BANK FOR INTERNATIONAL SETTLEMENTS

DELIVERY VERSUS PAYMENT IN SECURITIES SETTLEMENT SYSTEMS

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

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Contents

Foreword

The worldwide collapse of equity prices in October 1987 heightened the awareness of central banks of the potential for disturbances in settlements of securities transactions to spread to payment systems and to financial markets generally. Since then, central banks in the Group of Ten countries have been working with market participants and securities industry supervisors to strengthen settlement arrangements. In particular, most of the G-10 central banks have been actively involved in efforts to implement the Group of Thirty's recommendations for strengthening and harmonising settlement arrangements for corporate securities as well as in efforts to strengthen settlement arrangements for government securities.

In order to enhance central bank understanding of issues relating to securities settlement systems, the Committee on Payment and Settlement Systems reviewed and analysed arrangements in the G-10 countries at a meeting in Basle in December 1990. At that meeting the Committee identified a need for clearer understanding of the concept of delivery versus payment (DVP) and of the implications of the design and operation of systems intended to achieve DVP for credit and liquidity risks in securities settlements. Shortly thereafter, a study group, chaired by Mr. P. Parkinson, was formed to analyse these issues.

This report is the outcome of the study group's efforts. The group has developed a broad framework for analysing the types and sources of risk in securities clearance and settlement, including the concept and implications of DVP. Building on this framework, it has reviewed the design and operation of securities settlement systems in use or under development in the G-10 countries, identified common approaches to DVP and evaluated the implications of the various approaches for central bank policy objectives concerning the stability of financial markets and the containment of systemic risk. By publishing the report the Committee hopes to contribute to the understanding of these issues and thereby to facilitate ongoing efforts to strengthen securities settlement systems in the G-10 countries and in other countries.

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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September 1992

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1. INTRODUCTION AND SUMMARY

Introduction

1.1 At a meeting in December 1990, the Committee on Payment and Settlement Systems (CPSS) reviewed clearance and settlement arrangements in securities markets in the Group of Ten countries. The reports presented at that meeting indicated that substantial efforts have been made throughout the G-10 countries to reduce risk and increase efficiency in settlement arrangements since 1987, when the worldwide collapse of equity prices exposed weaknesses in many of those arrangements. In particular, market participants in each of the G-10 countries have been striving to implement a set of recommendations for strengthening and harmonising settlement arrangements in the corporate securities markets worldwide that were promulgated by the Group of Thirty in March 1989 (see Annex 1). Central banks are concerned about the strength of securities clearance and settlement arrangements because they perceive that disturbances to settlements in the securities markets have the potential to spread to the payment system and to the financial system generally. Because of this concern, most of the G-10 central banks have been actively involved in the efforts to implement the Group of Thirty's recommendations. In addition, publication of the Group of Thirty's report and recommendations has prompted authorities in many of the G-10 countries to re-examine settlement arrangements for government securities, in which central banks typically play a prominent role.

1.2 Although several of the Group of Thirty's recommendations were discussed by the CPSS at its December 1990 meeting, the recommendation that delivery versus payment (DVP) should be employed as the method of settling securities transactions received the most attention. The discussion revealed that the DVP recommendation has gained widespread acceptance. The intent of the recommendation is to reduce or eliminate principal risk in securities settlements, that is, the risk that the seller of a security could deliver the security but not receive payment or that the buyer of a security could make payment but not receive delivery of the security. Principal risk in securities clearance and settlement systems is generally recognised to be the largest potential source of systemic risk, that is, the risk that the inability of one institution to meet its obligations when due will cause other institutions to fail to meet their obligations when due, ultimately jeopardising the stability of payment systems and of financial markets.

1.3 Although the DVP recommendation has gained widespread acceptance, the CPSS's discussion revealed divergent views about the types of settlement systems that could be considered to achieve DVP. The vast majority of securities settlement systems in the G-10 countries claim compliance with the DVP recommendation. But the Committee's review uncovered significant differences in the means by which DVP is achieved, and, more importantly, suggested that significant differences might exist in the degree of protection provided by the various systems against principal risk and against credit and liquidity risks generally. In these respects, the understanding of DVP and its

implications brought to mind the state of understanding of netting and its implications prior to publication of the Report on Netting Schemes (Angell Report) and the Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten Countries (Lamfalussy Report).

1.4 The broad objective of the Delivery Versus Payment Study Group was to achieve a clearer understanding of mechanisms for achieving DVP and the implications of the design and operation of such mechanisms for credit and liquidity risks in securities clearance and settlement systems. Specific objectives included: (a) development of a framework for analysing the types and sources of financial risk in securities clearance and settlement; (b) review and description of securities settlement systems in use or under development in the G-10 countries; (c) identification of common approaches to DVP, common risk management issues and common risk safeguards; and (d) development of a framework for evaluation of the implications of the design and operation of DVP mechanisms for central bank policy objectives relating to stability and the containment of systemic risk. The Study Group also sought to make some progress towards understanding the implications of cross-border linkages between securities settlement systems for credit and liquidity risks in cross-border securities transactions.

1.5 The remainder of this section of the Study Group's report summarises the principal conclusions of its analysis and provides a brief account of its preliminary work on cross-border linkages. Section 2 develops a framework for analysing the types and sources of financial risk in securities clearance and settlement. Section 3 identifies and describes three common approaches to achieving DVP. Section 4 identifies several risk management issues common to all three approaches and common safeguards that may be employed to reduce risk. Section 5 considers whether the standards for the design and operation of cross-border and multi-currency netting and settlement schemes that were developed in the Lamfalussy Report (the Lamfalussy standards) also provide a useful framework for evaluating the implications of the design and operation of securities settlement systems for central bank policy objectives. Annex 2 is a glossary, while Annex 3 is a tabular summary of key features of the securities transfer systems in the G-10 countries that have been reviewed by the Study Group. Annex 4 lists the Lamfalussy standards.

Summary

1.6 In general, the types and sources of financial risk in the clearance and settlement of contracts for the purchase and sale of securities are the same as those that arise in the clearance and settlement of foreign exchange contracts, which were analysed in considerable detail in the Angell Report and the Lamfalussy Report. Prior to the settlement date, counterparties to securities transactions are subject to replacement cost risk, that is, the risk that a counterparty may default prior to settlement, denying the non-defaulting party an unrealised gain on the unsettled contract. The resulting exposure equals the cost of replacing the original contract at current market prices. The magnitude of replacement cost risk

depends on the volatility of the securities price and the amount of time that elapses between the trade date and the settlement date. Such risk can be reduced by shortening the interval between trade and settlement. It may also be reduced by implementing legally binding trade netting systems.[1]

1.7 By far the largest financial risks in securities clearance and settlement occur during the settlement process, that is, the process through which the transaction is completed by final (unconditional) transfer of securities from the seller to the buyer (delivery) and final transfer of funds from the buyer to the seller (payment). In some markets no mechanism exists to ensure that delivery occurs if and only if payment occurs. Without such a mechanism (delivery versus payment) counterparties are exposed to principal risk, that is, the risk that the seller of a security could deliver but not receive payment or that the buyer of a security could make payment but not receive delivery.[2] Principal risk in securities settlements is readily seen to be analogous to what is termed cross-currency settlement risk (Herstatt risk) in foreign exchange settlements.

1.8 Because principal risk involves the full value of the securities transferred, a default by a participant in a securities settlement system that permits such risk may well entail credit losses so sizable as to create systemic problems. For this reason, it is critical for a securities settlement system to create the strongest possible linkage between delivery and payment. Even if principal risk is eliminated through the achievement of DVP, however, participants are still exposed to replacement cost risk and liquidity risk. Liquidity risk includes the risk that the seller of a security that does not receive payment when due may have to borrow or liquidate assets to complete other payments. It also includes the risk that the buyer of the security does not receive delivery when due and may have to borrow the security in order to complete its own delivery obligation. Liquidity problems have the potential to create systemic problems, particularly if they occur at a time when securities prices are changing rapidly and failures to meet obligations when due are more likely to create concerns about the solvency of counterparties. In the absence of a strong linkage between delivery and payment, the emergence of systemic liquidity problems at such times is especially likely, as the fear of a loss of the full principal value of securities or funds is likely to induce some participants to withhold deliveries and payments, which, in turn, may prevent other participants from meeting their obligations. But even the achievement of DVP does not by itself ensure that systemic liquidity or credit problems cannot develop. An analysis of systemic risks in securities settlement systems must not only determine

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[1] The general conclusions of the Angell and Lamfalussy Reports regarding the potential benefits of netting of foreign exchange contracts appear directly applicable to the netting of securities trades.

[2] This report focuses on transfers of securities and funds between direct participants in securities settlement systems. Even if a DVP mechanism is available for such transfers, transfers between direct participants and third parties (their customers) may not receive the protection of the DVP mechanism. A discussion of the various safeguards utilised to protect customers in securities transactions is beyond the scope of this report.

whether DVP is achieved (and, thus, whether principal risk is eliminated) but must also assess the degree of protection provided against replacement cost risk and liquidity risk.

1.9 The Study Group has thoroughly reviewed most of the securities transfer systems in use or under development in the G-10 countries. On the basis of this review, the Study Group has identified three broad structural approaches to achieving DVP (or more generally, to creating a strong linkage between delivery and payment in a securities settlement system):

Model 1: systems that settle transfer instructions for both securities and funds on a trade-by-trade (gross) basis, with final (unconditional) transfer of securities from the seller to the buyer (delivery) occurring at the same time as final transfer of funds from the buyer to the seller (payment);

Model 2: systems that settle securities transfer instructions on a gross basis with final transfer of securities from the seller to the buyer (delivery) occurring throughout the processing cycle, but settle funds transfer instructions on a net basis, with final transfer of funds from the buyer to the seller (payment) occurring at the end of the processing cycle;

Model 3: systems that settle transfer instructions for both securities and funds on a net basis, with final transfers of both securities and funds occurring at the end of the processing cycle.

1.10 Although the Study Group at first attached considerable significance to the structural differences among these models, further analysis has led it to conclude that the degree of protection provided against principal risk and especially against replacement cost risk and liquidity risk depends more on the specific risk management safeguards a system utilises than on which model is employed. Model 1 systems can eliminate principal risk by ensuring that securities are transferred from the seller to the buyer if and only if funds are transferred from the buyer to the seller. However, the completion of settlements in such systems may require participants to maintain substantial money balances, especially if participants are unable to adjust their money balances during the processing cycle. If sufficient money balances are not available, high "fail" rates may result, implying substantial liquidity risk and replacement cost risk to participants and possibly adversely affecting the liquidity of the securities markets. To minimise the need for participants to maintain substantial money balances while avoiding high fail rates, most model 1 systems extend credit to their participants, in some cases substantial amounts of credit. While the extension of credit (either intraday or overnight) to participants limits the risks associated with fails, it creates another source of risks - the failure of a participant to repay a credit extension. Such a failure would clearly entail both credit and liquidity risks. Indeed, if such credit extensions are not collateralised (either by securities received during the processing cycle or by other assets), credit risk of the same magnitude as principal risk can be created.[3]

[3] As will be discussed below, the effectiveness of collateral as a means of limiting credit risks depends on the enforceability of the lien and the quality of the collateral (including the volatility of collateral values).

1.11 The fact that final securities transfers precede final funds transfers in model 2 clearly has the potential to expose sellers of securities to substantial principal risk. Operators of the model 2 systems that the Study Group has reviewed have recognised this potential problem, and these systems are designed to provide strong assurances that sellers will receive payment for securities delivered. In most cases, this involves the creation of an assured payment system in which the seller delivers securities in exchange for an irrevocable commitment by the buyer's bank to make payment to the seller's bank at the end of the processing cycle. To protect itself, the guarantor typically seeks a lien on securities held by the buyer. Nonetheless, the guarantor may be exposed to credit risk of the same magnitude as principal risk as a result of securities purchases on behalf of customers, pledges of securities to other creditors or, if securities are certificated, withdrawals of securities from the system. Even if these problems are avoided, the guarantor is exposed to credit risk from declines in the value of the securities (analogous to replacement cost risk) and to liquidity risk if a participant fails to cover a net funds debit position. From the perspective of system participants, the failure of a guarantor bank is the major potential source of credit and liquidity risks, including principal risk. If the buyer's bank is of sufficiently high credit standing, however, the seller may regard its principal risk as negligible, if not eliminated.

