

BANK FOR INTERNATIONAL SETTLEMENTS

**CENTRAL BANK PAYMENT AND SETTLEMENT
SERVICES WITH RESPECT TO
CROSS-BORDER AND MULTI-CURRENCY TRANSACTIONS**

**Report prepared by the Committee on Payment and Settlement Systems
of the central banks of the Group of Ten countries**

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Foreword

As a follow-up to the Report of the Committee on Interbank Netting Schemes, the Working Group on Central Bank Payment and Settlement Services (Working Group) was established to examine a range of options that central banks might consider in an effort to help reduce risk and increase efficiency in the settlement of cross-border and multi-currency interbank transactions. The goal of the analysis was to identify and promote a common understanding of the advantages and disadvantages of different payment and settlement services that central banks might offer. The report neither recommends a preferred option nor should it be construed as indicating that central banks, either individually or as a group, are prepared to offer one or more services. Indeed, the study points out that individual central banks may weigh differently the advantages and disadvantages of various options, given their differing institutional, legal, and policy perspectives. Furthermore, the study recognises that central bank services are likely to continue to develop over time in conjunction with, or perhaps as a catalyst for, market developments.

This discussion paper is being made publicly available for two reasons. Firstly, many central banks and financial institutions are considering important changes to their home-currency payments systems. While some of these developments are motivated by domestic concerns, this report highlights how changes in certain features of home-currency payments systems can influence the risk and efficiency of international settlements. Secondly, the report emphasises the scope and need for private sector efforts to reduce risk and increase efficiency in the settlement process. In this regard, the report may serve as a useful reference document and stimulate public discussion of the means to achieve these goals.

This report should be viewed solely as the product of study by the Committee on Payment and Settlement Systems and does not necessarily represent the views of either the central banks of the G-10 countries or the Bank for International Settlements. Able assistance in editing, translating and publishing the report was provided by the BIS.

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1. Introduction

1.1 The settlement of cross-border and multi-currency transactions currently raises significant systemic risk concerns owing to the very large daily volumes involved, the lack of simultaneous delivery of currencies and the interdependencies of payments system participants throughout the world. The BIS estimates that global foreign exchange market activity alone amounted to about \$880 billion per day in April 1992. The settlement flows resulting from these and other international transactions represent a sizable share of the daily volume of many home-currency payments systems.

1.2 Central banks have expressed great interest, both individually and collectively, in reducing the risk in the settlement of foreign exchange and other cross-border and multi-currency transactions. In the press communiqué of November 1990 accompanying the publication of the Report of the Committee on Interbank Netting Schemes (Lamfalussy Report), the Group of Ten (G-10) central bank Governors requested that the Committee on Payment and Settlement Systems (CPSS) “continue to review possible measures that central banks might take - either individually or on a cooperative basis - to improve efficiency and reduce risks in the settlement of cross-border and multi-currency transactions”.

1.3 The Working Group on Central Bank Payment and Settlement Services (Working Group) was established by the CPSS to examine possible options for central banks to improve efficiency and reduce risk in the settlement of cross-border and multi-currency interbank transactions.¹ The Working Group has identified a number of options and established a framework for their evaluation based on central bank policy concerns. This report summarises the Working Group’s findings and their implications for central banks. No specific option, or combination of options, is recommended. Instead, this report highlights the major benefits and concerns common to many possible options with the intention of contributing to future analysis and discussion.

¹ The members of the Working Group are listed in the Annex.

2. Summary and conclusions

2.1 Reflecting their different domestic origins, payments systems within the G-10 countries vary considerably. Some systems complete home-currency large-value funds transfers on a gross, payment-by-payment basis, while other systems rely on net settlement procedures. In some countries, final (i.e. irrevocable and unconditional) transfers can be made in “real time” throughout the business day, while in others such transfers might not become final until several hours or possibly a day or more after they are initiated. Each country’s payments system has its own hours of operation, and these hours typically are not synchronised with payments system operating hours in other countries.

2.2 Using these diverse home-currency payments systems to settle cross-border and multi-currency transactions can be cumbersome and may entail considerable risk. For instance, when the hours of operation of two payments systems do not overlap, it is technically impossible to arrange for the simultaneous settlement of both sides of a foreign exchange transaction. Even when operating hours do overlap, local payments arrangements often make it difficult to control and coordinate the timing of payments in several currencies. More generally, differences and uncertainty in the timing of finality in each country present other obstacles to the effective management of the risks that arise in cross-border and multi-currency settlements.

2.3 Home-currency payments system hours and arrangements and the timing of finality thus make it difficult, if not impossible, to achieve settlements involving two or more currencies (i.e. multi-currency settlements) in which final transfers in one currency occur if and only if final transfers in the other currency or currencies also take place. In the absence of such a delivery-versus-payment (DVP) process for settling obligations in multiple currencies, significant credit risks can be present. These risks include the potential loss of principal (often called “principal” or “Herstatt” risk) that would arise if transfers in one currency became final while associated transfers in another currency did not take place. This is a significant risk to international market participants since the loss of principal in settling, for instance, a foreign exchange trade would dwarf any gain or loss that might have accrued to the counterparties to the original transaction.

2.4 Liquidity risks can also arise in the absence of a multi-currency DVP settlement process. For instance, a fear of incurring principal risk might lead some market participants to refuse to honour their obligations in earlier-settling currencies out of concern that a “suspect” counterparty would not be able to settle its associated obligations in later-settling currencies. The sudden interruption of a significant level of expected payment flows could cause serious liquidity problems for the counterparty and, hence, for other market participants that expect to receive payments from the counterparty. This liquidity risk might also spread to other payments systems in the same or other countries if concern about loss of principal during the settlement process became widespread.

Summary of options

2.5 The Working Group examined a range of central bank payment and settlement services that might reduce these risks and increase the efficiency of cross-border and multi-currency settlements. The options that were considered by the Working Group included: (1) modifying or making available certain home-currency payment and settlement services; (2) extending the operating hours of home-currency large-value funds transfer systems; (3) establishing cross-border operational links between these payments systems; and (4) developing multi-currency payment and settlement services. These central bank service options were evaluated in circumstances where they would facilitate the settlement both of individual transactions and of a stream of transactions between two or more counterparties that have been netted through the operation of a private sector netting scheme.

2.6 *Home-currency payment and settlement services.* Certain home-currency payment and settlement services might be modified or made available to increase the level of support for international settlements. In particular, where they do not currently exist, settlement accounts and intraday final transfer capabilities could be made available by central banks to settle home-currency obligations related to cross-border and multi-currency transactions. An intraday final transfer capability is defined as the ability to initiate - and to receive timely confirmation of - transfers between accounts at the central bank of issue that become final within a brief period of time. It is important to recognise that the availability of these services would not be sufficient to permit the simultaneous settlement of obligations in all currencies. Hence these home-currency services could not, per se, eliminate the credit and liquidity risks that exist in the absence of multi-currency DVP capabilities.

2.7 Recognising that they cannot eliminate the risks associated with non-DVP settlement, intraday final transfers and settlement accounts nonetheless significantly improve the ability of market participants to manage and control these and other settlement risks. Accurate information about when obligations in each currency are finally discharged would enable individual institutions and clearing houses to quantify and control more precisely and efficiently than they can at present the level and duration of exposures that may be incurred in the process of settling both individual and netted transactions in two or more currencies. It is apparent that the capability in each country's domestic large-value payments system to effect final transfers at any time of the business day between accounts at the central bank of issue is the foundation stone upon which risk reduction measures can be developed in respect of a range of domestic and cross-border transactions.

2.8 *Operating hours of home-currency payments systems.* The operating hours of home-currency large-value funds transfer systems could be extended to increase the level of support for international settlements. At one end of the range of possibilities, a modest lengthening of the operating hours of an individual payments system would reduce its current gap (or increase its current overlap) with the operating hours of payments systems in other countries. Towards the other end of the

spectrum (which, in the extreme, could involve the large-value funds transfer systems in a number of countries operating round-the-clock), a major extension of the hours of several key home-currency payments systems could result in an operational overlap of most major currencies. Combined with the availability of final transfers over those systems, such an overlap could create the technical ability to conduct on the same value date a DVP settlement of all relevant currencies in which counterparties would be assured that payments in one currency would be made if and only if payments in all relevant currencies are made. This would help support the potential elimination of the credit and liquidity risks associated with the current lack of multi-currency DVP capabilities. However, without directly linking payments made over different large-value funds transfer systems, this assurance would have to come from private sector procedures that would use the available home-currency payment and settlement services during the extended hours of operation.

2.9 ***Cross-border links between payments systems.*** Another possible option might be the establishment of bilateral or multilateral cross-border links between large-value funds transfer systems in conjunction, where necessary, with an extension of their operating hours to increase the level of support for international settlements. In particular, direct operational and informational links could be created that would give participating central banks the joint capability to monitor, control and execute simultaneously final transfers over their respective home-currency payments systems. With such cross-border connections, central banks could directly provide the private sector with DVP settlement services for currencies with overlapping payments system operating hours.

2.10 ***Multi-currency payment and settlement services.*** Another possible option might involve the joint offering of multi-currency payment and settlement services. Multi-currency accounts and settlement facilities might be provided by the central banks of issue through a “common agent”. Specifically, a central bank controlled common agent could accept deposits in multiple currencies and facilitate final transfers between these accounts. A variant of this arrangement would involve one or more central banks acting as the common agent in providing multi-currency services. In both cases, an important issue is whether arrangements would be in place to provide assurances that sufficient liquidity would be available to complete settlement in the relevant currencies.

