to complete daily settlements in a timely manner, the limits placed on the level of participants' contingent liquidity obligations could be quite constricting. In such a system, participants would need not only to be highly creditworthy but also to have access to reliable sources of liquidity in each of the relevant currencies. Even so, highly-creditworthy participants with access to liquidity probably would face tighter limits on their activity than with a collateral-based approach. The necessity of such limits on activity is likely to impose significant implicit costs on participants' use of the system.

4.25 Overall, in the design and operation of particular systems, it will be necessary for netting system providers and participants to weigh carefully the explicit costs of the collateral approach against the implicit costs of the distribution approach while maintaining the same degree of certainty that the system will be able to ensure the timely completion of settlements in each currency.

V. Multilateral netting systems should have objective and publicly-disclosed criteria for admission which permit fair and open access

5.1 Criteria for admission to multilateral systems for the netting of financial contracts or payment orders should address the financial and managerial capacity of an institution to satisfy its obligations and to manage the associated credit and liquidity risks. To comply with the suggested minimum conditions for the design and operation of multilateral netting systems, netting systems will need to place limits on the level of participants' obligations that are consistent with the institutions' credit and liquidity resources. Netting systems will also be expected to be capable of ensuring the timely completion of settlement in the event of the inability to settle of the participant with the largest, single net-debit position. In combination, these two requirements should ensure that netting systems

are capable of permitting participation by a wide number of institutions consistent with the prudent management of risks. Thus, both the centralised, collateral-based approach and the decentralised, credit-based approach to risk management should permit participation by institutions of varying sizes.

5.2 In centralised, collateral-based systems, participants effectively “prepay” for the risk of their own default by posting collateral sufficient to cover the exposures which their obligations create for the central counterparty. Participants can expand their obligations within the system only if they can also provide additional collateral. These systems should provide for quite broad access and, correspondingly, tight restrictions on membership would be difficult to justify.

5.3 In netting systems with decentralised risk-management procedures, participants will have strong incentives to limit their exposures based upon bilateral counterparty credit assessments. Participants will tend to set lower limits for smaller counterparties and also for counterparties of relatively lesser credit standing. In these systems, tight restrictions on access should not be necessary and institutions should be allowed to participate at a level of activity consistent with their counterparties’ assessments of their credit and liquidity resources. But because of the reliance of these systems on the direct distribution of losses among the surviving participants, concerns with respect to the ability of some institutions to satisfy their contingent obligations may justify a somewhat more restrictive approach to membership in comparison with centralised, collateral-based systems. Such concerns could also be addressed by requiring such participants to post collateral to cover their contingent, and possibly their direct, obligations.

5.4 Criteria for membership can appropriately distinguish between financial institutions that are subject to effective supervision and those institutions that are not. Moreover, if liquidity exposures are to be allocated directly to the participants, access to central bank credit facilities - in some or all of the relevant currencies - could be an important factor in determining the appropriateness of participation. Finally, it will always be necessary to establish the legal capacity of an institution both to enter into the transactions subject to netting and to participate in the netting system.

VI. All netting schemes should ensure the operational reliability of technical systems and the availability of back-up facilities capable of completing daily processing requirements

6.1 The providers of netting services and, in particular, of multilateral netting systems should ensure that all hardware, software, and communications facilities which support daily operations have a high degree of reliability and integrity. In particular, contingency plans should be established for the failure of each of these facilities which should include the availability of back-up facilities capable of completing the settlement process within the normal parameters of the relevant money markets as well as the completion of any necessary accounting and processing work prior to the start of the next business day.

6.2 Netting schemes have the potential to become significant mechanisms for the settlement of interbank transactions on which the participants come to rely for the completion of their daily treasury and money market operations. Some netting schemes have already achieved this status. The dependence of financial institutions on these systems implies the need to ensure their technical integrity and reliability – not just for the benefit of the individual participants but to help ensure the stability of the relevant markets and to limit systemic risks. In this setting, and in a world of 24-hour trading, the availability of back-up facilities capable of completing one calendar day’s business before the start of the next is clearly only a minimum requirement for the sound operation of any netting scheme.

Part D

Principles for cooperative central bank oversight of cross-border and multi-currency netting and settlement schemes

The following principles for the oversight of cross-border and multi-currency netting and settlement systems specify procedures which the Committee recommends for use by G-10 central banks in cooperating with one another and with other authorities. They are neither a statement nor an allocation of central banks' roles as lenders of last resort and in no way prejudice the statutory responsibilities of central banks and bank supervisory authorities. Rather, they are intended to provide a mechanism for mutual assistance among central banks in carrying out their individual responsibilities in pursuit of their shared objectives for the efficiency and stability of interbank payment and settlement arrangements. These principles may also be of use to other central banks and supervisory authorities when considering cross-border and multi-currency settlement structures.

1.1 ***Each central bank that has identified the actual or proposed operation of a cross-border or multi-currency netting or settlement system, outside of the country of issue of the relevant currency or currencies, should inform other central banks that may have an interest in the prudent design and management of the system.*** These will normally include the central bank or central banks of issue of the currencies accepted in the system, the "host-country" central bank in whose domestic market the system is located or operating, and the "home-country" central bank or central banks of the charter or incorporation of both the participants and the netting provider. These central banks should, in turn, seek to inform supervisory authorities that have responsibilities for the participants, the netting provider, or the settlement agent or agents. In carrying out this responsibility, central banks may find it useful to impose a duty or responsibility on financial institutions to report their provision of, or participation in, any netting service or system.