1.12 Like model 1 systems, model 3 systems can eliminate principal risk by ensuring that final transfers of securities (on a net basis) are made if and only if final transfers of funds (on a net basis) are made. However, some model 3 systems inadvertently allow credit risk of the same magnitude as principal risk to arise for the same reasons that guarantors may face such credit risk in model 2 systems. Even if such large exposures are avoided, failure of a participant to cover a net funds debit position exposes the system operator or its participants to replacement cost risk and to liquidity risk. In the extreme, the system might fail to settle, probably resulting in serious systemic liquidity problems.

1.13 The key to developing a framework for the analysis of the implications of DVP systems for credit and liquidity risks is to recognise that nearly all of the systems that the Study Group has reviewed extend credit to their participants, either explicitly by allowing funds account overdrafts (model 1) or tacitly by allowing funds transfer instructions to be settled on a net basis (models 2 and 3). The primary question to be addressed is how well the system could cope with the failure of one or more participants (or guarantor banks) to repay such credit extensions. As noted above, in most

cases such settlement failures would not create principal risk, but substantial replacement cost risk and liquidity risk may be involved.[4]

1.14 In many systems the completion of settlement is guaranteed, either by the system operator (which may be a central bank or a private entity) or by one or more third parties (often commercial banks). In systems that provide such a guaranty, a variety of risk controls are imposed by the guarantor to protect it from losses and liquidity pressures and, in cases where the guarantor's solvency might be questioned, to make the guaranty credible to participants. At a minimum, such systems establish membership requirements. Additional credit risk safeguards that may be employed are requirements that credit extensions be collateralised and, less frequently, the creation of collateral pools to cover any residual losses (analogous to replacement costs). Safeguards that directly limit liquidity risk, such as caps on credit extensions and third-party liquidity facilities, are utilised much less often. In several cases, a collateral requirement is the only factor limiting the size of potential credit extensions to participants. The effectiveness of such risk controls is critical; should the controls prove inadequate and the guarantor's financial condition become impaired, serious systemic problems would be likely to result.

1.15 Some model 3 systems, by contrast, do not guarantee settlement; rather, they would respond to a failed payment by a participant by unwinding (deleting) some or all of the transfers involving that participant and then recalculating the settlement obligations of the other participants. Reliance on this procedure has the potential to create significant systemic risk. The key issue raised is whether the participants can be expected to cope with the potential liquidity pressures that might arise from an unwind. This would depend on the magnitude of the pressures and the liquidity resources available to the other participants. The magnitude of the pressures would depend on the size of the net positions of the participant that fails to settle and on how widely the underlying transfer activity is divided among the other participants.[5] The liquidity resources available to other participants would depend, among other things, on the liquidity of the relevant money and securities lending markets at the time a settlement failure became apparent and on the size and availability of their credit facilities (either from the central bank or from commercial banks). In markets in which the numbers and values of transfers

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[4] As will be discussed more thoroughly below, some model 3 systems do not guarantee the completion of settlement in the event that a participant fails to settle a net funds debit position. It could be argued that such systems do not extend credit to their participants. As a practical matter, however, the system operators have typically sought to avoid the potential consequences of a failure to settle by arranging an ad hoc extension of credit to a participant that encounters difficulty settling. And, in any event, such systems must address the same risk management issues as systems that do, in fact, extend credit.

[5] The netting of funds transfers and securities transfers in a model 3 system without a guaranty is what the Angell and Lamfalussy Reports termed multilateral position netting. The distribution of pressures from an unwind among the other participants would depend on their bilateral net positions with the participant that failed to settle. Participants that traded actively with the failed participant could be called upon to raise large amounts of funds or to borrow sizable amounts of securities.

are small, money markets are liquid (or all participants have direct or indirect access to central bank credit facilities) and securities lending markets are liquid (or automatic securities lending facilities are available), such an approach may not entail unacceptable systemic risks. But if these conditions are not all met, some type of risk controls would appear necessary to prevent the emergence of serious systemic liquidity problems.

1.16 Another important issue is the vulnerability of the system to insolvency or liquidity problems on the part of the settlement bank (the entity that holds the funds accounts used for payments in the settlement system). One obvious solution is to use central bank accounts and funds transfers, and such arrangements are in fact used in many of the securities settlement systems that the Study Group has reviewed. However, this solution is not always available, either because of statutory limits on access to central bank accounts (particularly for non-bank participants in securities settlement systems) or because central banks have made policy decisions to limit access, most often because of concerns about competition with the private banking system. If central bank accounts are not available, the vulnerability of the system can nonetheless be greatly reduced by requiring the entity whose liabilities are used as the settlement medium to allow such balances to be retransferred to a third party on the same day. The use of "same-day funds" in settlements, it should be noted, is another of the recommendations of the Group of Thirty. Still another issue arises in those securities settlement systems that do not themselves dematerialise securities or immobilise certificates but instead rely on the custody services of third parties (custodians). In such cases, the failure of a custodian may temporarily impair the ability of participants to transfer securities (at least to non-participants), and a loss of some portion of the value of the securities held in custody may also be possible in certain circumstances.

1.17 The Study Group's work suggests that a variety of approaches to the design and operation of a securities settlement system are consistent with central bank policy objectives relating to stability and the containment of systemic risk and to the efficiency of financial markets. Whether a given system provides adequate protection against systemic risk depends on the particular risk controls that it adopts. These vary from system to system because of differences in the structure of securities markets, money markets and national payment systems. No single set of controls can be expected to strike the most favourable balance between risk and efficiency in all circumstances. Nonetheless, securities settlement systems must address a common set of risk management issues.

1.18 In attempting to develop a framework for evaluating the implications of the design and operation of securities settlement systems for the central bank policy objectives identified above, the Study Group decided to explore the feasibility of building on the earlier work on payment and settlement systems contained in the Angell Report and the Lamfalussy Report. In particular, the Lamfalussy Report contained a framework for evaluating the implications for central bank policy objectives of cross-border and multi-currency netting and settlement schemes for payment orders and

foreign exchange contracts. This framework took the form of a set of minimum standards for such schemes (see Annex 4), along with a lengthy set of explanations and analysis.

1.19 The Study Group has concluded that the issues addressed by the Lamfalussy Report are also relevant to securities settlement systems and that the Lamfalussy standards provide an effective means of highlighting issues regarding the design and operation of such systems that are relevant to central bank concerns about stability and the containment of systemic risk. However, the standards do not address all of the important risk management issues that arise in securities settlement systems. Moreover, because the potential for systemic risk to arise in securities settlement systems may not in some cases be as great as the potential systemic risks in the multi-currency and cross-border schemes addressed by the Lamfalussy Report, certain safeguards that the Report concluded were essential may not always be necessary for securities settlement systems. Thus, while the Lamfalussy standards provide a valuable framework for the analysis of securities settlement systems, they should **not** be characterised as **minimum** standards that such systems must in **all** cases meet to address central bank concerns about systemic risks.

Additional issues relating to cross-border securities transactions

1.20 During the 1980s cross-border securities transactions grew extremely rapidly, reflecting not only the general trend towards higher turnover in securities markets, but also the liberalisation of restraints on capital flows in many countries and a growing appreciation by investors of the potential benefits of international diversification of portfolios. The Study Group's analysis has focused on the settlement of transactions between two direct participants in a single securities settlement system, but in cross-border trades one of the counterparties typically is not a direct participant in the home country settlement system (generally the system in the country in which the issuer of the security is located). Cross-border transactions can be settled through a variety of channels and numerous cross-border linkages between securities settlement systems have been developed in recent years, including both linkages between national systems and linkages between national systems and international systems.

1.21 The Study Group has done some preliminary work analysing the implications of such linkages for credit and liquidity risks in cross-border transactions, including whether DVP can be achieved for such transactions and, if so, by what means. On the basis of this preliminary work, it is clear that a number of additional issues arise in a cross-border context. In particular, while DVP can be achieved, this usually requires exchanges of information between the settlement systems involved on whether their respective participants have the necessary securities and funds. As a result, the settlement process can take longer to complete, especially when the settlement systems operate in different time zones (but even when different processing cycles are employed in the same time zone). In the interim, the settlement systems may face credit and liquidity risks vis-à-vis each other or vis-à-vis their respective participants. To protect against exposures to the participants, the settlement

systems often require the participants to preposition securities or funds in advance of the settlement date or delay the availability of securities and funds until after the settlement date, thereby adding to liquidity demands on, and credit exposures of, participants. These inefficiencies and the relatively high costs they impose on counterparties in cross-border securities transactions appear to be inherent in cross-border settlements. Nonetheless, opportunities may exist to develop models for cross-border linkages that improve upon existing arrangements.

2. ANALYTICAL FRAMEWORK: CREDIT AND LIQUIDITY RISKS IN SECURITIES CLEARANCE AND SETTLEMENT[6]

Key steps in clearance and settlement

2.1 The process of clearing and settling a securities trade includes a number of key steps, including the **matching** of the terms of the trade, the calculation of the obligations of the counterparties as a consequence of matched trades (**clearance**), the discharge of those obligations (**settlement**) through the **final transfer** of securities (**delivery**) and the final transfer of funds (**payment**). Although a number of these steps may not directly involve the securities **settlement system**, which is the focus of interest of this study, an understanding of each of the steps is essential to an understanding of the nature and sources of risk that are faced by the operator of the settlement system or by other participants in the system.

2.2 The process begins with the execution of the trade. A variety of trade execution systems are in use in the G-10 countries, ranging from the "open outcry" systems that have traditionally been used on stock exchanges, to the networks of telecommunications links that have traditionally been used in the over-the-counter markets, to automated trade execution systems based on links between computers.[7] Once a trade is executed, the next step is to ensure that the counterparties to the trade (the buyer and the seller) agree on the terms of the transaction - the security involved, the price, the amount to be exchanged, the settlement date and the counterparty. This step is referred to in some markets as trade matching and in others as trade comparison or checking. In automated trade execution systems, counterparties often agree that trades will settle as recorded at the time of execution unless both agree to a cancellation; such trades are referred to as "locked-in" trades. In other trade execution systems matching is typically performed by an exchange, a clearing corporation or trade association, or by the settlement system. Direct market participants may execute trades not only for their own accounts but also for the accounts of customers, including institutional investors and retail investors. In this case, the direct market participant may be required to notify its customer (or its agent) of the details of the trade and allow the customer to positively affirm the details, a process referred to as trade **confirmation** or affirmation. As part of its overall strategy to reduce delays between the execution of a trade and its settlement, the Group of Thirty recommended that by 1990 trade matching should be accomplished by trade date plus one day (T + 1) and that by 1992 institutional investors should be members of a trade confirmation system.

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6 The terms that appear in the text in bold face are included in the glossary. Not all of the bold face terms are defined in the body of the paper, and some that are defined are given more precise definitions in the glossary.

2.3 Trade matching and confirmation set the stage for trade clearance, that is, for the computation of the obligations of the counterparties to make deliveries or payments on the settlement date.[8] The obligations arising from securities trades are sometimes subject to **netting**. As in the payments and foreign exchange areas, netting arrangements in the securities markets take a variety of forms that have varying degrees of legal enforceability in the event of bankruptcy of one of the counterparties. **Multilateral netting** arrangements, for example, include **position netting** schemes as well as systems that involve **substitution** of a central counterparty and **novation** of trades with that central counterparty. In the majority of markets, however, no multilateral trade netting occurs and **bilateral netting**, if practised at all, is not widespread. The Group of Thirty recommended that the potential benefits of a trade netting system should be studied and, if appropriate, implemented. In many securities markets, however, participants have questioned whether the volume of trading (in the market as a whole and in particular issues) is large enough for netting to produce benefits that are sufficient to justify the costs of setting up such arrangements.

2.4 Once the obligations of the market participants have been calculated, whether on a gross basis, a bilateral net basis or a multilateral net basis, the instructions to transfer the securities and funds (money) necessary to discharge the obligations must be transmitted to the entity or entities that operate the settlement system. These instructions may be prepared by the counterparties themselves or by an exchange or **clearing system** (which may perform trade matching and perhaps netting as well). If trades have not previously been matched, the settlement system would typically perform this function before initiating processing of the transfer instructions. Other action may be required of participants before settlement can proceed, such as the prepositioning of securities, funds or collateral. The time required to complete these and previous steps currently varies greatly from market to market. The Group of Thirty recommended that settlement occur no later than T + 3.