2.11 The purpose of jointly offering multi-currency services would be similar to that of creating an overlap in the operating hours (with or without direct operational and informational links) of the major large-value funds transfer systems: to provide the private sector with the technical ability to achieve DVP in the settlement of multi-currency obligations. With multi-currency services this would be accomplished by effecting settlement over operational accounts in each currency held either at the common agent or, in the case of the variant discussed above, at one or more individual central banks.

Summary of analysis

2.12 The Working Group's analysis of the various central bank service options indicates that each has potentially significant advantages and disadvantages. Where such facilities do not currently exist, the ability to initiate transfers between accounts at the central bank of issue that become final within a brief period of time when the local money market is open and liquid would add a capability that could substantially reduce the risks in the settlement of cross-border and multi-currency transactions. Such an intraday final transfer facility would have the effect of supporting the discharge of all home-currency settlement obligations, whether related to foreign exchange, cross-border or purely domestic transactions; it would thereby improve the overall safety and efficiency of the home-currency payments system. Furthermore, intraday finality is a necessary building-block for implementing the other potential central bank service options described in this report.

2.13 The benefits of intraday finality, however, also carry certain costs. To realise the desired risk reduction and improved efficiency conferred by intraday finality, private sector entities would need to develop and implement payment arrangements that use this capability in a safe and sound manner. In addition, for those central banks that currently do not offer account holders this capability, the implementation and operational costs of doing so could be major considerations. Furthermore, even though intraday finality might foster substantial reductions in risk, it cannot, by itself, eliminate the risks that exist in the absence of multi-currency DVP settlements. Nevertheless, intraday final transfer capabilities substantially improve the ability of the private sector to manage, and indeed reduce, the current risks that arise in cross-border and multi-currency settlements.

2.14 A modest lengthening of the operating hours of an individual payments system that creates or expands an operational overlap with payments systems for other currencies would increase the opportunity to conduct DVP settlements among those currencies. In the extreme, a major extension of the hours of certain home-currency payments systems (with or without direct links between them) or the development of central bank multi-currency services would create the technical ability to conduct a DVP settlement of all G-10 currencies on the same value date and thus could support the elimination of the current credit and liquidity risks associated with non-DVP settlements. In particular, multi-currency DVP settlements would eliminate the potential loss of principal that currently arises during the settlement of multi-currency transactions. Furthermore, by assuring market participants that they would not incur principal risk in the settlement process, a multi-currency DVP mechanism would encourage them to honour their settlement obligations even at times of market stress.

2.15 However, while facilitating the elimination of these important risks, multi-currency DVP settlements may also raise a number of important policy issues and concerns. One concern stems from the settlement linkages that would be created under a multi-currency DVP settlement mechanism. By virtue of the interdependencies created by directly linking the settlement of two or more currencies

through a DVP mechanism operated by either central banks or the private sector, a disruption in the settlement of one currency would disrupt the settlement of other currencies. Such disruptions could result from public or private sector operational problems, or from private sector liquidity shortages. Multi-currency DVP settlements that rely on “off-hour” money markets for funding in one or more major currencies would be susceptible to liquidity problems if these off-hour markets were not sufficiently deep and liquid to provide a reliable source of funds. It is possible, or even probable, that money markets would eventually evolve into an adequate source of liquidity to support off-hour settlements in each currency. Until then, however, implementing this capability could involve a trade-off between different sources of systemic risk.

2.16 Another issue is the high degree of coordination that might be needed (on a regular basis and when dealing with settlement problems) to support multi-currency DVP settlements. Enhanced central bank coordination has potential advantages and disadvantages. On the one hand, growing interdependencies among the world’s financial markets have increased the benefit to individual central banks of more accurate and timely information flows, especially at times of financial stress. In this regard, the operational and informational links that might be created in conjunction with multi-currency DVP settlements, as well as the formalised relationships that would accompany the establishment of a central bank controlled common agent, would provide mechanisms for enhanced central bank coordination.

2.17 On the other hand, the interdependencies created by directly linking the settlements of two or more currencies through DVP procedures might also reduce the ability of individual central banks to respond to liquidity problems in their home currencies. By definition, multi-currency DVP settlement means that payments in one currency will be made if and only if payments in all currencies will be made. It is possible, therefore, that home-currency settlement payments could be delayed or disrupted because of settlement problems in other linked currencies. In such circumstances, the ultimate resolution of the situation may depend more on the liquidity of money markets for other currencies and on the action of other central banks than on home-currency liquidity provision. More generally, because of these linkages, the presence of multi-currency DVP settlements may constrain the ability of each central bank to respond in a relatively independent manner to home-currency settlement problems based on local market considerations.

2.18 Multi-currency DVP settlements, which would be specifically created or supported by an extension of payments system operating hours, cross-border payments system links or multi-currency central bank services, might have undesirable implications for the implementation of monetary policy. For instance, depending on the specific time chosen for a multi-currency settlement, daily fluctuations in the size of settlement obligations might influence the volatility of the aggregate demand for central bank balances as used for monetary policy purposes in some countries. The magnitude and duration of this impact on the monetary forecasting capabilities of the affected central banks of issue would

depend on the size, distribution, and predictability of settlement obligations among the banks that participate in such multi-currency settlements. Although this greater uncertainty could potentially reduce the ability of the affected central banks of issue to influence targeted domestic interest rates, in practice it might not be difficult for central banks to deal with the situation by making modest adjustments to their current monetary policy operating procedures. In addition, any central bank lending to support multi-currency DVP settlements also has potential monetary policy implications. Depending on the timing of such lending in relation to the timing of domestic reserve monitoring and open market operations, it might be difficult for some, although by no means all, central banks of issue to offset quickly the impact of settlement-related lending on domestic interest rates and exchange rates.

Implications

2.19 Central banks face an array of service options that could increase the level of support for international settlements. Some of these services - such as intraday finality, settlement accounts and other home-currency services - are either currently available or could be offered quickly by at least some central banks, while others - such as those that would create or support the development of multi-currency DVP mechanisms - might take time to develop. Indeed, the development of sound multi-currency DVP settlements would require certain preconditions: design of the organisational and operational mechanisms that could facilitate multi-currency DVP settlements; solution of the technical and legal problems concerning the interlinkage of domestic systems that could accompany a major extension of operating hours or the creation of a common agent; meeting the needs of central banks regarding coordination; and the development of off-hour money markets that could adequately support multi-currency settlements. From a practical point of view, home-currency final transfers and settlement accounts likely could be developed - and would need to be offered - before the establishment of multi-currency DVP capabilities. Accordingly, central bank services are likely to develop over time.

2.20 Many central banks are currently considering important changes to their home-currency payments systems. Where not already in place, the development of an intraday final transfer capability could, in addition to any domestic goals, also contribute substantially to the reduction of international settlement risks and would provide a necessary building-block for other potential central bank services described in this report. Furthermore, some home-currency payment netting systems are considering ways to strengthen their current risk control mechanisms in a manner consistent with the Lamfalussy minimum standards for netting schemes. Such improvements could also increase the level of support for settling multi-currency transactions.

2.21 Some central banks are also considering moderate extensions of their local payments system operating hours to support domestic markets and settlements. At the same time, many pairs of

payments systems already have overlapping hours. Thus, notwithstanding other potential obstacles to achieving multi-currency DVP (e.g. local payment arrangements, cut-off times for international correspondent payment orders and the timing of finality), expanding the operating hours of home-currency payments systems that have intraday finality increases the opportunities for the private sector to eliminate or reduce the duration of settlement exposures by more closely aligning the timing of payments between two or more banks in two or more currencies. Expanded operating hours would also increase the scope for two or more central banks, should they choose to do so, to provide directly DVP services for their respective currencies of issue by linking their home-currency payments systems, if home-currency money markets develop into a reliable source of funds for settlement requirements. It is likely that different responses may occur in different countries depending, for example, on whether operating hours are increased at the beginning or the end of the current business day. In any event, extensions of local payments system hours may provide useful information about the desire of the private sector to achieve multi-currency DVP settlements and about the likely development of off-hour money markets.

2.22 The Working Group's analysis also identified some implications of central bank services for multilateral multi-currency netting schemes, should private sector proposals for such arrangements become more fully developed. At the outset, the Working Group noted that the Lamfalussy Report concluded that soundly constructed and managed multilateral netting schemes may usefully contribute to the control and reduction of Herstatt risk in the foreign exchange markets. Soundly constructed netting schemes would be expected to manage prudently the settlement risks for all currencies - including non-G-10 currencies - that are included in such schemes. As to central bank settlement, the establishment of settlement accounts for netting schemes, with the possibility of final intraday settlements, might be considered. Such developments, were they to occur, would not be expected to preclude other changes in central bank services identified by the Working Group that might help reduce risk and increase efficiency in foreign exchange settlements, both for netted and non-netted transactions. Indeed, over time, a number of changes might be made to central bank payment services in conjunction with, or perhaps as a catalyst for, market developments.

2.23 Section 3 analyses existing central bank payment and settlement services in the G-10 countries. Following a review of important concepts and a discussion of current institutional arrangements, Section 3 then describes multi-currency settlement risks and key features of home-currency payments systems that are essential to reducing these risks. Section 4 describes potential central bank payment and settlement services that could help reduce risk and increase efficiency in cross-border and multi-currency settlements. Section 5 presents the Working Group's analysis of the advantages and disadvantages of these service options in the context of seven broad policy criteria.

3. Existing central bank payment and settlement services

3.1 This section has two purposes. Firstly, it introduces a few key concepts necessary to analysing credit and liquidity risks associated with existing and potential central bank payment and settlement services. Secondly, this section provides a perspective on existing national large-value interbank funds transfer arrangements and their limitations from the point of view of cross-border and multi-currency payments and settlements.