1.2 Central banks are most concerned with the operation of large-scale or wholesale systems which are, or have the potential to become, significant mechanisms for interbank settlements. But central banks should inform one another of all netting arrangements. What may appear to be a small operation in relation to the market of the host country, for example, could be large in relation to the interbank market in the country of issue and vice versa. Relatively small operations can also grow over time and become more significant. Thus, there should be a presumption in favour of informing other central banks and supervisory authorities about the existence of a netting system without regard, in the first instance, to its apparent importance.

2.1 ***Cross-border and multi-currency netting and settlement systems should be subject to oversight by a central bank which accepts primary responsibility for such oversight and there should be a presumption that the host-country central bank will have this primary responsibility.*** However, in consultation with other relevant central banks and supervisory authorities it could be agreed that another authority would undertake the primary responsibility.

2.2 Although several national authorities may have interests in the operation of any one cross-border or multi-currency netting system, the host central bank will usually have the broadest interest in the systemic implications of the system's operation and in the risks experienced by the participants within its domestic market. The central bank or central banks of issue will have an interest in the prudence of the settlement procedures and the implications for its domestic money market of any failure to complete settlement. The home central banks and supervisory authorities of the netting provider and of the participants will be concerned for their liquidity and solvency. The host central bank, however, is likely to be the home central bank of many of the system's participants and of the netting provider and will, of course, be the host of any resident non-domestic participants. Thus, the host central bank will normally be in the best position to oversee the activities of the netting provider and to ensure that appropriate risk controls are in place. Where a single system is simultaneously

provided directly to institutions located in different financial centres, consultations between the different “host” central banks may be needed to determine which among them should have primary responsibility to oversee the system’s activities.

2.3 There may be occasions where the host central bank does not wish to assume primary responsibility and where another authority would be better placed to do so. For example, where a netting system is provided by a branch of a bank chartered in another country, the home supervisory authority or home central bank may be better able to oversee the netting provider’s activities and, thus, to oversee the system as a whole. This may be particularly true where the home central bank is also the central bank of issue of the relevant currency. But there should be a presumption that the host central bank will be responsible in the absence of agreement to the contrary among the relevant authorities.

3.1 ***In its oversight of a system, the authority with primary responsibility should review the design and operation of the system as a whole and consult with other relevant authorities on its conclusions both in the first instance and, from time to time, with respect to developments in the system’s status.*** The statement of minimum standards for the design and operation of cross-border and multi-currency systems should provide a starting point for this review. Thus, consideration should be given to the operational and financial soundness of the message carrier, the netting provider, and the settlement agent or agents and to the legal soundness of the netting process. Special attention should be applied to the system’s risk-management procedures to ensure that the provider and the participants have a clear understanding of the credit and liquidity risks they bear and that they have both the incentives and the capabilities to manage and contain these risks.

3.2 The extent of consultations among the authorities may depend upon the size and importance of the system. With respect to the largest systems central banks may wish to communicate on a regular basis. However, in reaching its initial conclusions and in its continuing oversight of any system, the authority with primary responsibility should recognise the interests and concerns of other relevant central banks and supervisory authorities through a process of consultation. At the same time, central banks and supervisory authorities responsible for the participants or the currencies in a system should keep the authority with primary responsibility informed of relevant developments. Such continuing communication and co-ordination should provide a means of anticipating and containing the systemic risks which could be transmitted in the event of the failure of a participant, or of a system, or of other disturbances.

4.1 ***The determination of the adequacy of a system’s settlement and failure-to-settle procedures should be the joint responsibility of the central bank of issue and the authority with primary responsibility for the system.*** A review of the soundness of the design and operation of any netting or settlement system will necessarily entail consideration of the adequacy of both its routine settlement procedures as well as those to be invoked in the event of a participant’s inability to satisfy its settlement obligations. These procedures will need to be considered in relation not only to the system’s overall risk-management arrangements but also in relation to the domestic money market in which settlement ultimately occurs. Because of its knowledge of its domestic money market, and its concern for this market’s stability, the views of the central bank of issue will be particularly important in the assessment of a netting system’s settlement arrangements. Thus, the authority with primary responsibility will need to consult with the central bank or central banks of issue in order to reach a joint determination of the adequacy of the system’s settlement and failure-to-settle procedures.

5.1 ***In the absence of confidence in the soundness of the design or management of any cross-border or multi-currency netting or settlement system, a central bank should discourage use of the system by institutions subject to its authority and, if necessary, identify the use of, or the provision of services to, such a system as constituting an unsafe and unsound banking practice.*** In the course of their consultations, central banks should endeavour to ensure the prudent operation of cross-border and multi-currency systems on terms acceptable to all relevant central banks and supervisory authorities. However, if this is not possible in some cases, it is clear that each national authority must maintain its discretion to discourage the use of a system if, in its judgement, the system is not prudently designed or managed.

Annex

Members of the Committee on Interbank Netting Schemes

Chairman	M A Lamfalussy
Belgium	M J-J Rey
Canada	Mr G G Thiessen
France	M P Lagayette
Germany	Herr O Werthmüller
Italy	Dott T Padoa-Schioppa
Japan	Mr T Ohta
Netherlands	Mr J A Sillem
Sweden	Mr L Nyström
Switzerland	Dr H Meyer
United Kingdom	Mr B Quinn
United States	Mr W D Angell Mr J H Oltman
Basle Committee on Banking Supervision	Mr H J Muller
BIS	Dr H Bockelmann Mr M G Dealtry
Secretariat	Mr P R Fisher Mr J T Kneeshaw

Index of terms

(The citations providing the most detailed definition or explanation of each term are in bold type.)

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