2.5 Settlement of a securities trade involves the transfer of the securities from the seller to the buyer and the transfer of funds from the buyer to the seller. Historically, securities transfers involved the physical movement of **certificates**. However, in recent years securities transfers have increasingly occurred by **book-entry**. This trend has been supported by the Group of Thirty, which recommended the establishment of, and broadest possible participation in, **central securities depositories** that provide a facility for holding securities in either a certificated or an uncertificated (**dematerialised**) form and permit the transfer of these holdings through book entry. A central securities depository may also offer funds accounts and permit funds transfers as a means of payment, or funds transfers may

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[7] The design of the trade execution system may have implications for risk management. For example, many automated trade execution systems do not allow traders to discriminate among counterparties on the basis of creditworthiness.

[8] As noted in the glossary, the term “clearance” is sometimes also used as a synonym for delivery, that is, the final transfer of securities on the settlement date.

occur on the books of another institution, such as a commercial bank or central bank. In some cases (most often for government securities), the central bank operates the central securities depository, while in other cases it is operated by a private entity.

2.6 The processing of transfer instructions by a securities transfer system and a funds transfer system often involves several stages during which the rights and obligations of the buyer and the seller are significantly different. Therefore, the status of transfer instructions during the various stages must be carefully distinguished. Often a transfer that has been executed by such systems, in the sense that books have been debited and credited, is a **provisional transfer**, that is, a conditional transfer in which one or more parties retain the right by law or agreement to rescind the transfer.[9] If the transfer can be rescinded by the sender of the instruction (the seller of the security or the payer of money), the transfer is said to be revocable. Even if the transfer is an **irrevocable transfer**, some other party (often the system operator) may have authority to rescind it, in which case it would still be considered provisional. Not until a later stage does the transfer become a final transfer, that is, an irrevocable and unconditional transfer that effects a discharge of the obligation to make the transfer. Only the final transfer of a security by the seller to the buyer constitutes delivery, while only final transfer of funds from the buyer to the seller constitutes payment.[10] When delivery and payment have occurred, the settlement process is completed.

Types and sources of risk

2.7 The types and sources of risk to counterparties to securities trades are essentially the same as those faced by counterparties to foreign exchange trades. Consequently, the definitions and analysis of credit and liquidity risks in foreign exchange trades that were developed in the Angell Report and the Lamfalussy Report are directly applicable in the present context. As in those earlier reports, **credit risk** is defined in this report as the risk that a counterparty will not settle an obligation for full value, either when due or at any time thereafter. Credit risks in the event of a counterparty **default** include both the risk of loss of unrealised gains on unsettled contracts with the defaulting participant and the risk of the loss of securities delivered or payments made to the defaulting counterparty prior to detection of the default.

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9 Alternatively, no actual entries may be made on the books. Rather, running balances of debits and credits are calculated, which are only later posted to securities or funds accounts. In those cases, the running balances indicate provisional transfers until the books are actually debited or credited.

10 As noted earlier, the funds transferred may be central bank balances or balances on deposit at private commercial banks. What is critical for payment to be completed is that the transfer of funds is irrevocable and unconditional, not the form of funds. Nonetheless, as discussed below, if commercial bank balances rather than central bank balances are transferred, the terms on which the funds can be retransferred take on added importance in assessing the degree of credit risk in the settlement process.

2.8 The risk of loss of unrealised gains is termed **replacement cost risk**. The unrealised gain, if any, on a contract is determined by comparing the market price of the security at the time of default with the contract price; the seller of a security is exposed to a replacement cost loss if the market price is below the contract price, while the buyer of the security is exposed to such a loss if the market price is above the contract price. Because future securities price movements are uncertain at the time a trade is initiated, both counterparties face replacement cost risk. The magnitude of this risk is an increasing function of the price volatility of the security and the interval between trade and settlement.[11] Even on cash market (as opposed to forward settling) securities trades, replacement cost risk can be considerable. During the 1987 stock market crashes, for example, equity price declines of 25% to 35% between trade date and settlement date were not uncommon.

2.9 By far the largest credit risks, however, arise in connection with contracts scheduled to settle on the date (and possibly just prior to the date) on which a counterparty default may occur. On such contracts the non-defaulting counterparty may be exposed to **principal risk**, that is, the risk of loss of the full value of securities or funds that it has transferred to the defaulting counterparty.[12] Both the buyer and the seller of a security may be exposed to principal risk; the buyer is at risk if it is possible to complete payment but not receive delivery, and the seller is at risk if it is possible to complete delivery but not receive payment. Principal risk in securities settlements is readily seen to be analogous to cross-currency settlement risk (Herstatt risk) in foreign exchange settlements.

2.10 Both counterparties to a securities trade are also exposed to liquidity risk on the settlement date. **Liquidity risk** is defined as the risk that a counterparty will not settle an obligation for full value when due, but on some unspecified date thereafter. The reason that a counterparty fails to settle may be technical or temporary, in which case the event would be termed a failed transaction rather than a default. If so, the counterparty might settle for full value at a later date and no credit loss would be involved. At the time a settlement failure is detected, however, the counterparty generally cannot determine with certainty whether the event is a default or a **failed transaction**. As a result, a technical failure may result in a loss of confidence in the counterparty that failed to settle, which could cause its counterparties to withhold settlement of other transactions. Counterparties may be especially likely to take such action if the technical failure occurs during a period when securities prices are changing rapidly and thereby creating doubts about the solvency of securities market participants generally. Also, a failure to settle an obligation to transfer funds is much more likely to result in a loss of

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[11] Replacement cost risks can be reduced by **marking-to-market** unsettled trades, that is, by revaluing securities at the current market price and requiring the counterparty with an as yet unrealised loss to transfer funds or collateral equal to the value of the loss to the other counterparty, the clearing system or the settlement system.

[12] Although the term "settlement date" is used for expositional convenience, the settlement process may take more than one day. In general, a party may be exposed to principal risk from the time it initiates a securities or funds transfer instruction until the time settlement is completed.

confidence than a failure to settle an obligation to transfer securities. Market participants recognise that securities and securities lending markets are relatively illiquid and, therefore, that a financially sound counterparty may be unable to buy or borrow the securities needed to complete settlement.

2.11 Even without a loss of confidence, liquidity risks are a matter of concern. For the seller of a security, liquidity risk is the risk that payment will not be received from the buyer, possibly forcing the seller to borrow funds or to liquidate assets to avoid failing to discharge its own payment obligations on other transactions. For the buyer of securities it is the risk that delivery will not be received from the seller, possibly forcing the buyer to borrow the security to complete an obligation to deliver it to a third party. The costs associated with such liquidity pressures depend on the liquidity of the markets in which the affected party must make its adjustments; the more liquid the markets, the less costly the adjustments.

2.12 In addition to counterparty risks, participants in a securities settlement system may face the risk of a settlement bank failure, that is, the failure of the entity that holds the funds accounts used to make payments for securities. This risk can be eliminated by the use of central bank accounts for funds transfers. But in many countries non-bank participants in the securities markets do not have access to central bank accounts, either because it is prohibited by statute or because of a policy decision by the central bank, which may be reluctant to compete with private commercial banks for non-bank customers. If central bank accounts are not available, funds accounts must be provided either by the securities transfer system itself or by a commercial bank. In these cases, in the event of the settlement bank's failure, participants are exposed to the loss of the value of payments received if the balances involved have not been retransferred to another bank prior to the failure.

2.13 Of particular concern to central banks is the possibility of systemic risk in securities settlement arrangements. **Systemic risk** is defined in this report as the risk that the inability of one institution to meet its obligations when due will cause other institutions to fail to meet their obligations when due. This is a very broad definition of systemic risk that covers some events that are unlikely to be of serious concern to central banks. In particular, under this definition, technical failures in securities settlements are quite likely to entail systemic risk; because the liquidity of markets for securities loans in many cases is quite limited or non-existent, the failure of the seller of a security to complete delivery quite often causes the buyer to fail to discharge its obligation to redeliver the security to a third party. Market participants have developed contractual and banking arrangements that allow them to manage routine liquidity pressures arising from limited numbers of technical failures quite successfully. Central banks are concerned primarily with the possibility that defaults or widespread technical failures might result in losses or liquidity pressures that cannot be managed and contained with existing arrangements and that, as a result, the stability of payment systems and financial markets might be jeopardised.

The delivery versus payment principle

2.14 As noted earlier, by far the largest source of credit risk in securities settlement and, therefore, the most likely source of systemic risk is the principal risk that may arise on the settlement date. Such principal risk can be eliminated if the securities settlement system adheres to the principle of delivery versus payment (DVP), that is, if it creates a mechanism that ensures that delivery occurs if and only if payment occurs. Furthermore, by eliminating concerns about principal risk, DVP reduces the likelihood that participants will withhold deliveries or payments when financial markets are under stress, thereby reducing liquidity risk. However, not all securities settlement arrangements currently achieve DVP. In some cases the linkage that exists between delivery and payment is, nonetheless, sufficiently strong to make a loss of principal by a participant seem a remote possibility. But in other cases book-entry securities transfer systems have been created that neither provide, nor are linked to, a money transfer system. The Group of Thirty recommended that by 1992 settlement systems for corporate securities should be **delivery versus payment systems**.

2.15 Achievement of DVP eliminates principal risk (and contributes to the reduction of liquidity risk), but it does not eliminate replacement cost risk or liquidity risk. Liquidity risk and, to a lesser extent, replacement cost risk also have the potential to create systemic risk. Thus, while the achievement of DVP (or, at a minimum, of a very strong linkage between delivery and payment) is necessary to contain systemic risk, it is not sufficient. An analysis of risks in securities settlement systems must not only determine the strength of the linkage between delivery and payment but must also assess whether the systems adequately control counterparty replacement cost and liquidity risks. Also, unless central bank money is employed in settlements, it must examine the likelihood and potential consequences of a settlement bank failure. In part because of concerns about the potential consequences of a settlement bank failure, the Group of Thirty recommended that the money balances transferred to complete payments be **same-day funds**, that is, balances that may be used (retransferred) on the day of receipt. In addition, if settlement obligations of participants are guaranteed by some third party (a bank or perhaps the securities settlement system itself), the likelihood and potential consequences of failure of a guarantor must be considered. Finally, those systems that hold securities through third parties (custodians) must consider the risks that could result from failure of one of the custodians.

3. ALTERNATIVE STRUCTURAL APPROACHES TO DELIVERY VERSUS PAYMENT

Identification of alternative models

3.1 The Study Group began its analysis by developing a questionnaire regarding the structure of securities settlement systems and applying the questionnaire to at least one national system in each of the G-10 countries and also to two international securities transfer systems, Cedel and Euroclear. The questionnaire and the responses for the eighteen systems examined are summarised in Annex 3. Although this does not constitute an exhaustive survey of the systems in use or under development in the G-10 countries, the Study Group believes that the systems that have been reviewed adequately represent the range of approaches to linking delivery and payment in those countries.

3.2 On the basis of its review of the responses to the questionnaire, the Study Group identified three common structural approaches or models for achieving DVP (or, more generally, for linking delivery and payment in a securities settlement system):

Model 1: systems that settle transfer instructions for both securities and funds on a trade-by-trade (gross) basis, with final (unconditional) transfer of securities from the seller to the buyer (delivery) occurring at the same time as final transfer of funds from the buyer to the seller (payment);

Model 2: systems that settle securities transfer instructions on a gross basis with final transfer of securities from the seller to the buyer (delivery) occurring throughout the processing cycle, but settle funds transfer instructions on a net basis, with final transfer of funds from the buyer to the seller (payment) occurring at the end of the processing cycle;

Model 3: systems that settle transfer instructions for both securities and funds on a net basis, with final transfers of both securities and funds occurring at the end of the processing cycle.[13]

Although the systems examined did not all fit equally well into this classification, the Study Group found the distinctions quite useful in developing its analysis. The remainder of this section describes these three models in greater detail. In each case, the potential risks associated with the structure are first identified. Consideration is then given to how in practice or in principle these risks can be limited through the imposition of various risk controls.

[13] Logically, one might posit the existence of a fourth model in which funds transfer instructions are settled on a gross basis and securities transfer instructions on a net basis. However, the Study Group is aware of no system that is designed in this way. The apparent preference to complete securities transfers before, or at least no later than, the completion of funds transfers probably reflects the greater complexity and difficulty of ensuring completion of securities transfers, given the large number of individual securities and the tendency for securities markets and securities lending markets to be less liquid than money markets.