Key concepts

3.2 Payments system concepts as used by the Committee on Payment and Settlement Systems (CPSS) have evolved over time. These concepts have been addressed in documents such as the Report on Netting Schemes (the Angell Report), the Report of the Committee on Interbank Netting Schemes (the Lamfalussy Report) and, most recently, the Report on Delivery Versus Payment in Securities Settlement Systems (the DVP Report). In addition, an effort has been made by the CPSS to compile a glossary of terms for use by G-10 central banks. EC central banks have also created a glossary of terms and concepts in recent work analysing payments systems in the Community. This report builds on these earlier documents.

3.3 From the point of view of analysing credit, liquidity and systemic risks in payments systems, the most important concept is *finality*. As stated in the glossary of the DVP Report, finality or a *final transfer* is a concept that defines when payment, settlement and related obligations are discharged. Thus the DVP Report defines a final transfer as “an irrevocable and unconditional transfer which effects a discharge of the obligation to make the transfer”. This is the definition of finality adopted in this report. The report also discusses the idea of an *intraday final transfer capability* at central banks of issue. An intraday final transfer capability is defined as the ability to initiate - and to receive timely confirmation of - transfers between accounts at the central bank of issue that become final within a brief period of time.

3.4 Finality is important because when it occurs - which depends upon applicable rules and laws - the interbank obligations generated in the interbank payment, clearing and settlement process are discharged. Thus, the credit, liquidity and systemic risks generated in this process, particularly interbank risks, may similarly be extinguished. Furthermore, from a broad perspective, finality is the point at which a money transfer process is completed.

3.5 One of the major roles of central banks is to provide a monetary asset free of default risk that can be used for making interbank transfers and settling interbank obligations. Central banks also typically provide accounts to qualified financial institutions in which balances of central bank money may be held. Arrangements differ across countries as regards whether central banks also provide, or possibly administer, electronic systems for executing payment instructions that effect transfers of

central bank money. As discussed below, operational and legal arrangements also differ as regards when transfers of central bank money take place and are final (i.e. irrevocable and unconditional).

3.6 Interbank funds transfers can be made by transfer of commercial bank deposit money as well as by transfer of central bank money. Correspondent banks, for example, typically provide this service. Unlike transfers of central bank money, transfers of commercial bank deposit money are not transfers of a risk-free monetary asset.

3.7 As noted in the Angell Report, *settlement risk* involves a combination of credit and liquidity risks that arise in the interval of time between entering into a financial (or other) transaction that involves an obligation to pay an amount of money and the discharge of the obligation to pay money by the final transfer of the required sum. *Systemic risk* may accompany such situations, particularly if large numbers of payments between and among financial and other firms in an economy have been made on the assumption that all such payments will lead to, or are, final transfers. If this assumption proves false, significant unforeseen reallocations of monetary and other assets may take place between and among such firms, with potentially serious consequences for the liquidity and even solvency of these institutions. Furthermore, underlying obligations thought to have been discharged may, in fact, not have been discharged at all.

3.8 In the case of multi-currency payments the situation is even more complex. Major financial institutions and other sophisticated organisations may, in the normal course of business, enter into significant numbers of interdependent financial transactions in two or more currencies for settlement on a particular value date. In such cases, the final transfers of money needed to settle transactions denominated in different currencies, and, in particular, needed to settle exchanges of one currency for another through foreign exchange transactions, are usually dependent on the characteristics of two or more national payments and banking systems for the relevant currencies. In such circumstances, liquidity, credit and systemic risks can become quite difficult to manage precisely.

3.9 Cross-border issues further complicate the risks involved in transactions because, at the very least, potential conflicts and other problems may arise involving the application of different countries' laws to different aspects of payment and settlement. Furthermore, more than one country's laws may apply to the financial institutions through which payments and settlements are made. This is especially true in the case of foreign branches of these institutions. Some cross-border issues are also closely related to multi-currency issues. Thus the existence of differing national payments systems is also, in a sense, a cross-border "issue". Problems created by payments between counterparties in different time zones are also typically, although not necessarily, associated with cross-border issues.

3.10 At present, the *sequential settlement* of the various payment legs in foreign exchange transactions is the norm in the banking industry. Transfers of one currency are typically initiated and even become final before transfers of another currency or currencies are initiated and become final. As a result, if transfers and settlements in later-settling currencies do not take place as scheduled,

significant risks of loss of the principal value of one or more of the payments in a sequence may arise. Such risk is also called *Herstatt risk*.^{2,3}

3.11 Another aspect of sequential settlement is the potential liquidity risk that may be generated in circumstances of financial stress and market uncertainty, if counterparties refuse to use customary sequential settlement methods out of fear that large credit losses might result. Payments may be withheld or their timing and sequencing changed. In these cases, the anticipated distribution of liquidity in the financial sector, both within a day and at the end of a day, may be disrupted, with potentially serious consequences for markets and clearing arrangements.

3.12 A fundamental concept used in this report is *multi-currency delivery-versus-payment* (multi-currency DVP). Drawing on the DVP Report, when two or more currencies are involved, multi-currency DVP means that a final transfer in one currency occurs if and only if a final transfer of the other currency or currencies also takes place. The significance of this concept is that when transfers are made using a DVP mechanism, Herstatt (principal) risk does not arise, although other risks may still be present.

3.13 The term *simultaneous settlement* is also used by the Working Group. Multi-currency settlements may take a form, whereby, either through a DVP arrangement or through a less structured arrangement, settlement in two or more currencies is coincident. In the less structured arrangement there is no DVP, and no physical mechanism exists to assure at all times that if one currency were settled all other currencies would also be settled.

3.14 In summary, multi-currency DVP can, in principle, eliminate Herstatt risk in the settlement of transactions involving the exchange of two or more currencies. Multi-currency DVP also provides an important yardstick against which to judge the settlement risks in non-DVP multi-currency settlements, in particular settlement risks in sequential settlements that are the current norm in the banking industry. As noted in the DVP Report, the overall risk characteristics, particularly liquidity risk characteristics, of any actual DVP mechanism will depend on the risk management features of that mechanism, along with market usage.

² The term “Herstatt risk” derives from the episode in 1974 in which the Bankhaus Herstatt was closed at the end of the German banking day, but before the end of the banking day in North America. One result was that the Deutsche Mark leg of some of Herstatt’s foreign exchange contracts for value on the day of closure had been settled before the closure of the bank, but the dollar legs of those contracts had not yet been finally paid. Note that sequential settlements can be disrupted for operational or other reasons, as well as problems associated with the creditworthiness of a counterparty to a contract.

³ The Lamfalussy Report also refers to Herstatt risk as “cross-currency settlement risk”. That Report states that “during the interval between the settlement of each leg [of a foreign exchange transaction], 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*” (Lamfalussy Report, Part C, paragraph 2.7). Similarly, in the DVP Report principal risk is defined as the “risk of loss of the full value of securities or funds ... transferred to the defaulting counterparty” (DVP Report, paragraph 2.9).

Current arrangements and risk implications

3.15 From the point of view of overall credit and liquidity risks in making and receiving cross-border and multi-currency payments and counter-payments, current national large-value transfer systems have two related characteristics that may inhibit the reduction of risks. The first is a constraint in some national systems on when during a payments system operating cycle transfers can be initiated and on when they are final. The second is a constraint on the hours of operation of payments systems themselves, which in turn implies a constraint on the times of day at which final transfers can be initiated and completed. Both of these restrictions limit the possibility of DVP (or simultaneous) exchanges of currencies through national payments systems. Given such constraints, the sequential settlement of most currencies is inevitable. The only issue from the standpoint of credit and liquidity risk is how to manage and reduce those risks.

3.16 There are a variety of operational and financial structures for large-value transfer systems in the G-10 countries. Significant changes are also under way. The structures, along with relevant payments and insolvency law, determine the timing of the finality of transfers effected using these systems.

3.17 Two major types of large-value transfer system can be distinguished that have very different characteristics with respect to the timing of finality. The first type is the *gross real-time transfer system*, in which payment messages are processed one at a time through an operating system or systems, with each message resulting in the transfer of central bank money as it is processed. Gross real-time transfer systems for central bank money potentially can provide finality for transfers on a payment-by-payment basis. This would require, however, that payments, insolvency and other relevant laws grant a discharge of any obligation to transfer money at the point transfers of central bank money take place. This may not be the case in some countries. Where these conditions are met, there is no constraint based on the structure of the payments system that prevents intraday final transfers of central bank funds.

3.18 Financial arrangements differ across central banks that operate gross real-time transfer systems with respect to the treatment of payments when a bank sending a transfer through such a system has insufficient covering balances or credit. In such circumstances, payments may be held in a queue pending the receipt of funds, or they may be rejected by the operating system. Thus central bank credit constraints placed on gross real-time transfer systems may limit the ability of banks to make final transfers of funds at the time of their choosing, given the level and distribution of central bank money and credit at a particular time during an operating day. However, such constraints are not necessarily part of the inherent design of a payments system and may arise from the financial or credit policy of a central bank as applied to its country's payments system.

3.19 By contrast, in the second major type of large-value transfer system, called *multilateral netting systems*, limitations on the timing of finality are an inherent feature. In such systems, final

transfers of central bank money take place at specified times rather than on a continuous basis. Such systems are based on the multilateral netting of payments across members in the arrangement using principles similar to those employed in the classic bankers' clearing house for paper instruments. Settlements for such systems can take place at multiple times during the day. However, in current practice, settlements are typically made at the end of the processing day using transfers of central bank money between central bank accounts or, in at least one case, through the medium of a special settlement account at the central bank for the transfer system. At the time of the transfers of central bank money, payments and settlements are typically considered final. (Care needs to be taken that payments, insolvency and other laws actually support this assumption of finality, particularly in countries with so-called zero-hour bankruptcy rules.⁴)

3.20 In any event, the structure of these netting arrangements with periodic settlement may make it difficult for transfers to be final, in the sense of an irrevocable and unconditional discharge of obligations to transfer money, during a processing day or, more accurately, between the periodic settlements. Various netting arrangements may employ more or less extensive risk management and loss-sharing arrangements designed to ensure that periodic settlements take place and thus that promised final transfers of central bank money are made.

3.21 Netting arrangements can be designed to guard against the unwinding⁵ of payments and to provide for "certainty of settlement"⁶ This is the certainty that, when the netting cycle and the associated settlement procedures have been completed, there will be an appropriate transfer of central bank money to effect settlement. Legal considerations, particularly in situations involving the cross-border participation in a payments system by branches of multinational financial institutions, may also affect the certainty attached to the settlement of netting systems.

3.22 There are variations of both major types of payments system model along with hybrid systems. The table provides summary information on the large-value transfer systems in the G-10 countries. In addition to indicating whether a system is a gross real-time transfer system or a netting system, the table shows the hours of operation of the systems, the timing of settlement finality and the cut-off times for third-party transfers. It appears from the table that, in a few countries, it is not

⁴ In general, under a zero-hour bankruptcy rule, a bankruptcy that occurs during the day may be deemed to have occurred at 0:00 hours for the purpose of determining whether transactions entered into by the bankrupt on the day of bankruptcy will be binding on the estate in bankruptcy. A court hearing is usually required to determine whether each individual transaction will have to be reversed.

⁵ An unwinding of payments is a procedure allowed in certain multilateral netting arrangements, whereby the funds transfers to and from a participant that fails to complete a net settlement are to be deleted and net settlement positions are to be recalculated to reflect those deletions.

⁶ For example, it may be the case that netting arrangements with explicit and robust loss-sharing formulas, net debit caps and fail-safe liquidity backstop facilities, involving the full collateralisation of all net debit positions by appropriately discounted government securities, would provide for the virtual assurance of settlement at the end of a netting cycle.

possible at the present time to obtain intraday finality of payments via those countries' large-value transfer systems.

3.23 The chart highlights for a given value date the operating times of selected G-10 large-value transfer systems typically used to settle foreign exchange transactions. Several important points should be noted. Firstly, there is little or no overlap in the operating hours of key transfer systems used for settling foreign exchange transactions in several of the major currencies. Thus it would be difficult if not impossible to conduct simultaneous or DVP settlements for several major currencies over national large-value systems under present conditions.

3.24 Secondly, if suggested rules governing cut-off times for international correspondent transfers are followed, the apparent overlap in operating hours between some European and North American large-value transfer systems would disappear for the purposes of processing correspondent payments. DVP or similar processing would be impossible for most foreign exchange settlements requiring payments via international correspondents. Even if suggested rules governing cut-off times for international correspondent payments are not followed in practice, cut-off times for all third-party transfers on some systems are likely to limit further the effective degree of overlap in processing hours among key transfer systems.

3.25 Thirdly, although a number of central banks operate gross real-time transfer systems, these are often not extensively used to settle foreign exchange transactions. Instead, large-value systems relying on net settlement appear to be used quite extensively. Providing for multi-currency DVP settlements of foreign exchange transactions over these existing large-value netting systems, with intraday finality, would require among other things significant coordinated changes in settlement times or in interbank settlement practices.

Operating hours of selected large-value interbank funds transfer systems¹
(as of August 1993)

System	Gross (G) or net (N)	Opening-closing time for same-day value (local time)	Settlement finality (local time)	Cut-off for all third-party payment orders	Cut-off for international correspondents' payment orders	Memo item: Standard money market hours (local time)
Belgium						
C.E.C. ²	N	13:46-13:45 ³	16:30	13:30	8:30 ⁴	
Clearing House of Belgium	N	9:00-16:30	16:30	13:00	8:30 ⁴	(9:00-16:15 ⁵)
Canada⁶						
IIPS	N ⁷	8:00-16:00	15:00 ⁸	14:30 ⁹	16:00 ⁹	(8:30-17:30)
ACSS	N	18:00-24:00	15:00 ⁸	17:00	n.a.	
France						
SAGITTAIRE ...	N	8:00-13:00 ¹⁰	18:30	n.a. (¹²)	8:00 ¹¹	(8:15-17:00)
TBF (planned) ...	G	8:00-17:15	8:00-17:15		8:00 ¹¹	
Germany						
Express electronic credit transfer system	G	8:30-14:30	8:30-14:30	(¹³)	8:00 ¹¹	
Express (paper-based) local credit transfer system ...	G	8:00-12:00	8:00-12:00	(¹³)	8:00 ¹¹	(9:30-13:00 ¹⁴)
EAF ¹⁵	N	8:00-12:30	14:30 ¹⁶	(¹³)	8:00 ¹¹	
Italy¹⁷						
BISS	G	8:00-17:00	8:00-17:00	17:00	9:00 ¹¹	(8:30-17:30)
SIPS	N	8:00-14:00	16:30	14:00	9:00 ¹¹	
ME	N	8:00-16:00	16:30	16:00	9:00 ¹¹	
Japan						
FEYSS	N	9:00-13:45	15:00	10:30 ¹¹	10:30 ¹¹	(9:00-17:00)
BOJ-NET	G ¹⁸	9:00-17:00	9:00-17:00	14:00	n.a.	
Netherlands¹⁹						
Central Bank						
FA System	G	8:00-15:30	8:00-15:30	12:45	n.a. ¹⁹	(8:00-15:30)
8007 S.W.I.F.T.	N	8:00-11:30 ²⁰	13:00	n.a. ¹⁹	8:00 ¹¹	
Sweden						
RIX	G ¹⁸	8:15-16:30 ²¹	8:15-16:30 ²¹	12:00 ²²	8:00 ¹¹	(9:00-16:00)
Switzerland						
SIC	G	18:00-16:15 ²³	18:00-16:15 ²³	15:00 ²³	8:00 ⁴	(9:00-16:00)
United Kingdom						
CHAPS	N	8:30-15:10 ²⁴	end of day	none	12:00 ¹¹	(9:00-12:00 ²⁵)
United States⁶						
Fedwire	G	8:30-18:30	8:30-18:30	18:00	18:00	(8:30-18:30 ²⁶)
CHIPS	N	7:00-16:30	18:00 ²⁷	16:30	16:30	
ECU clearing system	N	14:01-14:00 ²⁸	15:45	none	none	(TOM/NEXT ²⁹)

Footnotes to the table

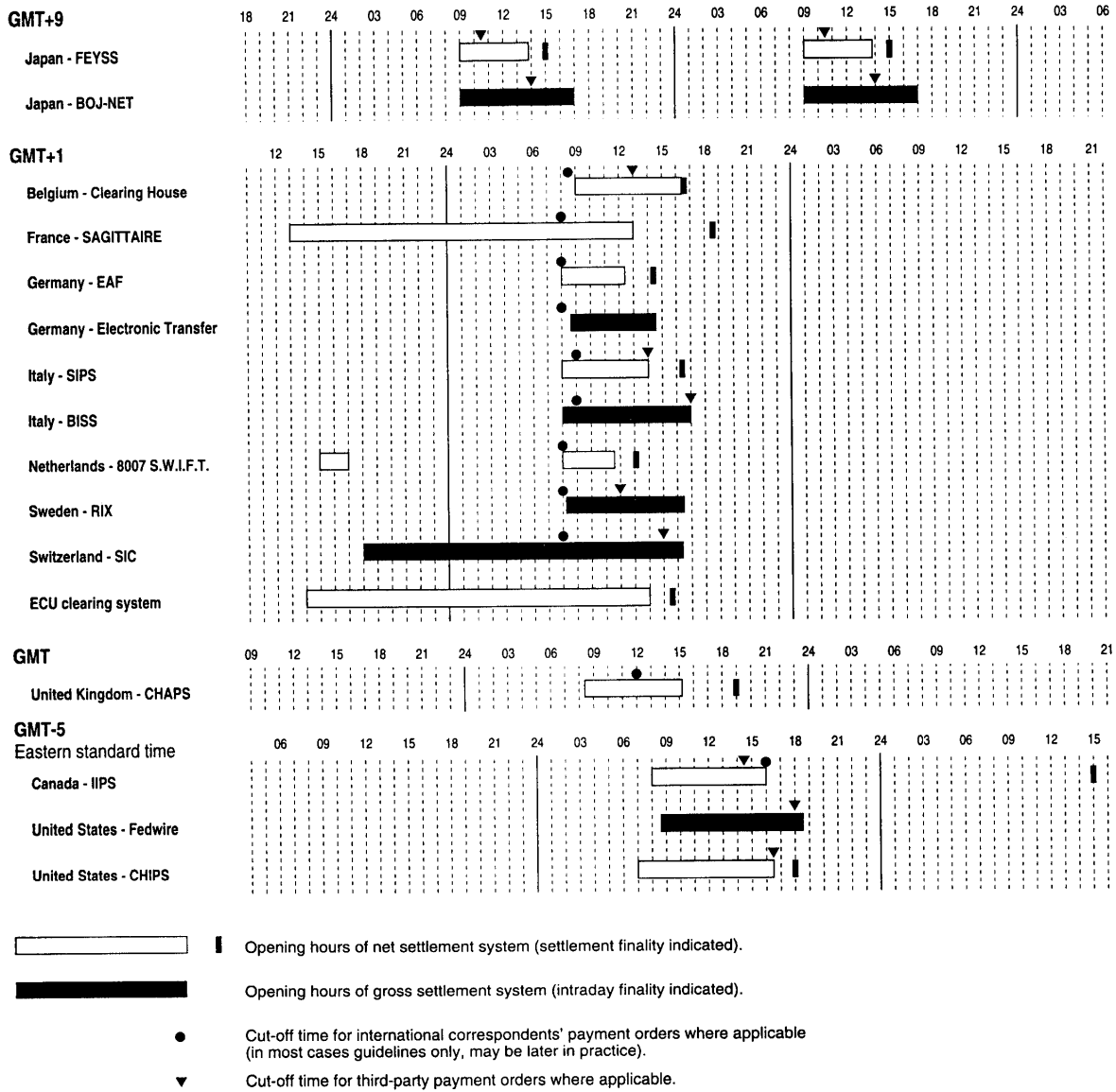
(n.a. = not applicable)