Model 1: Gross, simultaneous settlements of securities and funds transfers

3.3 The essential characteristic of model 1 systems is the simultaneous settlement of individual securities transfer instructions and associated funds transfer instructions. The system typically maintains both securities and funds accounts for participants and makes all transfers by book entry.[14] An "against payment" transfer instruction is settled by simultaneously debiting the seller's securities account, crediting the buyer's securities account, debiting the buyer's funds account and crediting the seller's funds account.[15] All transfers are final (irrevocable and unconditional) transfers at the instant the debits and credits are posted to the securities and funds accounts. Overdrafts (negative balances) on securities accounts are prohibited. Although funds account overdrafts are allowed in most model 1 systems, the Study Group concluded that the properties of model 1 systems could be brought into sharper focus by assuming initially that funds account overdrafts are also prohibited. In such a system an instruction to transfer securities against payment would not be executed either if the seller had an insufficient securities balance or if the buyer had an insufficient funds balance.

3.4 Model 1 systems clearly allow participants to eliminate principal risk. However, such systems may require participants to maintain substantial money balances to ensure the completion of settlements, especially if participants are unable to adjust their money (or securities) balances during the processing cycle, or if the volume and value of transfers are relatively large. If balances cannot be adjusted during the processing cycle, participants must maintain balances sufficient not only to cover the net value of all funds debits and credits on the settlement date, but also to cover the largest debit balance during processing. The magnitude of the largest debit balance during processing tends to be very difficult to predict with any precision. Even if the debit balance after processing were known with certainty, the largest debit balance during processing could be considerably larger because the order in which transfers occur is determined by the availability of securities balances and cannot be predicted in advance. If participants do not maintain substantial money balances and are unable to adjust their money balances during the processing cycle, high rates of failed transactions are likely to result in a model 1 system. High fail rates increase replacement cost risk by delaying settlements and increase liquidity risk by adding to uncertainty about balances in both securities and funds at the end of processing. In an extreme case, a high fail rate could escalate to a gridlock situation in which very few, if any, transactions could be completed on the settlement date.

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[14] If funds accounts are held by another entity, a communications link must be established between the operator of the securities transfer system and the other entity to provide the securities transfer system with real-time information on the completion of funds transfers.

[15] The system may also allow participants to make "free transfers", that is, transfers of securities without a corresponding transfer of funds, or "free payments", that is, transfers of funds without a corresponding transfer of securities.

3.5 To avoid high fail rates, model 1 systems frequently employ some type of queue management technique and may also offer securities lending facilities. Any system that prohibits securities overdrafts or funds overdrafts must make decisions about the treatment of transfer orders that cannot be executed because of insufficient securities or money balances. The options available depend critically on whether participants are able to interact with the system during the processing cycle. If so, responsibility for queue management might be left to the participants. Counterparties to a failed transaction could be promptly notified and given the opportunity to borrow the securities or funds necessary to allow execution of the instruction. The system could repeatedly recycle instructions on a simple "first in, first out" basis until participants had taken the steps necessary to allow execution. In some model 1 systems, however, transfers are executed during one or more "batch-processing cycles" in which participants have no opportunity to adjust their securities or money balances to make completion possible. Such systems typically employ complex "chaining procedures" that manipulate the order in which transfer instructions are executed so as to maximise the number or value of securities transferred and correspondingly minimise the number and value of failed transactions.[16] These systems may also offer automatic securities lending programmes, that is, programmes in which participants may preauthorise the lending of available securities to other participants that have insufficient securities balances to allow execution of their transfer instructions.

3.6 Queuing arrangements and securities lending arrangements (automatic or otherwise) can reduce participants' uncertainties regarding the balances required to execute their transfer instructions. Even with such facilities, however, participants are often perceived to face an unattractive trade-off between higher money balances and higher fail rates, particularly in systems in which the volume and value of transfers are relatively large. To limit the need for money balances while keeping fail rates at acceptable levels, most model 1 systems have extended intraday or overnight credit to their participants by allowing them to overdraw their funds accounts, in some cases by quite substantial amounts. The provision of such credit extensions reduces the need for (and the opportunity costs usually associated with) money balances and, by reducing fail rates, reduces the associated replacement cost and liquidity risks. However, it creates a new source of risk - the failure of a participant to repay the credit extended. Such a failure would clearly entail liquidity and replacement cost risks. If such credit extensions are not collateralised, principal risks would also, in effect, be created. Liquidity pressures and any losses from a failure to repay the loan would be borne by the system operator or by the other participants.

[16] In some countries, "chaining procedures" are not employed because of concerns about the legality of a departure from "first in, first out" processing.

3.7 Thus, the degree of protection against counterparty credit and liquidity risks in a model 1 system often depends importantly on the controls that the system imposes to limit the likelihood of a failure by a participant to repay an intraday or overnight credit extension and to contain the potential losses and liquidity pressures should a failure occur.[17] Credit risk is normally limited by imposing membership standards and by establishing a lien on the participant's holdings of securities, including securities received during the current processing cycle. To ensure that adequate collateral is available, the system would need to restrict free transfers of securities, free payments and, if securities are certificated, withdrawals of securities from the system. Also, in many cases customer securities held by the participant would need to be identified and could not be counted towards compliance with the collateral requirement.[18] Even if credit extensions are collateralised, however, credit losses could result from unanticipated declines in the value of the collateral.

3.8 In existing model 1 systems such residual losses (analogous to replacement costs) are borne by the system operator, but the system could establish loss-sharing rules that allocated the losses to the participants.[19] The system operator typically guarantees the timely receipt of payment for securities transferred and attempts to ensure that the guaranty can be honoured by arranging lines of credit with third parties (either commercial banks or the central bank). In principle, liquidity pressures on the system operator could be limited by imposing a cap on each participant's funds overdraft, but in existing model 1 systems a collateral requirement is usually the only factor limiting intraday credit extensions. If a central bank operates the system, it can clearly meet any demands for liquidity resulting from a failure to repay a credit extended. Nonetheless, it may wish to limit such credit extensions, both to avoid undermining incentives for participants to manage counterparty credit and liquidity risks and to limit the scale of the operations it would need to undertake to offset the effects of its actions on the monetary base.

3.9 In addition to imposing net debit caps, some private sector systems limit potential liquidity pressures by prohibiting participants from withdrawing funds received during the processing cycle until the next day. While this gives the system an extra day to address liquidity problems arising from a default, it potentially places the system's participants at considerable risk in the event that the system operator fails. This risk, which the Group of Thirty addressed in its same-day funds recommendation, would be particularly acute if the system operator were not very strongly capitalised or engaged in other, potentially more risky lines of business in addition to providing settlement services.

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[17] Securities loans to participants also create credit risks that must be limited, usually through the use of similar types of controls.

[18] More generally, the system needs to ensure that its lien on any collateral is legally enforceable.

[19] Of course, if the operator is owned by the participants they ultimately bear the loss in any event.

Model 2: Gross settlements of securities transfers followed by net settlement of funds transfers

3.10 The essential characteristic of the model 2 system is that securities transfers are settled on a trade-for-trade (gross) basis throughout the processing cycle, while funds transfers are settled on a net basis at the end of the processing cycle. The system maintains securities accounts for participants, but funds accounts are generally held by another entity, either a commercial bank or the central bank. Securities are transferred by book entry, that is, by debiting the seller's securities account and crediting the buyer's securities account. These transfers are final at the instant the entries are made on the system's books. The corresponding funds transfers are irrevocable but not final. During the processing cycle the system calculates running balances of funds debits and credits. The running balances are settled at the end of the processing cycle when the net debit positions and net credit positions are posted on the books of the commercial bank or central bank that maintains the funds accounts. Settlement of funds transfers may occur once a day or several times a day. Thus, final transfer of securities (delivery) precedes final transfer of funds (payment). Like model 1 systems, model 2 systems typically prohibit participants from overdrawing securities accounts but funds overdrafts are tacitly allowed since the running balances are permitted to be net debit balances. A securities transfer instruction is rejected if and only if sufficient securities are not available in the seller's account.

3.11 Without additional safeguards model 2 systems would expose sellers of securities to principal risk. Replacement cost risk and liquidity risk would also be present, but by allowing participants to settle funds transfer instructions on a net basis, the frequency of failed transactions would be reduced, thereby limiting the potential for fails to exacerbate such risks to participants. Nonetheless, failed transactions would occur in the case of insufficient securities balances. Thus, queuing arrangements need to be developed, although they generally do not need to be as complex as in a model 1 system that prohibited both securities and funds overdrafts. Still, the system must decide whether to depart from "first in, first out" processing of securities transfer instructions and adopt more complex procedures that maximise the number or value of transfers completed.

3.12 Operators of model 2 systems have recognised the dangers inherent in allowing delivery prior to payment, and these systems are designed to provide strong assurances that sellers will receive payment for securities delivered. In most cases, an assured payment system is utilised, that is, a system in which the seller delivers securities in exchange for an irrevocable commitment from the buyer's bank to make payment to the seller's bank at the end of the processing cycle.

3.13 A model 2 system that includes an assured payment system eliminates counterparty principal risk but leaves participants exposed to the failure of the guarantor of one or more participants.[20] Typically, the guarantors are commercial banks of the highest credit standing.[21] A guarantor normally protects itself against credit risks by establishing a lien on securities held by the participant in the system, including securities delivered to the participant's account during the processing cycle. Nonetheless, credit risks of the same magnitude as principal risks may result from securities purchases by participants on behalf of customers, retransfers of securities free of payments, free payments or, if securities are certificated, physical withdrawals of securities from the system. Even if the guarantor successfully establishes a lien on the participant's securities, it still faces credit risk analogous to replacement cost risk and liquidity risk if a participant fails to cover a net funds debit position. To limit the potential consequences of a failure of a guarantor, one model 2 system is considering a variety of additional safeguards, including capping the sum of net funds debit positions of participants that can be supported by any one guarantor (including the guarantor's own net debit position).[22] Finally, the possibility of failure of a buyer's bank in an assured payment system must be considered. As in model 1, that risk can be limited by insisting on same-day availability of balances received for securities delivered.

Model 3: Simultaneous net settlement of securities and funds transfers

3.14 The essential characteristic of model 3 systems is the simultaneous net settlement of both securities and funds transfer instructions. Settlement may occur once a day or at several times during the day. The system maintains securities accounts for participants. Funds accounts may be maintained by a separate entity, either a commercial bank or a central bank. Securities are transferred by book entry, that is, by debiting the seller's securities account and crediting the buyer's securities account. During a processing cycle, running balances of debits and credits to funds and securities accounts are calculated, and in some systems this information may be made available to participants.[23] However, book-entry transfers of securities do not occur until the end of the processing cycle. In the interim, all

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[20] The obligation of the seller's bank in the event of failure of the buyer's bank is a matter of negotiation between the seller's bank and the seller. In some cases, the seller's bank may guaranty that the seller will receive payment even if the buyer's bank fails.

[21] In at least one system, some of the guarantors are also participants in the system.

[22] Of course, the imposition of caps on net funds debit positions would tend to require more complex queuing arrangements and would, nonetheless, tend to result in higher fail rates.

[23] In other systems such information is not communicated to participants. In some of these systems transfer instructions are processed in batches, affording no possibility of communicating the results to participants prior to the end of the cycle. Even in systems that process transfer instructions individually, however, the information may not be communicated prior to the end of the cycle because the legal system provides that the securities transfers would be final as soon as the participants were notified (and thus before the associated funds transfers were final).

funds and securities transfers are provisional. At the end of the processing cycle (and possibly also at points during the processing cycle) the system checks whether those participants in a net debit position in funds or securities have sufficient balances to cover the net debits.[24] If a participant has insufficient balances, it may be notified and given an opportunity to obtain the necessary funds or securities. If and only if all participants in net debit positions have sufficient balances of funds and securities, final transfers of the net securities balances and net funds balances are executed.

3.15 Model 3 systems can achieve and most do achieve DVP and, therefore, eliminate principal risk. The exceptions involve systems that in certain circumstances allow provisional securities transfers to become final prior to the settlement of funds transfers. For example, one system allows a participant that has received a securities transfer to retransfer the securities free of payment to a third party and treats the transfer to the third party as final at the time the securities accounts are debited and credited. In effect, it operates as a model 2 system with respect to those transfers. But the existence of principal risk in model 3 systems is the exception rather than the rule. As in all other systems, replacement cost risk and liquidity risk, however, are not eliminated. Failed transactions and the associated risks are reduced by the extensions of intraday credit implicit in allowing funds transfer instructions to be settled on a net basis, and also by the settlement of securities transfers on a net basis.[25] Also, if funds accounts are not held at a central bank, the risk of settlement bank failure exists.