- ¹ Some systems make no explicit distinction between large-value and retail transactions and may be used to settle interbank transfers relating to a variety of underlying transactions. Some systems may also accept payment orders for a number of value days. Money market hours indicated refer to the time period in which domestic interbank transactions are normally carried out. They therefore do not relate to particular interbank funds transfer systems.
- ² In June 1990 a special "Large-value credit transfer application" was introduced in the C.E.C. All net settlements from the C.E.C. take place at the end of the day at the (manual) Clearing House of Belgium.
- ³ The C.E.C. transfer system operates round-the-clock, five days a week.
- ⁴ S.W.I.F.T. guideline.
- ⁵ Luxembourg dealers, who are important operators in Belgian francs, are only active in the market before noon; the central bank conducts its daily fine-tuning operations at about 11:00.
- ⁶ Eastern time.
- ⁷ The receiving bank creates a paper document called an inter-member debit voucher either for each credit transfer received or for a daily bilateral net amount. These vouchers are delivered to the (net) sending bank in batches, for which value and volume counts are entered into the Automated Clearing and Settlement System (ACSS), operated by the Canadian Payments Association.
- ⁸ Net settlement at 15:00 on the next day (retroactively). A decision has been made to advance this by three hours, beginning early in 1994.
- ⁹ Local time at the receiving IIPS point, or the beneficiary account point, whichever is earlier.
- ¹⁰ SAGITTAIRE'S exchange day, i.e. the period during which orders are recorded by the Bank of France, begins at 8:00 and ends at 17:30. Orders sent after 17:30 are stored by S.W.I.F.T. and processed at the start of the next exchange day. SAGITTAIRE'S accounting day starts at 13:00 on D - 1 and ends at 13:00 on D (transfers sent after 13:00 on D, regardless of whether they are processed during the same exchange day or at the start of the following exchange day, are only entered in the accounts on D + 1). The net positions of members are drawn up after the close of the accounting day.
- ¹¹ S.W.I.F.T. guideline; in practice it may be later.
- ¹² A cut-off for third-party orders is being discussed for the planned TBF system.
- ¹³ This is subject to arrangements between the correspondent banks.
- ¹⁴ For settlement purposes it can be later.
- ¹⁵ Electronic netting system in Frankfurt for interbank transfers predominantly relating to international DM transactions.
- ¹⁶ Planned time for communication of completion (positive message) or non-completion (negative message) of settlement.
- ¹⁷ Lira transfers relating to international transactions are sent through SIPS and to a lesser extent through ME; net settlement of these transactions takes place through the National Clearing Procedure and ultimately through accounts at the central bank. BISS is a gross real-time settlement system which can be used for a variety of interbank transfers.
- ¹⁸ The system has been designed to allow participants to enter funds transfer instructions continuously, in which case settlement takes place on the central bank's books immediately (in the case of RIX, provided they are confirmed by the counterparty). BOJ-NET, however, is also used to settle on a net basis.
- ¹⁹ Interbank guilder transfers relating to international transactions are sent through the 8007 S.W.I.F.T. system which is operated by the Netherlands Bank; net settlement of these transactions takes place over the Central Bank FA System.
- ²⁰ The 8007 S.W.I.F.T. system is, for a given value day, also open from 15:00 to 17:00 on the previous business day.
- ²¹ Closing time for new payment orders is 16:15; payments can be confirmed, and thereby settled, until 16:30.
- ²² Third-party orders can be "transformed" to interbank orders, and thereby settled continuously during the whole day, if the bank and customer agree to do so. Thus, in practice the cut-off time is not applied strictly to all third-party transactions.
- ²³ The system is open for input 24 hours a day. Settlement services are limited by the indicated opening and closing times. A value day starts at 18:00 local time on the previous business day and ends at 16:15 on the value day. Third-party

payments may be entered for same-day settlement until 15:00. Between 15:00 (cut-off 1) and 16:00 (cut-off 2) only cover (bank-to-bank) payments are accepted for same-day settlement. From 16:00 to 16:15 transactions are restricted to the processing of lombard credits (collateralised loans from the Swiss National Bank at a penalty rate).

- ²⁴ Earliest opening time is 8:30; all banks are required to be open to receive payments by 9:30.
- ²⁵ There are no standard money market hours but trading typically takes place between about 8:00 and 15:30. The market is most liquid in the morning. The Bank of England intervenes in the market as necessary between 9:45 and 15:30.
- ²⁶ Transactions occur among dealers for funds on deposit at Federal Reserve Banks (i.e. federal funds) as early as 6:30.
- ²⁷ Payments over CHIPS become final on completion of settlement, which normally occurs between 17:00 and 17:30. Rules are designed to ensure that settlement takes place no later than 18:00.
- ²⁸ ECU payment orders can be sent (for up to 28 forward value days) through S.W.I.F.T. 24 hours a day, seven days a week. At 14:00 (GMT + 1) on each value day the netting computer calculates participants' net positions. Messages arriving after 14:00 are processed automatically for the next value day(s).
- ²⁹ There is no overnight market for ECU interbank loans. Day-to-day interbank ECU transactions are normally carried out in the Euro-markets on a TOM/NEXT basis.

**Global time zone relationships:
Opening hours of selected large-value interbank transfer systems
For same value day***



* The diagram shows the opening hours, as of August 1993, of selected interbank funds transfer systems as they relate to the same value day; some systems, including SAGITTAIRE and the ECU clearing system, may accept payment orders for a number of value days. As indicated, some systems open on the day before the value day. For Canada, settlement finality for IIPS occurs on the next business day, with retroactive value dating. Precise information on opening hours and cut-off times is provided in the table. For FEYSS, Fedwire and CHIPS, the cut-off time for third-party and international correspondents' payment orders is the same.

4. Potential central bank payment and settlement services to reduce risk and increase efficiency in cross-border and multi-currency settlements

4.1 The possibility of enhanced central bank services to support cross-border and multi-currency settlements was identified in discussions of the Committee on Interbank Netting Schemes. To examine how this possibility might be realised in practice the Working Group considered various models of central bank payment and settlement service options that could help reduce risk and increase efficiency in the settlement process. The options that were considered by the Working Group included: (1) modifying or making available certain home-currency payment and settlement services; (2) extending the operating hours of home-currency large-value funds transfer systems; (3) establishing cross-border operational links between these payments systems; and (4) developing multi-currency payment and settlement services. This section summarises the different ways in which these central bank services could, if the central banks so chose, support the settlement of both gross (or bilaterally netted) transactions and transactions netted through the operation of a private sector multilateral netting facility. The Working Group's analysis of the advantages and disadvantages of each of these options is then presented in Section 5.

Home-currency payment and settlement services

4.2 Certain home-currency payment and settlement services might be modified or made available to increase the level of support for international settlements. In particular, where they do not currently exist, settlement accounts and intraday final transfer capabilities (i.e. the ability to initiate transfers between accounts at the central bank of issue that become final within a brief period of time) could be made available by central banks to settle home-currency obligations related to cross-border and multi-currency transactions. These central bank services could facilitate the settlement of both gross and net obligations in each currency.

4.3 The rationale for making available certain home-currency services would be to help lower the significant credit and liquidity risks that can arise in the process of settling obligations in multiple currencies. It is important to recognise, however, that the availability of these services would not be sufficient to permit the simultaneous settlement of obligations in all G-10 currencies. Hence these home-currency services could not, per se, eliminate the credit and liquidity risks that exist in the absence of multi-currency DVP capabilities. As described in Section 3, these risks include the potential loss of principal inherent in a non-DVP settlement process. They also include the possible liquidity risk that can emerge if participants refuse to honour their settlement obligations to "suspect" counterparties out of fear of losing principal.

4.4 Recognising that they cannot eliminate the risks associated with non-DVP settlement, certain home-currency payment and settlement services would nonetheless significantly improve the ability of

market participants to manage and control these and other settlement risks on both a bilateral and multilateral basis. Without intraday finality, for instance, it is possible that transfers initiated over home-currency payments systems might be cancelled or revoked, and so the ultimate discharge of obligations in such currencies remains uncertain. This uncertainty carries over to the discharge of multi-currency settlement obligations that include those currencies. In light of this uncertainty, which characterises today's multi-currency settlements, the availability of accurate information about when obligations in each currency are finally discharged would enable financial institutions to quantify more precisely and efficiently than they can at present the exposures that may be incurred in the process of settling both gross and netted transactions in multiple currencies. If the level and duration of exposures, such as principal risk, can be quantified more accurately, it should be more feasible (i.e. less costly) for the private sector to implement bilateral procedures and multilateral systems that could monitor and control these exposures in a manner consistent with the Lamfalussy standards.

4.5 The Lamfalussy standards for managing credit and liquidity risk require that netting schemes “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” (Lamfalussy Report, Part C, page 26). Since settlement obligations remain outstanding until appropriate payments are made irrevocably and unconditionally, a settlement system would need to maintain (i.e. pay for) adequate resources in one form or another to cover the credit and liquidity exposures that exist until all obligations have been finally discharged. In this regard, the use of final transfers in the settlement process could reduce the size and duration of settlement exposures and, hence, could reduce the cost of protecting against these risks.

4.6 Other sources of risk can arise in the settlement process. For instance, if a financial intermediary provides a settlement service which takes the form of collecting and disbursing settlement payments for a multilateral netting system, the clearing house and market participants that make use of this service could be exposed to the intermediary for the full amount of the settlement flows. Accordingly, by using settlement accounts at the central bank of issue, multilateral netting systems could obtain this service without being exposed to private entities.

4.7 Overall, to the extent that the availability of intraday final transfers, settlement accounts and other home-currency services would facilitate the development of sound private sector settlement arrangements, systemic risk would be reduced. Market participants, whether individually or through a multilateral clearing house, would be in a better position to monitor and manage settlement risks. Furthermore, new arrangements, such as multilateral netting schemes that meet the Lamfalussy standards, would bring with them the potential to reduce the size of outstanding settlement exposures.

4.8 It is worth noting that individual central banks could modify or make available home-currency payment and settlement services either unilaterally or on a more coordinated basis. Indeed,

many home-currency payments systems already permit intraday final transfers and several central banks plan to develop, or are in the process of implementing, this capability in their large-value funds transfer systems. The combined availability of intraday final transfers and other home-currency payment and settlement services from each central bank could influence the private sector's overall technical and financial ability to develop risk-reducing, multi-currency settlement arrangements for the relevant currencies.

Operating hours of home-currency payments systems

4.9 The operating hours of home-currency large-value funds transfer systems, particularly gross real-time transfer systems, could be extended to increase the level of support for international settlements. At one end of the range of possibilities, a modest lengthening of the operating hours of an individual payments system would reduce its current gap (or increase its current overlap) with the operating hours of payments systems in other countries. Towards the other end of the spectrum (which, in the extreme, could involve the large-value funds transfer systems in a number of countries operating round-the-clock), a major extension of the hours of payments systems in certain countries could result in an operational overlap of most major currencies. Provided that intraday final transfers were available over those systems, such an overlap could support the elimination of the current risks associated with non-DVP settlements by creating the technical ability to conduct a simultaneous settlement of all relevant currencies.

4.10 Simultaneous settlement would eliminate temporal settlement risk. Counterparties could build upon this capability to develop procedures to ensure that payments in one currency will be made if and only if payments in another currency or currencies are made - that is, to create a multi-currency DVP settlement. Without directly linking payments made over different large-value funds transfer systems, however, this assurance would have to come from bilateral or multilateral private sector procedures that would use the available home-currency payment and settlement services during the extended hours of operation. For instance, individual institutions (for both gross and bilaterally netted transactions) or a clearing house (for multilaterally netted transactions) could require, monitor and collect the final payment of daily settlement obligations in each currency over each large-value funds transfer system before disbursing funds in any currency. By creating an operational overlap that would make possible a DVP settlement process, an extension of hours would help support the potential elimination of the credit and liquidity risks associated with the current lack of multi-currency DVP capabilities.

4.11 Individual central banks could also choose to extend the operating hours of their home-currency payments systems either unilaterally or on a more coordinated basis. In fact, several central banks are considering moderate extensions of their local payments system operating hours to support domestic markets and settlements. At the same time, many pairs of payments systems already have

overlapping hours. Notwithstanding other potential obstacles to achieving multi-currency DVP settlements (e.g. differing local payment arrangements and the timing of finality), such expansions increase the opportunities for the private sector to eliminate or reduce certain international settlement risks by more closely aligning the timing of payments in multiple currencies. As is the case with the availability of home-currency payment and settlement services, the combined effect of the expanded hours of each large-value funds transfer system could influence the private sector's overall technical and financial ability to develop risk-reducing, multi-currency settlement arrangements that would take advantage of the resulting overlap in hours and available services.

Cross-border links between payments systems

4.12 Another possible option might be the establishment of bilateral or multilateral cross-border links between large-value funds transfer systems in conjunction with an extension of their operating hours to increase the level of support for international settlements. In particular, direct operational and informational links could be created that would give participating central banks the joint capability to monitor, control and execute simultaneously final transfers over their respective home-currency payments systems.

4.13 As discussed above, an extension of hours would not, per se, be sufficient to create a DVP settlement. The private sector could develop arrangements to ensure that payments in one currency will be made if and only if payments in all relevant currencies are made. Alternatively, with the additional benefit of cross-border connections between payments systems with overlapping operating hours, central banks could provide this assurance directly. In either case, an extension of operating hours - with or without direct operational and informational links - would help support the potential elimination of the credit and liquidity risks associated with the current lack of multi-currency DVP capabilities by permitting a DVP settlement among currencies with overlapping payments system operating hours.

4.14 In contrast to simply extending home-currency payments system hours, developing and running central bank operational and informational links would require a high degree of bilateral or multilateral central bank coordination and cooperation. Compatible central bank policies, as well as computer systems, software and communications facilities, would be needed (both on a regular basis and when dealing with settlement problems) to provide a multi-currency DVP settlement service.

Multi-currency payment and settlement services

4.15 Another possible option might involve the joint offering of multi-currency payment and settlement services. Multi-currency accounts and settlement facilities might be provided by the central banks of issue through a "common agent". The rationale for developing and offering these

multi-currency services would be to support the elimination of the current risks associated with non-DVP settlements by creating the technical ability to conduct a DVP settlement of all relevant currencies at one location.

4.16 In the basic model considered by the Working Group, a central bank controlled common agent could be established to accept deposits in multiple currencies and to facilitate final transfers between these accounts. The central bank common agent would accept private sector deposits denominated in the currencies of issue of the controlling central banks. Deposits with the common agent would, in turn, be fully backed by deposits at the respective central banks of issue (i.e. subject to a 100% reserve requirement); this is to ensure that central banks of issue retain full authority over the process of creating central bank money in their currencies. To guarantee that deposits at the common agent are fully backed by deposits at the central banks of issue, deposits into and withdrawals from accounts at the common agent would require corresponding final transfers between accounts on the books of the respective central banks of issue. Accordingly, the respective large-value funds transfer systems would need to offer intraday final transfer capabilities.

4.17 A variant of this model would involve one or more central banks offering settlement accounts in foreign currencies. The services offered would be similar to those envisaged for the common agent. The central bank or banks playing this role would operate the accounts in each currency in accordance with predefined authority from the central bank of issue. As in the case of the common agent, foreign currency deposits in these accounts would represent deposits at the central banks of issue.

4.18 The purpose of collectively offering multi-currency services would be similar to that of creating an overlap in the operating hours (with or without direct operational and informational links) of the major large-value funds transfer systems: to provide the private sector with the technical ability to achieve on the same value date DVP in the settlement of multi-currency obligations. With multi-currency services this would be accomplished by effecting settlement over operational accounts in each currency held either at the common agent or, in the case of the variant, at one or more individual central banks. In both cases, an important issue is whether arrangements would be in place to provide assurances that sufficient liquidity would be available to complete settlement in the relevant currencies.

4.19 Multi-currency payment and settlement services could be used by multilateral clearing houses, should they be established, and their members to settle net multi-currency obligations. Similar to the situation where an overlap exists in the operating hours of the major payments systems, the actual DVP settlement process (i.e. the debiting and crediting of the relevant accounts) could be managed either by the clearing house and its participants or by the controlling central banks through a

common agent. The issues that would arise if these services were also used by the counterparties to individual or bilaterally netted transactions are discussed in Section 5.

4.20 Establishing and operating central bank multi-currency payment and settlement services would require a high degree of central bank coordination and cooperation. Integrated central bank policies and operational links would be needed to create and run a common agent. Furthermore, in setting up and operating the technical and settlement arrangements, central banks would likely need to share confidential information.

5. Analysis of central bank service options

5.1 As indicated in Section 4, the Working Group considered various central bank payment and settlement service options that might facilitate the settlement of both gross (or bilaterally netted) transactions and transactions netted through the operation of a private sector multilateral netting facility. Although the options were not refined to the level of actual implementation designs, they included sufficient detail to serve as a useful basis for comparative analysis of their policy and market implications. No specific option, or combination of options, is recommended. Instead, the major benefits and concerns common to many possible options are highlighted with the intention of contributing to future analysis and discussion.

5.2 To help focus its comparative analysis, the Working Group examined each of the service options in the context of the following seven broad policy issues:

- (1) The effect on *monetary policy implementation*: monetary policy implementation could be affected by the impact of the service on the ability of the central bank to control the supply of and to forecast the demand for reserve balances, and by the impact on open market operations, central bank lending and other operating procedures. This might affect interest rates and exchange rates.
- (2) The adequacy of *private sector sources of liquidity* to support settlement in each currency: this could be influenced by the availability during settlement of deep and liquid money markets, of final transfers into settlement accounts and of collateral to support funding transactions.
- (3) The impact on *systemic risk*: this could depend on the effect of the service on private sector motivation to design new methods to reduce settlement risks, on the ability and incentive of the public and private sectors to manage credit and liquidity risks, and on the degree of reliance on public and private sector credit and liquidity.
- (4) The *well-founded legal basis* of settlement arrangements and entities: this would depend in part on the legal status of settlements in each country and on the legal implications of the location and corporate form of settlement entities.
- (5) The likely *competitive effects* in private financial markets: this would depend on the markets to be served, on the participants and entities that would benefit from access to central bank services and on likely changes to correspondent banking relationships.
- (6) The *cost-effectiveness* of the service from the private sector perspective: this would reflect initial investment costs and the implementation timetable, the ongoing operating costs relative to the status quo and the costs of any required idle balances that might arise as a result of prefunding of debits or delayed access to credits.

(7) The *acceptability of the service from an individual central bank perspective*: this would reflect initial investment costs (e.g. the cost of new technology) and the implementation timetable; ongoing operating costs; required legislative and policy changes; implications for central bank supervision or oversight; implications for the role of the central bank as liquidity provider; likely shifts in the loci of financial activity; and the required degree of coordination, cooperation and sharing of confidential information.