3.16 By far the most serious concern regarding risk in model 3 systems is the potential for substantial liquidity pressures to emerge if a participant fails to settle its net funds debit position. With a few notable exceptions, the netting of securities and funds transfers in model 3 systems is not legally binding. Rather, in the event that a participant fails to settle a net funds debit position, some or all transfers involving that participant may be revoked (a procedure referred to as an unwind) or, less likely, all transfers might be postponed to the next day or indefinitely. In the case of an unwind, the settlement obligations of the other participants would be recalculated. If a partial unwind of the transfers of the failed participant were possible (say, if just enough securities transfers could be revoked to eliminate the net debit position), liquidity pressures would tend to be limited, but most systems require (sometimes because of legal concerns) a complete unwind of all the participant's transfers.[26]

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[24] In some systems a transfer instruction would not be processed if it would result in a net debit position in a security larger than the participant's balance in that security. In other systems, however, an inadequate securities balance might not become evident until later in the processing cycle or at the end of the processing cycle.

[25] Still, in most systems transfers would not be processed if sufficient securities balances were not available, and some sort of queuing arrangements would need to be established.

[26] In those systems in which an inadequate securities balance might not become evident until the end of the processing cycle, an unwind could also be triggered by a failure to cover a net debit position in a security. In such systems a partial unwind of transfers involving that particular security typically occurs.

3.17 The unwind of all transfers involving even a single participant that fails to settle has the potential to create significant systemic risk. The key issue raised is whether the participants can reasonably be expected to cope with the liquidity pressures that might arise. This would depend on the magnitude of the potential changes in their funds and securities positions and on how easily they can adjust to those changes. The potential changes depend not only on the size of the net positions of the participant that fails to settle its obligations but on the distribution of its transfer activity among the other participants. The netting of funds and securities transfers in a model 3 system is usually multilateral position netting. In the event that the multilateral net position is unwound, participants whose transfer activity vis-à-vis the participant that failed to settle involved bilateral net credit positions in funds or securities would lose those net credits; upon recalculation, their multilateral net positions vis-à-vis the system would be smaller net credits or larger net debits.

3.18 The other participants' ability to cope with the changed positions would depend in part on how tightly they were managing their cash and securities balances and whether, in particular, they were relying on the credits generated by their bilateral activity with the participant that failed to settle.[27] In the case of cash balances, if they were depending on the credit to meet other obligations, their ability to cope would depend on the liquidity of the money markets (or their access to credit lines, either from commercial banks or from the central bank) at the time the failure to settle became apparent. In money markets, liquidity tends to dry up as the end of the business day approaches, so participants would be more likely to encounter serious difficulty adjusting to a settlement failure if settlement is scheduled for very late in the day.

3.19 In the case of securities balances, an unwind may cause other participants to be unable to meet their obligations to deliver securities if they had relied on securities that they had anticipated receiving from the failed participant. Furthermore, in an unwind, the system may not reverse all of the subsequent transfers made by a participant that received securities from the failed participant. In that case, a participant would in effect overdraw its securities account to the extent it relied on securities from the failed participant.[28] If the participant cannot cover the shortfall, it may also be declared in default, triggering an additional unwind.

3.20 The ability of a participant affected by a complete or partial unwind to complete its delivery commitments may depend on the liquidity of the securities lending markets (or the availability of automatic securities lending facilities). Securities lending markets are often rather illiquid throughout the business day, although the liquidity of markets for different securities varies greatly. Illiquidity in

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[27] Such reliance may be more likely if the running balances are reported to participants during the day.

[28] An overdrawn securities account could also result in those systems that permit participants to withdraw securities transferred to their account during the day. Most securities settlement systems do not allow withdrawals, however.

the securities lending markets would probably be exacerbated if an unwind forced a number of participants into the market simultaneously.

3.21 In markets with relatively small settlement volumes and which either are extremely liquid at the time of settlement or enjoy highly reliable liquidity facilities (for funds and securities), reliance on unwinding may not create unacceptable systemic risk. In several markets, however, operators of model 3 systems evidently have concluded that the risk associated with unwinds is unacceptable and have imposed a variety of risk controls to either supplement or substitute for unwinds. In these systems the completion of settlement is generally guaranteed by the system operator (or by a clearing corporation that achieves legally binding multilateral trade netting by acting as a central counterparty). The risk controls are intended to protect the guarantor and also to make the guaranty credible to participants. Among the controls that have been employed to limit credit risk are membership requirements, requirements that net funds debits be fully collateralised, and required contributions to a collateral pool. Liquidity risk has in some instances been limited by arranging third-party liquidity facilities; however, none of the model 3 systems that the Study Group has reviewed currently imposes caps on net funds debit positions. In principle, such caps could be determined by the system operator, perhaps on the basis of bilateral limits set by the participants.

4. COMMON RISK MANAGEMENT ISSUES AND COMMON SAFEGUARDS: A SYNTHESIS

Counterparty credit and liquidity risks

4.1 The above discussion suggests that the degree of protection against counterparty credit and liquidity risks that a securities settlement system provides to its participants depends more on the specific risk safeguards utilised by the system than on which of the structural approaches (models) is employed. Model 1 and model 3 systems typically achieve DVP, while model 2 systems typically create an assured payment system that is intended to make the risk of a loss of principal value negligible. But no system has eliminated replacement cost risk or liquidity risk. Regardless of the model chosen, in managing these risks a settlement system faces three fundamental, interrelated questions:

(a) How much credit should the system extend to its participants (either explicitly in the form of funds overdrafts or tacitly by allowing funds transfer instructions to be netted and net funds debit positions to be created)?

(b) What safeguards should be employed to limit the potential losses and liquidity pressures from a participant's failure to repay a credit extension?

(c) How should any losses and liquidity pressures be shared among the system operator and other participants?

In each case the best answer for a particular system is influenced by a variety of factors exogenous to the settlement system, including the opportunity costs of maintaining cash balances and the costs of credit facilities, the magnitude of replacement cost risks, the liquidity of money markets and securities markets, the credit standing of participants, and the degree of access by participants to central bank credit facilities.

4.2 In principle, participants could be required to maintain sufficient cash balances in their funds accounts to avoid an intraday or overnight overdraft (model 1) or an intraday net debit position (models 2 or 3). However, because the order and timing of securities transfers tend to be highly uncertain, participants would generally need to maintain quite substantial balances, especially if the balances could not be adjusted during the processing cycle or if the volume and value of transfers were relatively large. Therefore, participants might incur substantial opportunity costs if overdrafts or net debit positions were prohibited. If adequate balances were not maintained, high rates of failed transactions might occur, possibly adding substantially to replacement cost risk and liquidity risk. To improve this trade-off between efficiency (cost) and risk, nearly all securities settlement systems extend intraday (or overnight) credit to participants, either explicitly (model 1) or tacitly (models 2

or 3).[29] The extent of the improvement in the trade-off depends on the level of uncertainty about intraday debit positions, the magnitude of opportunity costs associated with holding cash balances, the volatility of securities prices (through their influence on replacement costs) and the liquidity of money markets (through their influence on liquidity risk).

4.3 Against these potential benefits from the extension of credit to participants must be weighed the potential costs associated with failures to repay such credit extensions. These potential costs, in turn, depend on the safeguards imposed by the system to limit the likelihood of a default or failed payment and to contain the potential losses and liquidity pressures should a default or failed payment occur. All systems attempt to limit these risks through membership standards for participants. Other risk controls may or may not be imposed. Some systems limit credit risks by attempting to ensure that all credit extensions are collateralised, either by securities received by the participant during the processing cycle or by other securities held by the participant. However, relatively few systems appear to impose a binding collateral requirement on participants, in the sense that completion of a securities transfer is conditional on the availability of collateral with value greater than the resulting funds overdraft (or net funds debit). More often they attempt to maintain a closed system by stipulating that securities can be retransferred only against payment or, at a minimum, by limiting free transfers or free payments.[30] Nor are caps on participants' funds overdrafts (model 1) or net funds debit positions (models 2 or 3) commonly imposed to limit potential liquidity pressures from failure to cover an overdraft (model 1) or to cover a net funds debit position (models 2 or 3). The imposition of binding caps would, of course, require participants to maintain higher balances or higher fail rates would occur. Some systems have apparently concluded that the use of caps could cause fails to escalate to the point where substantial numbers of securities transfers could not be completed on the settlement day, that is, where "gridlock" could develop.[31] Moreover, those systems that impose a binding collateral

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29 In the short run, the trade-off is between risk and efficiency, where efficiency is measured by the proportion of scheduled securities transfers that can be completed. In the longer run, the trade-off is between risk and cost - the cost of maintaining higher balances or enhancing the system in ways that reduce uncertainty, for example allowing participants to interact with the system (including adjusting balances during the processing cycle).

30 Even if a collateral requirement is binding, the degree of protection provided would depend on the effectiveness of the lien and on the quality of the collateral. Reliance on collateral to limit credit risks would raise particular concerns where an unanticipated default by the issuer of the security serving as collateral is a significant risk, notably in transfer systems for money market instruments such as commercial paper.

31 Concerns about gridlock tend to be especially acute in systems for transferring government securities, because a reduction in market liquidity could increase the interest cost on the national debt and, in cases in which open market operations are conducted in government securities, because the implementation of monetary policy might be complicated. It should also be noted, however, that, to the extent that caps are perceived to contribute to the stability of the settlement system, market liquidity would tend to be enhanced.

requirement may believe that the need for collateral will sufficiently limit credit extensions to avoid serious liquidity problems in the event of a failure to repay. Finally, as noted earlier, some model 3 systems do not impose any risk controls other than membership standards.

4.4 Even if relatively strong safeguards are employed, a securities settlement system should establish a clear understanding as to how credit losses and liquidity pressures would be distributed in the event of a participant's failure to repay a credit extension. In some systems the system operator or some other entity guarantees settlement. To protect itself and, if necessary, to make its guaranty credible, the guarantor would typically impose some of the risk controls discussed above - membership standards, collateralisation, or (less frequently) caps. In addition, unless the guarantor is a central bank, it would need to arrange access to liquidity facilities to ensure that it could complete settlements on schedule. The existence of a guarantor need not imply that participants would not bear any credit risk. In some cases the guarantor takes responsibility for liquidating any unencumbered collateral of a defaulting participant, but if the value of the collateral were insufficient to cover the credit extended, losses would be charged to the surviving participants. This allocation of losses could be based on the surviving participants' transfer activity with the failed participants or losses could be mutualised (spread across the entire membership). In either case, the guarantor might require participants to collateralise their contingent obligations through contributions to a collateral pool.

4.5 In model 3 systems without a guaranty, a default normally triggers the revocation of some transfer instructions. If the only transfer instructions revoked are those involving the participant that failed (an unwind), any replacement costs and liquidity pressures are borne initially by the counterparties of the failed participant (and perhaps by those participants' customers). If a partial unwind is possible, these liquidity pressures might well be manageable. But if the rules require a complete unwinding of transfers involving the failed participant, considerable systemic risk could be involved. On the funds side, the liquidity demands placed on some participants that dealt with the failed participant could, in theory, far exceed the size of the net debit position that the participant failed to cover. On the securities side, a complete unwinding could create short positions in securities accounts that may be very difficult to cover.[32]

Risk of failure of a settlement bank, guarantor or custodian

4.6 In addition to counterparty credit and liquidity risks, some systems must consider the potential consequences of failure of a settlement bank, a guarantor (either the securities buyer's bank

[32] As noted earlier, a short position could result because the system may not reverse subsequent transfers made by a participant that received securities from the failed participant. If the subsequent transfer were reversed, participants that had not dealt directly with the failed participant would be adversely affected by the failure.

in an assured payment system or the guarantor of all settlement obligations in some other systems) or a custodian of securities. The risk of settlement bank failure has been eliminated in some systems by using central bank funds for payments. However, as noted earlier, in other cases some participants do not have access to central bank funds accounts. If central bank accounts cannot be used, several steps can, nonetheless, be taken to mitigate the risk of losses from a settlement bank failure. One possible approach is to diversify the risk by using multiple settlement banks. However, the settlement process with multiple banks would be more complicated; funds transfers between banks would be necessary to balance net funds debits and net funds credits at each of the banks. Completion of settlement might then hinge on completion of these transfers, introducing another source of potential error and delay into the process. As noted earlier, one step that is certain to reduce the risk of loss from settlement bank failure is to require the settlement banks to offer participants same-day availability.[33] Of course, when funds must be made available on a same-day basis, liquidity problems must be dealt with on a same-day basis. The Group of Thirty has concluded that the trade-off in moving from next-day to same-day funds is favourable, but the use of same-day funds increases the need for liquidity safeguards, which, as noted earlier, are not always very robust in existing securities settlement systems.

4.7 Model 2 systems that create an assured payment system to reduce the risk of losses from participant defaults must also give careful consideration to potential losses from the failure of a guarantor bank, especially since the full principal value of the securities transferred to the buyer would be at risk. At a minimum, financial standards for guarantor banks would appear necessary to ensure that only banks of the highest credit standing could act as guarantors. To provide further protection, at least one system is considering: placing caps on the net debit positions of individual participants, which would imply caps on the sum of the net debit positions guaranteed by any one bank; requiring the guarantors to enter into an agreement to share losses from the failure of a guarantor; and requiring the guarantors to collateralise their contingent obligations under the loss-sharing agreement.

4.8 Two other sources of risk must be considered in certain systems. First, in those systems (models 1, 2 or 3) in which the system operator or some other entity guarantees the completion of settlement of transfer instructions executed by the system, the risk of the failure of that guarantor must be considered. Clearly, such a failure could create serious systemic problems.[34] To ensure its financial integrity, a guarantor would need to impose various risk controls that limit its exposures to participants and ensure timely completion of settlements. Secondly, if the securities settlement system does not

[33] The use of same-day funds is possible, however, only if the national payment system provides same-day finality, a condition not yet satisfied in all G-10 countries.

[34] An obvious parallel is with the potential consequences of failure of a central counterparty in a multilateral foreign exchange netting system.

dematerialise securities or immobilise certificates itself but instead relies on the custody services of third parties (custodians), the risk of failure of a custodian must be considered. Even if there is no risk of loss of the value of the securities held by the custodian, the ability of participants to transfer the securities (other than to other participants) might temporarily be impaired.[35]

[35] Such custodial risk also typically exists for indirect participants in securities settlement systems whose securities are held in custody by direct participants. While for completeness the Study Group has identified custodian failure as a source of risk, analysis of the potential consequences is a very complex issue that is beyond the scope of this report.

5. EVALUATION OF IMPLICATIONS OF SECURITIES SETTLEMENT SYSTEMS FOR FINANCIAL STABILITY

5.1 A specific objective of this study is to provide a framework for evaluating the implications of the design and operation of securities settlement systems for central bank policy objectives relating to stability and the containment of systemic risk. The discussion above suggests that a variety of approaches to the design and operation of such systems are consistent with those central bank objectives. Nonetheless, securities settlement systems must address a common set of risk management issues if they are adequately to contain systemic risk. Therefore, it should be possible to develop a common set of criteria that are applicable to all such systems.

5.2 The analysis of credit and liquidity risks in securities clearance and settlement that was developed in Section 2 built upon the analysis of risks in netting and settlement systems that was developed in the Angell Report and the Lamfalussy Report. The Lamfalussy Report also contained a framework for evaluating the implications for central bank policy objectives of cross-border and multi-currency netting and settlement schemes for payment orders and foreign exchange contracts. This framework took the form of a set of minimum standards for such schemes (see Annex 4), along with a lengthy set of supporting explanations and analysis. Together the standards and the supporting analysis identify a set of critical issues that designers and operators of such schemes must address.

5.3 The decisions by central banks to set strict standards and to establish principles for cooperative central bank oversight to ensure compliance with the standards reflected a concern that multilateral netting systems for foreign exchange would create a concentration of risks that had the potential to spread systemic pressures throughout international markets quite rapidly. In particular, the absence of a DVP mechanism for settlement of foreign exchange contracts implies that the central counterparty in a multilateral foreign exchange netting system would have substantial credit exposures to participants. And, by the very nature of foreign exchange contracts, a credit or liquidity problem in one national market has the potential to spread quickly to other national markets.

5.4 Clearly, some of these key concerns about multilateral netting mechanisms for foreign exchange do not arise in all cases for securities settlement systems. Nonetheless, rather than building a new framework for the evaluation of securities settlement systems from the ground up, the Study Group saw a number of advantages in exploring whether the issues involved are sufficiently similar to those identified in the Lamfalussy Report that the Lamfalussy analysis can be applied to such systems. The remaining sub-sections of this section evaluate the relevance of the issues highlighted by each of the Lamfalussy standards point by point. At the beginning of each sub-section some of the key issues that arise when a securities settlement system is analysed in these terms are highlighted, including some issues not explicitly addressed in the Lamfalussy Report.

Legal basis for the system

- Effectiveness of funds transfers, including netting of funds transfers.
- Effectiveness of securities transfers, including netting of securities transfers.
- Effectiveness of liens on securities.

5.5 Any netting or settlement system, whether for foreign exchange, securities or other financial interests, should have a well-founded legal basis. If a securities settlement system involves securities issues, markets, participants, custodians or settlement banks subject to the law of more than one jurisdiction, the legal enforceability of the system's rules and procedures in all relevant jurisdictions should be established. In terms of the specific analysis of the implications of this standard, the Lamfalussy Report focused on one legal issue: the effectiveness of the netting of sums of money owed in the event of bankruptcy of a system participant. In those securities settlement systems that provide for the netting of funds transfer instructions and rely on the effectiveness of the netting in designing their risk management systems (model 2 systems and some model 3 systems), this issue is clearly a critical one. Should the system or its participants come to rely on exposures produced by netting when the netting is not legally enforceable, they may face credit and liquidity exposures far larger than they realise (and can cope with) in the event of a participant default. In addressing this issue it is often important not only to assess whether any netting is effective, but also to determine at what stage in the processing cycle the netting takes effect. As noted earlier, in some model 3 systems net funds debit and credit balances are provisional until all net debit positions have been covered; if a net debit position is not covered, an unwind of transfers back to the original gross obligations is possible.

5.6 The legal issues encountered in the design and operation of a securities settlement system go well beyond those specifically analysed in the Lamfalussy Report, however. Indeed, the basic goal of DVP - establishing the strongest possible linkage between delivery and payment - requires a careful determination of whether (and when) a securities transfer is effective. Although not all of the additional legal issues necessarily give rise to systemic concerns, the Study Group has not attempted a thorough analysis of the issues and their implications. Rather, in this report the Study Group has merely attempted to identify some of the relevant legal issues. One group of issues that is clearly relevant relates to the effectiveness of transfers of securities in the settlement system. For example, does the transfer of a security on the books of the settlement system constitute a legal transfer in all relevant jurisdictions? If securities transfer instructions are netted, is the netting legally binding? Another significant set of legal issues arises when a securities settlement system looks to securities as collateral for credit extensions to participants. For example, is the lien effective in all relevant jurisdictions? Is it permissible for the participant to transfer rights to customer securities to the system? Finally, if the system provides a securities lending facility, are the terms of the lending agreement, including any lien on collateral, enforceable?

Understanding of risks

- Division of responsibility for risk management between system operator and participants.
- Implications of loss-sharing agreements.
- Implications of unwinds.

5.7 If the financial risks that arise in securities clearance and settlement are to be adequately controlled, both the system operator and the participants must clearly understand those risks. Securities settlement systems are inherently multilateral arrangements. As noted in the Lamfalussy Report, multilateral arrangements necessarily involve a multiplicity of relationships that make possible the shifting of risks both among participants and between the system participants and the system operator. The most basic issue that multilateral arrangements, including securities settlement systems, must address is the division of risk management responsibility between the system operator and the participants. The Lamfalussy Report concluded that more than one approach to the division of responsibilities is feasible. What is critical is that both the system operator and the participants understand clearly where the responsibility rests.

5.8 The discussion of alternative models of securities settlement systems in the previous sections revealed that several different approaches to allocating credit and liquidity risks are in fact currently utilised. In some systems, completion of settlement is guaranteed, either by the system operator or by one or more guarantor banks. In such systems the risks and the responsibility for risk management clearly rest with the guarantor or guarantors. From the perspective of the participants, the primary source of risk is the failure of a guarantor. As noted above, to protect themselves and, where necessary, to make their guaranty credible, guarantors have strong incentives to impose a variety of risk controls on participants. In some cases, these include loss-sharing arrangements that charge back losses to participants, either on the basis of their overall activity in the system or (less frequently) on the basis of their dealings with a defaulting participant. When losses are based on overall activity, participants may have difficulty gauging the magnitude of their contingent obligations, although the obligations are usually limited (to their contributions to a clearing fund or a multiple thereof).

5.9 As noted earlier, in some model 3 systems settlement is not guaranteed either by the system operator or by a third party. Rather, if a participant fails to cover a net debit position, some or all securities transfers are unwound (deleted) and the settlement obligations of the other participants are recalculated. In such a system the responsibility for risk management rests with the participants, who would bear the liquidity pressures (as well as any losses) arising from the failure of a counterparty to complete settlement. Participants may understand this clearly, and, therefore, have incentives to manage risks prudently. However, several factors may tend to blur their understanding and diminish their incentives. First, participants may assume that the system operator (or a central bank) will provide the necessary credit, directly or indirectly, to avoid a settlement failure. Secondly, incentives

to manage risks associated with customer transfers may be limited if participants are able to pass on the risks to customers. Concerns about the consequences of unwinds may, nonetheless, be substantially limited if the system imposes risk controls that limit the likelihood and potential consequences of a settlement failure.

5.10 Regardless of the approach taken to risk management, both the system operator and the participants face serious difficulties in ascertaining their credit exposures if the system fails to establish a firm linkage between delivery and payment. Without such a linkage, the potential losses from the failure of a participant could clearly be quite large and cannot be precisely quantified, although an upper limit may be ascertainable. Even if the system guarantees settlement, the ability of the guarantors to absorb potential losses from a participant default would be difficult to gauge in such circumstances. Furthermore, as noted earlier, without a firm linkage, in times of stress many participants are likely to balk at completing deliveries or payments for fear of large credit losses. The potential liquidity demands that might emerge in that event would also be difficult to anticipate.

Incentives and capabilities to manage risks

- Need to limit credit exposures produced by participants.
- Reliance on membership standards and collateral, rather than caps.
- Trade-offs between risk and efficiency associated with collateral requirements.

5.11 The need for securities settlement systems to have clearly defined procedures that provide appropriate incentives for risk management has already been discussed in the previous sub-section. System operators and participants also need to consider whether relevant parties (the system operator and/or the participants) have the capabilities to manage and contain the risks they bear. Lamfalussy standard III (and standard IV) provides specific criteria by which to judge whether a foreign exchange netting system adequately addresses this issue. With respect to credit exposures, this standard states that "limits" should be placed on the maximum level of credit exposure that can be produced by each participant. The analysis of securities settlement systems in the previous sections noted the importance of establishing safeguards to limit the potential losses from a participant's default. A more difficult issue is the circumstances under which various specific safeguards are necessary. As noted earlier, securities settlement systems tend to rely on membership standards and on collateral to limit credit exposures. While Lamfalussy standard III implies a need for a cap or quantitative limit on funds transfer activity, securities settlement systems seldom employ such a safeguard.

5.12 A key question, then, is whether membership standards and collateral procedures alone can adequately limit credit exposures in a securities settlement system. In assessing this question, it is important to remember that most securities settlement systems either achieve DVP (models 1 and 3) or introduce assured payment systems (model 2) intended to make principal risks negligible. Thus, in

well-designed systems, counterparty credit exposures to participants are effectively limited to replacement cost exposures. By contrast, in settlement systems for foreign exchange contracts, the absence of a DVP mechanism creates cross-currency settlement exposures (Herstatt exposures) as well as replacement cost exposures. If only replacement cost exposures are involved, collateralisation may by itself adequately contain participant credit exposures. Whether this is so would depend on the quality of the collateral and how tightly the collateral controls are administered. If the collateral is high-quality, is conservatively valued (high "haircuts" are applied), and is revalued frequently, counterparty credit exposures can be reduced to minimal levels. On the other hand, if defaults by issuers of the securities are a significant possibility or if mechanisms are not imposed to ensure that sufficient high-quality collateral is available, significant counterparty credit exposures may still remain.

5.13 Furthermore, the decision whether to impose even a collateral requirement confronts designers of securities settlement systems with a short-run trade-off between risk and efficiency (as measured by the proportion of scheduled transfers that settle) and a longer-run trade-off between risk and the cost of maintaining the collateral necessary to allow a higher proportion of transfers to be completed. As noted earlier, relatively few systems monitor collateral values ex ante and make the completion of a securities transfer conditional on the availability of adequate collateral. Their reluctance to do so has in some cases reflected a concern that if sufficient collateral were not posted unacceptably high fail rates could result, with a possible adverse impact on market liquidity. In addition, if transfers blocked by the collateral controls were initiated by the central bank, implementation of central bank monetary operations could be frustrated. Such concerns in some systems may argue decisively against collateralisation, especially if settlement volumes are sufficiently low that replacement cost exposures are unlikely by themselves to create systemic problems. On the other hand, if replacement cost exposures are sufficiently large to be a potential source of systemic problems or if collateral positions can be readily adjusted, a collateral requirement would appear to deserve serious consideration.