5.3 In examining these issues, it became apparent that each option might raise difficult policy issues. Furthermore, each central bank is likely to view these issues from a unique perspective shaped by different concerns, including the characteristics of its national payments systems and the impact of geographical distances, temporal differences and international developments (e.g. financial integration in the European Community). Overall, it is important for each central bank to recognise all of the possible side-effects of each service option and to weigh them carefully against the potential risk reduction and efficiency benefits.

Analysis

5.4 *Monetary policy implementation.* Each central bank service option might have some potential to affect current monetary policy operational procedures in one or more countries. For example, the introduction of intraday finality may affect the overall demand for clearing balances and possibly require an initial adjustment to the current timing of open market operations, central bank lending and other operating procedures in countries where this is relevant. However, central banks that choose to implement intraday final transfer capabilities for purely domestic payments purposes would face the same issues.

5.5 Beyond these concerns, it does not appear that any additional monetary policy issues would be raised if intraday final transfers, central bank settlement accounts or other currently available home-currency services were used to settle the home-currency legs of cross-border and multi-currency transactions during normal home-country business hours. As long as settlements in each currency continue to take place relatively independently of one another and during hours when the local money market is open and liquid, no special monetary policy effects would be likely to accompany any liquidity support that might be provided by central banks of issue in the face of home-currency settlement disruptions. Furthermore, to the extent that a moderate lengthening of the operating hours of a country's large-value funds transfer system is accompanied by a similar expansion in the domestic money market, home-currency settlements that take place during an off-hour period would not appear to be problematic for monetary policy operations. DVP settlements among currencies with overlapping payments system and domestic money market operating hours would also not appear to complicate the implementation of monetary policy. Indeed, such settlement arrangements could be a significant stabilising force for money markets at times of financial stress.

5.6 By contrast, a multi-currency DVP settlement process involving currencies in Asia, Europe and North America, which would be specifically created or supported by a major extension of payments system operating hours, cross-border payments system links or multi-currency central bank services, might have implications for monetary policy implementation. For instance, individual banks may choose to adjust frequently their central bank clearing balances in individual currencies in response to fluctuations in their anticipated daily settlement obligations. Depending on the timing chosen for a multi-currency settlement, this might influence the volatility of the aggregate demand for central bank balances as measured for monetary policy purposes in some countries. The magnitude and duration of this impact on the monetary forecasting capabilities of the affected central banks of issue would depend on the size, distribution and predictability of settlement obligations among the banks that participate in such multi-currency settlements. Although this greater uncertainty could potentially reduce the ability of the affected central banks of issue to influence targeted domestic interest rates, in practice it might not be difficult for central banks to deal with the situation by making modest adjustments to their current monetary policy operating procedures.

5.7 Any central bank lending to support multi-currency DVP settlements might also have undesirable implications for the implementation of monetary policy. Depending on the timing of such settlements in relation to the timing of domestic reserve monitoring and open market operations, it might be difficult for central banks of issue to offset quickly the impact of settlement-related lending on monetary conditions. For instance, to support a multi-currency settlement it is possible that central bank liquidity in a major currency would have to be provided at a time when the market for immediately deliverable balances at the central bank of issue was closed. If this time also happened to be at or near the end of the reserve maintenance period for that currency, it might be impossible for the central bank of issue, given currently available monetary policy procedures, to neutralise the impact of this lending on banking system reserves, with possible implications, at least in the short run, for domestic interest rates and exchange rates. In general, some central banks might consider reviewing their specific monetary operating procedures, including those governing the availability of daylight credit, to offset any potential impact the various service options might have on the implementation of monetary policy. Other central banks might well regard as inappropriate any changes in central bank payment services that impinge to any degree on established monetary operating procedures.

5.8 ***Private sector liquidity.*** Intraday final transfers between accounts at the central banks of issue would give financial institutions the technical ability to fund and to discharge their settlement obligations in each currency during the day, whether settlements in each currency take place independently or in a coordinated fashion. In addition, an extension of operating hours (with or without operational and informational links between central banks) or multi-currency payment and settlement services would facilitate multi-currency DVP settlements.

5.9 In addition to the technical ability to effect settlement payments, however, financial institutions would need adequate clearing balances, credit or money markets to fund their settlement obligations. Central banks recognise that it is impossible to be certain that there would be sufficient private sector liquidity to support all settlements in all circumstances. In fact, recognition of this risk helps explain the existence of central bank lending facilities. Nevertheless, central banks expect that private sector liquidity resources would meet settlement needs in most situations.

5.10 If final transfers, central bank settlement accounts and other central bank services were used to settle the home-currency legs of cross-border and multi-currency transactions during normal home-country business hours, settlements in each currency would continue to take place in the country of issue when the local money market was open and most likely to be liquid. Accordingly, private sector sources of liquidity to support such settlements likely would be as available as they are at present. To the extent that these services were used to support the DVP settlement of two or more currencies in countries with overlapping payments system operating hours, it is possible that liquidity pressures that can otherwise arise at times of market stress due to heightened fear of incurring principal risk might also be reduced. For example, the availability of multi-currency DVP settlements may increase confidence that currency contracts will be settled as planned, thereby reducing strains on liquidity management for financial institutions and supporting the general liquidity of money markets.

5.11 By contrast, private sector sources of liquidity might not adequately support the multi-currency DVP settlements that would be specifically created or promoted by a major extension of payments system operating hours or multi-currency central bank services. For example, simultaneous settlements involving Asian and North American currencies would have to take place outside the current business hours of at least one of the respective money markets for immediately deliverable balances at the central bank of issue. Such multi-currency settlements would be particularly susceptible to liquidity problems if these off-hour money markets were not sufficiently deep and liquid to provide a reliable source of funds. In fact, many markets for balances at the central banks of issue are not uniformly liquid throughout the current operating periods of their respective payments systems. Inadequate private sector sources of liquidity could potentially lead to an unacceptable reliance on central bank liquidity facilities.

5.12 It is possible, or even probable, that money markets for immediately deliverable balances at the central banks of issue would eventually evolve into an adequate source of liquidity to support off-hour settlements in each currency. Even without the further development of money markets, multi-currency DVP settlement facilities could be used to alleviate liquidity pressures at times of financial stress. In the present circumstances, however, the private sector would need to build up on a regular basis adequate liquidity in advance or try to arrange special funding facilities to ensure the timely completion of settlements as required, for instance, under the Lamfalussy standards. This could involve costs in the form of lost interest resulting from prefunding requirements for debits and delayed

access to or use of credits, as well as the expense of arranging sufficient backup liquidity facilities to deliver balances at the central bank of issue in an off-hour period.

5.13 In the case of simultaneous settlements facilitated by multi-currency central bank services, available sources of liquidity could also be constrained operationally if potential money market participants were unable to transfer funds from accounts at the central banks of issue to accounts at the common agent (or central bank operating the multi-currency settlement) during the settlement period. Under these circumstances, the only relevant market that would be available to support settlement would be limited to the purchase and sale of existing balances at the common agent (or central bank operating the multi-currency settlement).

5.14 **Systemic risk.** An important source of the systemic risk that can arise during the settlement of cross-border and multi-currency obligations can be traced to the variety of home-currency payments systems and conventions currently involved in the process. Central banks could eliminate one source of this risk by offering the ability to execute final transfers between accounts on their books at a time when their respective money markets for immediately deliverable central bank balances are open and liquid.

5.15 As described in Section 4, intraday final transfers could lower systemic risk by reducing the time lag and uncertainty that currently accompany the settlement of obligations in many individual currencies. By itself, however, the availability of intraday final transfers would not be sufficient to permit the simultaneous settlement of obligations in multiple currencies. Accordingly this home-currency service could not, per se, eliminate the credit and liquidity risks that exist in the absence of multi-currency DVP settlements. Nevertheless, the use of final transfers could significantly improve the ability of market participants to manage and control these and other settlement risks on both a bilateral and a multilateral basis. In particular, final transfers would enable financial institutions and clearing arrangements to quantify - and, hence, to monitor and limit - more precisely and efficiently than they can at present the exposures that may be incurred in the process of settling both gross and netted transactions in multiple currencies. It is apparent that the capability in each country's domestic large-value payments system to effect final transfers at any time of the business day between accounts at the central bank of issue is the foundation stone upon which risk reduction measures can be developed in respect of a range of domestic and cross-border transactions.

5.16 Building on this capability, a modest lengthening of the operating hours of an individual payments system that creates or expands an operational overlap with payments systems for other currencies would increase the opportunity to conduct DVP settlements among those currencies. In the extreme, a major extension of the hours of certain home-currency payments systems or the development of central bank multi-currency services would create the technical ability to conduct a DVP settlement of all G-10 currencies on the same value date and thus could support the elimination

of the current risks associated with non-DVP settlements. Multi-currency DVP settlements would eliminate the potential loss of principal that currently arises on a regular basis during the settlement of multi-currency transactions. Furthermore, if problems were to arise in international markets, a DVP mechanism could assure market participants that they would not incur principal risk in the settlement process, thereby encouraging them to honour their settlement obligations. Multi-currency DVP settlements might also lead to a shifting of risk if, for instance, market participants needed to borrow funds to meet their DVP settlement obligations. Such shifts may result in risks being managed and borne in a more efficient manner than they are at present.

5.17 However, while facilitating the elimination of important risks, multi-currency DVP settlements may also lead to new types of risk. For instance, simultaneous settlements that involve all of the major currencies would have to take place outside the current business hours of at least one of the respective money markets for immediately deliverable central bank balances. As discussed above, this means, at least in the near term, that the private sector would likely be a less reliable source of liquidity to support an off-hour settlement than a settlement during standard business hours.