Arrangements for ensuring timely completion of settlements

- Containment of systemic liquidity pressures.
- Assessment of potential pressures from a participant's failure to settle.
- Assessment of liquidity resources available to the system operator and participants.

5.14 System operators and participants should also consider whether the potential liquidity pressures from the failure of a participant in a securities settlement system to cover a net funds debit position (or, equivalently, to cover a funds overdraft) can be adequately contained. As noted earlier, the achievement of DVP does not by itself ensure that the operation of a securities settlement system

adequately limits systemic risk. In particular, even if principal risks are eliminated and replacement cost risks are contained (through collateralisation or otherwise), a failure to contain liquidity pressures may create systemic problems. Thus, from a central bank perspective, liquidity risk is an important concern, and it is important to assess the ability of a securities settlement system to contain it in the event of a participant's failure to settle.

5.15 Analysis of this issue requires assessments both of the potential liquidity shortfall from a participant's failure to settle and of the extent of liquidity resources available to the system operator or to participants. If the system imposes limits on participants' net funds debit positions (or overdrafts), potential liquidity shortfalls can readily be gauged. However, as noted earlier, relatively few securities settlement systems impose caps. In the absence of caps, an assessment of potential liquidity shortfalls can be based on historical data on net debit positions. However, in using historical data for this purpose, it is important to recognise that during market disturbances (like the 1987 stock market crashes) activity levels (and, therefore, net debit positions) may substantially exceed historical averages. Thus, an assessment of potential liquidity pressures in the absence of caps would generally require a simulation of the potential effects of peak levels of activity.

5.16 Once the potential liquidity shortfalls have been assessed, the next step is to assess whether adequate liquidity resources are available to contain the resultant liquidity pressures. In those systems in which completion of settlement is guaranteed, it is the liquidity resources of the guarantor that are relevant. With the exception of systems in which completion of settlement is guaranteed by a central bank, those liquidity resources are limited. In such systems, collateral requirements ensure the availability of a pool of assets to support liquidity needs, but without prearranged facilities the collateral may be difficult or impossible to sell or pledge in time to use the proceeds to complete timely settlement. Thus, access by the guarantor to central bank or private sector liquidity facilities would generally be necessary. In those model 3 systems that do not guarantee the completion of settlement, it is the liquidity resources of the participants that are relevant. Here again, the return of securities that had been provisionally transferred to the participant that failed to settle provides a potential source of liquidity, but selling or pledging those securities may not be possible in time to use the proceeds to meet other obligations. Thus, the participants' access to money markets and to central bank or private credit facilities is a critical element in the assessment of their ability to contain the resultant liquidity pressures. Because an unwind has the potential to create short positions in securities, the liquidity of securities lending markets must also be assessed.

5.17 Without further information about actual and potential levels of activity and the availability of liquidity resources, it is difficult to generalise about the capacity of securities settlement systems to contain potential systemic liquidity pressures or about the circumstances in which specific safeguards (for example, caps) are necessary. The Lamfalussy Report can be taken to imply that cross-border and multi-currency netting schemes for payment orders and foreign exchange should impose caps to limit

such pressures. But underlying this conclusion was a presumption that such schemes were likely to reach a scale sufficiently large that the failure of a single participant to settle could by itself create a liquidity shortfall so large that it could not be contained by the system operator or by the participants and could, therefore, create systemic disturbances. In the case of securities settlement systems, however, such a presumption is not always warranted.

5.18 Whether a securities settlement system is a potential source of systemic disturbances depends on several factors. As noted above, the liquidity of money and securities markets is a critical consideration. This, in turn, depends importantly on the time of day that a settlement problem would become apparent. If it occurs at a time of day when markets are active, the loans of securities and funds needed to contain a disturbance may be readily available. Conversely, systemic disturbances may be inevitable if the settlement problem arises late in the day when the money and securities markets tend to be illiquid. Finally, the scale of operation of some securities settlement systems may suggest that they are unlikely to be the source of systemic disturbances, although an unusual concentration of settlement activity among a small number of participants could create systemic concerns even in a system whose overall scale of operation appears modest. In the absence of a strong presumption that systemic disturbances are possible, the arguments for caps should be considered on a case-by-case basis, bearing in mind the discussion above of the fundamental trade-off between efficiency and risk in securities settlement systems.

5.19 Lastly, it should be noted that while a securities settlement system should ensure the timely completion of securities and funds transfers associated with all transfer instructions accepted for execution by the system, it cannot ensure that all such instructions will be accepted. Rather, the acceptance of transfer instructions is always conditional on the availability of the securities in the seller's account; if the securities are not available, the trade will fail to settle. This reflects the fact that markets for securities and for lending individual securities tend to be much less liquid than money markets. The arrangement of automatic securities lending facilities can facilitate the timely completion of securities transfers, but no system can completely eliminate settlement failures resulting from the seller's inability to buy or borrow the securities needed. Because new securities cannot usually be created in order to complete settlement, there is no lender of last resort for securities.[36]

[36] In at least one case, however, a settlement system for government securities provides for the creation and temporary lending of securities to facilitate settlements.

Admission criteria

- Financial and managerial capacity of participants.
- Need to avoid use of membership standards intended solely to create competitive advantages for participants.

5.20 Securities settlement systems typically establish criteria for admission that address the financial and managerial capacity of a participant to satisfy its obligations and to manage the credit and liquidity risks that it bears. In some cases further criteria not directly related to financial or managerial capacity are also applied. For example, some systems operated by central banks limit participation to banks. Some might argue that such additional criteria are inconsistent with "fair and open access". However, the Lamfalussy Report recognised that membership criteria can appropriately distinguish between financial institutions subject to effective supervision and those that are not and may also appropriately distinguish between institutions that have access to central bank credit facilities and those that do not. What the Lamfalussy Report indicated would be inappropriate is a membership criterion intended solely or primarily to create an arbitrary competitive advantage for participants. Although the Study Group has not examined membership criteria for securities settlement systems in detail, they generally appear to focus on factors relevant to the financial and operational capacity of participants.

Operational reliability

5.21 The breakdown of a critical operational component of a securities settlement system can obviously create serious liquidity problems and, by delaying settlements, can increase replacement cost and credit exposures. Consequently, such systems should ensure that all hardware, software and communications facilities that support their operations have a high degree of reliability and integrity. Contingency plans should be established for the potential failure of each critical component, including the identification of backup facilities capable of completing the settlement process on the settlement day and performing the accounting and processing work necessary to prepare for the next settlement day. Because the Study Group has not focused on operational safeguards, this report cannot offer a firm opinion as to how securities settlement systems typically measure up to this requirement.

Conclusions

5.22 The discussion above indicates that issues addressed by the Lamfalussy Report are also relevant to securities settlement systems and that the standards are an effective means of highlighting issues concerning the design and operation of such systems that are relevant to central bank policy objectives regarding financial stability and the containment of systemic risk. However, in using the Lamfalussy Report as a framework for the evaluation of securities settlement systems, several

limitations should be borne in mind. First, certain issues that are important in securities settlement systems are not directly addressed by the Lamfalussy Report. For example, the discussion of legal enforceability revealed a number of such issues. Secondly, the Study Group's analysis suggests that the potential for systemic risk in securities settlement systems may not in some cases be as great as in the multi-currency and cross-border netting schemes addressed by the Lamfalussy Report, which were viewed as having the potential to reach a very large scale and to link interbank money markets in several countries in ways that could transmit systemic liquidity pressures across national borders very quickly. Consequently, certain safeguards that the Lamfalussy Report concluded were essential for netting schemes may not in some cases be necessary for securities settlement systems.

5.23 These considerations argue against characterising the Lamfalussy standards as minimum standards that securities settlement systems must in all cases meet to address central bank concerns about systemic risks. Nor should a system that meets the standards necessarily be assumed to adequately address those concerns. Nonetheless, the standards and accompanying analysis provide a valuable analytical framework that, when applied to securities settlement systems, serves to heighten awareness of central bank concerns about their design and operation. Failure of a particular national system to meet one or more standards should prompt further analysis of whether the system is a potential source of systemic disturbances. If such further analysis suggests that the system is a potential source of systemic disturbances, the central bank would presumably seek enhancements to the system, working in concert with securities supervisors or other responsible authorities where necessary. Such enhancements could be implemented over time, allowing the costs of enhancements to be minimised by incorporating them into the broader overhauls that such systems must undertake periodically.

Annex 1

Group of Thirty recommendations regarding securities clearance and settlement

1. Trade Comparison

By 1990, all comparisons of trades between direct market participants (brokers/dealers) should be accomplished by trade date plus one day (T + 1).

2. Trade Confirmation/Affirmation

By 1992, indirect market participants (institutional investors) should be members of a trade comparison system that achieves positive affirmation of trade details.

3. Central Securities Depository

By 1992, a central securities depository should be in place, and the broadest possible industry participation should be encouraged.

4. Trade Netting

By 1992, the potential benefits of a trade netting system should be studied and, if appropriate, implemented.

5. Delivery Versus Payment (DVP)

By 1992, DVP should be employed as the method for settling all securities transactions.

6. Same-Day Funds

Payments associated with securities transactions should be made in same-day funds.

7. T + 3 Settlement

By 1992, final settlement should occur on T + 3.

8. Securities Lending

Securities lending and borrowing should be encouraged as a method of expediting the settlement of securities transactions.

9. Common Message Standard

By 1992, the standard for securities messages and the ISIN numbering system developed by the International Organisation for Standardisation should be adopted.

Annex 2

Glossary[37]

Assured payment system

A mechanism whereby a seller delivers securities in exchange for an irrevocable commitment by the buyer's bank to make an unconditional and irrevocable payment to the seller's bank.

Beneficial ownership/interest

Entitlement to receive some or all of the benefits of ownership of a security or financial instrument (e.g. income, voting rights, power to transfer). Beneficial ownership is usually distinguished from "Legal ownership" of a security or financial instrument.

Bilateral netting

A netting between two parties.

Book-entry system

An accounting system that permits the transfer of securities without the movement of certificates.

Caps

Quantitative limits on the funds transfer activity of individual participants in a system; limits may be set by each individual participant or may be imposed by the body managing the system; limits can be placed on the net debit position or net credit position of participants in the system.

Central bank credit facility

A credit facility provided for certain account holders at the central bank; the loans typically take the form either of advances to, or secured overdrafts on, the current account (also known as lombard loans) or of traditional rediscounting of bills. In some cases the facility can be drawn automatically at the initiative of the account holder, while in other cases some degree of central bank discretion is involved.

Central securities depository

A facility for holding securities which enables securities transactions to be processed by means of book entries. Physical securities may be immobilised by the depository or securities may be dematerialised (so that they exist only as electronic records).

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[37] The definitions in this glossary are designed to assist the reader in understanding the analysis of securities settlement systems contained in this report. Many of the same terms are used in the analysis of payment systems, for example, that undertaken by the Committee on Payment and Settlement Systems of the central banks of the Group of Ten countries. An attempt has been made to utilise definitions that are equally serviceable in discussing payment systems, but priority has been given to those that are most useful and meaningful in analysing securities settlement systems. A working group of the Committee of EC central bank Governors has recently compiled a glossary of terms with definitions that are more directly applicable to the analysis of payment systems.

Certificate

The piece of paper which evidences the undertakings of an issuer of a security or financial instrument.

Chaining

A method used in certain settlement systems for processing transfers. It involves the manipulation of the order in which transfers are processed to increase the number or value of transfers that may be settled with available securities and funds balances (or available credit lines).

Clearance

The term "clearance" has two meanings in the securities markets. It may mean the process of calculating the mutual obligations of market participants, usually on a net basis, for the exchange of securities and money. It may also signify the process of transferring securities on the settlement date. In this report, the term is used in the first sense.

Clearing system

A mechanism for the calculation of mutual positions within a group of participants to facilitate the settlement of their obligations on a net basis.

Confirmation

The process by which a market participant notifies its customers of the details of a trade and allows the customer to positively affirm or question the trade.

Counterparty

One party to a trade.

Credit risk/exposure

The risk that a counterparty will not settle an obligation for full value, either when due or at any time thereafter. Credit risk is generally defined to include replacement cost risk and principal risk.