5.18 By virtue of the interdependencies created by directly linking the settlement of two or more currencies through a DVP mechanism operated by either central banks or the private sector, a disruption in the settlement of one currency would disrupt the settlement of other currencies, creating a novel source of systemic risk. Thus, while a DVP settlement mechanism would eliminate some of the significant credit and liquidity and, hence, systemic risks that currently exist during the settlement of multi-currency obligations, implementing this capability could involve a trade-off between different sources of systemic risk.

5.19 Each of the central bank service options considered by the Working Group could potentially be made available to multilateral netting schemes. The Lamfalussy Report described the potential risk reducing benefits of sound netting schemes, as well as the possibility that netting schemes could shift, mask and concentrate risks if not designed and operated in a prudent manner. Thus, to reduce risk, it would be important to restrict central bank services to netting arrangements that meet the necessary standards for sound netting schemes. To the extent that the availability of central bank services facilitates the development of sound netting arrangements, systemic risk could decline from current levels.

5.20 ***Well-founded legal basis.*** The laws and regulations of an individual country would need to work in harmony with the operational and accounting procedures of its home-currency payments system to achieve intraday finality for transfers between accounts at the central bank of issue. This could require significant changes in some countries where this is currently not the case, and it could be particularly problematic in certain countries with zero-hour bankruptcy rules. Achieving finality in a multi-currency DVP settlement - whether DVP is created or supported by an extension of payments

system operating hours, direct cross-border links between these systems or multi-currency central bank services - would require the combined support of the legal, regulatory, operational and accounting frameworks of all of the relevant countries of issue and large-value funds transfer systems.

5.21 To the extent that bilateral or multilateral settlements rely on final transfers, lack of finality would undermine effective risk management. In addition, to reduce settlement risk, any bilateral or multilateral settlement arrangement that makes direct or indirect use of these transfers would itself also need to have a well-founded legal basis. This would be influenced by numerous factors, including the location and corporate form of the entities involved in the settlement process.

5.22 *Competitive effects.* Although the Working Group selected and analysed central bank services that could facilitate the settlement of foreign exchange transactions, these services could also support the settlement of a variety of other domestic and international transactions. The most comprehensive support might come from the provision of an intraday final transfer capability, where this does not already exist, since such a capability could facilitate the settlement of home-currency obligations arising from any domestic or international transaction. As such, this feature could support the safety and efficiency of home-currency payments systems that offer it and financial markets that make use of it.

5.23 The settlement of other cross-border and multi-currency payment obligations might also be aided by the various central bank service options. For instance, central bank services could facilitate cross-border and multi-currency payments for securities and other financial instruments traded and delivered around the world. As pointed out in the DVP Report, however, cross-border and multi-currency linkages in the securities settlement process raise a number of issues including credit and liquidity risks, settlement efficiencies and costs, and central bank oversight.

5.24 The various service options could potentially alter the competitiveness of the world's payments system participants. For instance, although the provision of intraday finality is not tied to any required change in access to accounts and other services at individual central banks, payments processed in a system with intraday finality might be effected more competitively by participants with strong operational capabilities, significant central bank balances and potential access to central bank liquidity facilities. Furthermore, to the extent that intraday finality fosters the development of new private sector settlement arrangements, current banking relationships might also change.

5.25 This latter effect could equally arise through the creation of multi-currency DVP capabilities. In addition, because an extension of payments system operating hours, direct cross-border payments system links and multi-currency central bank services would facilitate multi-currency DVP settlements, these services may also favour those payments system participants with access to central bank accounts and funding in all of the relevant countries. Furthermore, depending on the timing of these settlements (and, hence, the potential need for prefunding and delayed access to credits in certain

currencies), these approaches might eventually also encourage the use of some currencies rather than others. However, predicting such long-run developments, which would also depend on many factors other than the use of particular settlement services, is beyond the scope of this study.

5.26 *Cost-effectiveness for the private sector.* For those large-value funds transfer systems in which intraday final transfers are not available, developing this capability could require significant initial investment. In addition, users will also need to develop their own systems for managing their intraday cash positions in the new environment. Notwithstanding these costs, many countries are moving ahead with plans to develop this capability for the domestic payment and settlement benefits.

5.27 Beyond this common cost, each of the central bank service options could have a different impact on the cost-effectiveness of private sector settlement arrangements. For instance, the operational costs of providing and using final transfers and home-currency settlement accounts during normal business hours may be relatively low. Similarly, moderate extensions of home-currency payments system operating hours that would support DVP settlements among currencies of countries with overlapping payments system operating hours would not be expected to entail a significant increase in operating costs.

5.28 By contrast, the cost of creating or supporting the development of a multi-currency DVP mechanism for Asian, European and North American currencies could be substantial. For instance, to facilitate a simultaneous settlement of all G-10 currencies by creating an operational overlap of all those countries' large-value funds transfer systems, the costs incurred would be related to a major extension of the operating hours of several key systems as well as to setting up and running operational and informational links between them. To support a DVP settlement of all G-10 currencies with multi-currency payment and settlement services, costs would be incurred in setting up and running a central bank common agent (or multi-currency facilities at one or more individual central banks). In addition, there would be costs associated with the decision-making machinery that would be needed to monitor simultaneous settlements and to respond to any problems that might arise in the multi-currency DVP process.

5.29 These direct costs, however, should be viewed in the context of how the availability of the associated central bank services would influence the private sector's overall ability and willingness to adopt risk-reducing settlement arrangements. It is unclear whether or not market participants would have sufficient incentive to develop and use the types of arrangements that would be needed to realise the intended risk-reducing benefits of the various central bank service options. Without sufficient use of the various service options, it would be difficult to justify their costs.

5.30 To the extent that market participants have the incentive to develop net settlement arrangements, the provision of payment and settlement services by central banks could help lower the overall cost of managing credit and liquidity risks as required by the Lamfalussy minimum standards.

For example, as discussed in Section 4, the use of intraday final transfers, central bank settlement accounts and other currently available home-currency services could lower the cost to netting schemes of protecting against settlement exposures.

5.31 The ability to conduct a multi-currency DVP settlement of all relevant currencies could reduce the need (and cost) of protecting against the credit and liquidity risks that can arise during a non-DVP settlement. With a multi-currency DVP settlement mechanism, however, the private sector would have to bear the newly created costs of providing adequate liquidity safeguards for the off-hour settlement of one or more of the currencies included. As described above, in the absence of well-developed off-hour money markets, these ongoing costs could take the form of lost interest associated with prefunding requirements for debits and delayed access to credits, as well as the cost of off-hour backup liquidity facilities.

5.32 *Acceptability to individual central banks.* Individual central banks would be concerned with the way the various service options might alter their roles of monetary authority, financial system supervisor or overseer and provider of liquidity. The introduction of intraday finality and the provision of central bank settlement accounts and other currently available home-currency services should not affect these roles as long as settlements in each currency continue to take place in a relatively independent manner, in the country of issue and during normal business hours. In contrast, by virtue of the settlement linkages that would be created by a multi-currency DVP process, a high degree of central bank coordination might be needed.

5.33 Enhanced central bank coordination would have potential advantages and disadvantages. On the one hand, growing interdependencies among the world's financial markets have increased the benefit to individual central banks of more accurate and timely information flows from around the world, including from other central banks, especially at times of financial stress. In this regard, the operational and informational links that might be created in conjunction with multi-currency DVP settlements, as well as the formalised relationships that would accompany the establishment of a central bank controlled common agent, would provide mechanisms for enhanced central bank coordination.

5.34 On the other hand, the structural interdependencies that would be created by directly linking the settlements of two or more currencies through multi-currency DVP procedures might reduce the ability of individual central banks to respond to liquidity problems in their home currencies. As discussed above, multi-currency DVP settlement means that home-currency settlement payments could be delayed or disrupted because of settlement problems in other linked currencies. In such circumstances, the ultimate resolution of the situation may depend more on the liquidity of money markets for other currencies and the action of other central banks than on home-currency liquidity provision. More generally, the formal mechanisms for central bank coordination that would be created

to support multi-currency DVP settlements could constrain the ability of each central bank to respond in a relatively independent manner to home-currency settlement problems based on local market considerations.

5.35 Overall, new central bank services can raise difficult policy issues. It is of fundamental importance that any new central bank services should not adversely affect the ability of central banks to ensure monetary and macroeconomic stability. Accordingly, it is important for each central bank to recognise all of the possible side-effects of each service option and to weigh them carefully against the potential risk reduction and efficiency benefits. Given their unique institutional, legal and policy perspectives, individual central banks are likely to weigh differently the advantages and disadvantages of each option. The degree of difficulty in implementing intraday finality, the potential impact on domestic monetary policy operations and the pace of European Community financial integration are just some of the factors that could influence each country's view.

Annex

Members of the Working Group on Central Bank Payment and Settlement Services established by the Committee on Payment and Settlement Systems*

Mr Tim E Noël, Chairman	Bank of Canada
Mr Marc Hollanders	National Bank of Belgium
Mr Peter W Allsopp Ms Jane E Plumbly	Bank of England
Mr Yvon Lucas	Bank of France
Mr Wolfgang Michalik	Deutsche Bundesbank
Mr Patrizio Ferradini	Bank of Italy
Mr Iwao Kuroda	Bank of Japan
Mr Simon P Kappelhof	Netherlands Bank
Mr Lars Nyström Mr Hans Bäckström	Sveriges Riksbank
Mr Christian Vital Mr Georg Zeerleder	Swiss National Bank
Mr Bruce J Summers Mr Jeffrey C Marquardt	Board of Governors of the Federal Reserve System
Mr Lawrence M. Sweet	Federal Reserve Bank of New York
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* The Committee on Payment and Settlement Systems is a standing committee of the central banks of the Group of Ten countries.