Credit transfer system

A funds transfer system through which payment orders move from (the bank of) the originator of the transfer message or payer to (the bank of) the receiver of the message or beneficiary.

Custody

The safekeeping and administration of securities and financial instruments on behalf of others.

Customer

A buyer, seller or holder of securities and financial instruments that does not participate directly in a system. A participant's holdings in a system often include securities and financial instruments of which the participant's customers are the beneficial owners.

Daylight credit (or daylight overdraft, daylight exposure, intraday credit)

Credit extended for a period of less than one business day; in a credit transfer system with end-of-day final settlement, daylight credit is tacitly extended by a receiving participant which accepts and acts on a payment order, even though it will not receive final funds until the end of the business day.

Debit transfer system (or debit collection system)

A funds transfer system in which debit collection orders made or authorised by the payer move from (the bank of) the payee to (the bank of) the payer and result in a charge (debit) to the account of the payer; for example, cheque-based systems are typical debit transfer systems.

Default

Failure to complete a funds or securities transfer according to its terms for reasons that are not technical or temporary, usually as a result of bankruptcy. Default is usually distinguished from a "failed transaction".

Delivery

Final transfer of a security or financial instrument.

Delivery versus payment system

A securities settlement system that provides a mechanism that ensures that delivery occurs if and only if payment occurs.

Dematerialisation

The elimination of physical certificates or documents of title which represent ownership of securities so that securities exist only as accounting records.

Discharge

Release from a legal obligation imposed by contract or law.

Failed transaction

A securities transaction in which the securities and cash are not exchanged as agreed on the settlement date, usually because of technical or temporary causes.

Final transfer

An irrevocable and unconditional transfer which effects a discharge of the obligation to make the transfer. The terms "delivery" and "payment" are each defined to include a final transfer. See Provisional transfer.

Gridlock

A situation that can arise in a funds or securities transfer system in which the failure of some transfer instructions to be executed (because the necessary funds or securities balances are unavailable) prevents other instructions from being executed, with the cumulative result that a substantial number of transfers fail to be executed on the scheduled date.

Haircut

The difference between the market value of a security and its collateral value. The haircut is intended to protect a lender of funds or securities from losses owing to declines in collateral values.

Immobilisation

Placement of certificated securities and financial instruments in a central securities depository to facilitate book-entry transfers.

Irrevocable transfer

A transfer which cannot be revoked by the transferor.

Issuer

The entity which is obligated on a security or financial instrument.

Legal ownership

Recognition in law as the owner of a security or financial instrument. Registration of a security or financial instrument usually confers legal ownership on the person or entity named, even in those cases where the legal owner has obtained the registration on behalf of another (e.g. custodian, trustee, broker).

Liquidity risk

The risk that a counterparty will not settle an obligation for full value when due, but on some unspecified date thereafter.

Loss-sharing agreement

An agreement among participants in a clearing or settlement system regarding the allocation of any losses arising from the default of a participant in the system.

Margin

Margin has at least two meanings. In the futures/commodity markets, margin is a good faith deposit (of money, securities, or financial instruments) required by the futures clearing system to assure performance. In the equities markets, margin is a sum of money deposited by a customer when borrowing money from a broker to purchase shares. In this report, margin refers to the equities market concept unless otherwise specified.

Matching (or comparison, checking)

The process used by market participants before settlement of a transaction to ensure that they agree with respect to the terms of the transaction.

Marking to market

The practice of revaluing securities and financial instruments using current market prices. In some cases unsettled contracts to purchase and sell securities are marked to market and the counterparty with an as yet unrealised loss on the contract is required to transfer funds or securities equal to the value of the loss to the other counterparty.

Multilateral netting

A netting among more than two parties.

Net credit or net debit position

A participant's net debit or net credit position in funds or in a particular security is the sum of all the transfers it has received up to a particular time less the transfers it has sent; if this sum is positive, the participant is in a net credit position, if the sum is negative, it is in a net debit position. The net credit or net debit position at settlement time is called the net settlement position. These positions may be calculated on a bilateral or multilateral basis.

Netting

An agreed offsetting of mutual positions or obligations by trading partners or participants in a system. The netting reduces a large number of individual positions or obligations to a smaller number of positions. Netting may take several forms which have varying degrees of legal enforceability in the event of default of one of the parties.

Net settlement

A settlement in which a number of transactions between or among counterparties are settled on a net basis.

Net settlement system

A system in which transfer orders are settled on a net basis. It is common for such systems to distinguish between types of transfer orders and settle some, such as payment orders, on a net basis and settle others, such as securities transfer orders, on a trade-for-trade basis.

Nominee

A person or entity named by another to act on his behalf. A nominee is commonly used in a securities transaction to obtain registration and legal ownership of a security.

Novation

The satisfaction and discharge of existing contractual obligations by the substitution of new obligations.

Obligation

A duty imposed by contract or law. It is also used to describe a security or financial instrument, such as a bond or promissory note, which contains the issuer's undertaking to pay the owner.

Payment

The satisfaction and discharge of a monetary obligation by the debtor's unconditional transfer of a claim on a party agreed to by the creditor. Typically, the party is a central bank or a commercial bank.

Position netting

The netting of instructions in respect of obligations between two or more parties which neither satisfies nor discharges those original obligations. (Also referred to as payment netting in the case of payment instructions.)

Principal risk

The risk that the seller of a security delivers a security but does not receive payment or that the buyer of a security makes payment but does not receive delivery. In this event, the full principal value of the securities or funds transferred is at risk.

Provisional transfer

A conditional transfer in which one or more parties retain the right by law or agreement to rescind the transfer.

Real time

The processing of instructions on an individual basis at the time they are received rather than at some later time.

Registration

The listing of ownership of securities in the records of the issuer. This task is often performed by an official registrar/transfer agent.

Replacement cost risk

The risk that a counterparty to an outstanding transaction for completion at a future date will fail to perform on the settlement date. This failure may leave the solvent party with an unhedged or open market position or deny the solvent party unrealised gains on the position. The resulting exposure is the cost of replacing, at current market prices, the original transaction.

Same-day funds

Money balances that the recipient has a right to transfer or withdraw from an account on the day of receipt.

Settlement

The completion of a transaction, wherein the seller transfers securities or financial instruments to the buyer and the buyer transfers money to the seller. A settlement may be final or provisional.

Settlement risk

The risk that a party will default on one or more settlement obligations to its counterparties or to a settlement agent.

Settlement system

A system in which settlement takes place.

Substitution

The process of amending a contract between two parties so that a third party is interposed as an intermediary creditor/debtor between the two parties and the original contract between the two parties is satisfied and discharged.

Systemic risk

The risk that the inability of one institution to meet its obligations when due will cause other institutions to be unable to meet their obligations when due.

Trade date

The date on which a trade/bargain is executed.

Trade netting

A legally enforceable consolidation and offsetting of individual trades into net amounts of securities and money due between trading partners or among members of a clearing system. A netting of trades which is not legally enforceable is a position netting.

Trade-for-trade (gross) settlement

A settlement in which a number of transactions between counterparties are settled individually.

Trade-for-trade settlement system

A system in which each individual transfer order is settled separately.

Transfer

An act which transmits or creates an interest in a security, a financial instrument or money.

Unwind

A procedure followed in certain clearing and settlement systems in which transfers of securities and funds are settled on a net basis, at the end of the processing cycle, with all transfers provisional until all participants have discharged their settlement obligations. If a participant fails to settle, some or all of the provisional transfers involving that participant are deleted from the system and the settlement obligations from the remaining transfers are then recalculated. Such a procedure has the effect of allocating liquidity pressures and losses from the failure to settle to the counterparties of the participant that fails to settle.

Variation margin

The amount which is paid by a counterparty to reduce replacement cost exposures resulting from changes in market prices, following the revaluation of securities or financial instruments that are the subject of unsettled trades.

Annex 3

Key features of securities transfer systems in the G-10 countries		
	Belgium	**Canada**
	A. Structure	
A.1. Name of system	National Bank of Belgium (NBB) Clearing system	Securities Settlement Service of the Canadian Depository for Securities (CDS)
A.2. Date operations commenced	January 1991	1981 for equities; 1989 for government debt securities
A.3. Instruments	TBs and long-term government bonds (OLOs), CP; in Belgian francs and ECUs	Debt securities, including government issues and "strips"; equities
A.4. Ownership	NBB	Six major banks; five trust companies; Investment Dealers' Association, Toronto and Montreal Exchanges - in three equal groups
A.5. Operator	NBB	CDS
A.6. Securities depository	NBB	CDS
A.7. Settlement bank for funds	NBB (central bank)	Royal Bank of Canada
A.8. Participants	Financial institutions and brokers established in Belgium and Luxembourg; Cedel, Euroclear	Regulated financial institutions (incl. dealers, banks, trust companies, insurance companies, clearing and depository companies); investment institutions (credit unions, unit trusts, pension funds, etc.)
A.9. Separation of accounts	Customer securities are separately identified (en bloc) in the system's records	Customer securities segregated en bloc by dealers only
A.10. Overseer or regulator	Theoretically by government representative; in fact by audit of central bank	No federal regulatory agency; but Office of the Superintendent of Financial Institutions has been developing Memorandum of Understanding with provincial securities commissions and CDS to establish cooperative regulatory arrangements
	B. Trade confirmation and trade netting	
B.1. Confirmation of terms	Dual confirmation; operated by NBB Clearing	Single reporting from seller (or dealer, if one side is non-dealer), with confirmation from other side (which may well be confirmation by absence of correction)

Key features of securities transfer systems in the G-10 countries		
	Belgium	**Canada**
	B. Trade confirmation and trade netting (contd.)	
B.2. Trade netting	Multilateral netting of trades	Gross transfers of securities; payments netted multilaterally
	C. Securities transfers	
C.1. Initiation	Transfers across accounts initiated by NBB Clearing	Sender of security initiates transfer
C.2. Basis and timing	Once a day, net, end of afternoon	Two batch cycles, one overnight, one at noon (to sweep up the night's fails, etc.). Gross book-entry transfer
C.3. Finality	Unconditional transfers	Conditional on receipt of payment (by 11 a.m. on the morning following overnight cycle, or 2.30 afternoon cycle)
C.4. Securities overdrafts	No	No
C.5. Borrowing/lending	Bilateral lending possible within system. Automatic bond lending provided by pool of lenders; return of bonds guaranteed by NBB Clearing	System provides facility for pledging, but lending arrangements made outside system
C.6. Limits on borrowing	10% of amount of issue for all borrowers, 5% per participant; collateral must amount to 110% of market value of borrowed securities	(Not within system)
	D. Funds transfers	
D.1. Initiation	NBB Clearing initiates	Initiated by the Payment Exchange process of the settlement cycles
D.2. Type of funds	Cash accounts at central banks	Payments made to CDS by certified cheque drawn on a payment agency (transferring the payment obligation to that agency, a direct clearer with settlement account at Bank of Canada: limits may apply) by 11 a.m. (or 2.30 p.m. for noon cycle); CDS makes payment by uncertified cheque at 3.45 p.m. (4.15 p.m.)
D.3. Settlement	Net, end of afternoon	Cheques are cleared for settlement at Bank of Canada next day, and backdated to day the transfer was initiated (S)
D.4. Separation	Clearing combined with that of other funds transfers	Cleared and settled with all other payment items
D.5. Unwinding	Transfers may be reversed in case of default of cash, by NBB Clearing	Funds themselves can only be unwound by Canadian Payments Association in event of agency's default

Key features of securities transfer systems in the G-10 countries		
	Belgium	**Canada**
	D. Funds transfers (contd.)	
D.6. Credit facilities	Central bank offers credit facilities	No credit provided by system
D.7. Credit limits	Limits vary from bank to bank, collateral is taken	-
	E. Linkages between final transfers of securities and funds	
E.1. Synchronisation	Final transfers occur simultaneously at end of afternoon	Not simultaneous
E.2. Order of transfers	-	Securities first; final funds transfer next day, backdated to day of transfer. Securities received may be redelivered; but any received cannot be withdrawn from system until following day (on payment finality)
E.3. Consequence of payment failure	If participant fails, all its securities and cash transfers are cancelled	CDS seeks to complete all bargains including defaulter's. It may (in extremis) cancel some of the defaulter's bargains to remain within its constraints: a guaranteed credit line collateralised by the assets in the participant fund, and any further monies which could be raised using this collateral. These monies would be recovered by sale of defaulter's purchased stock and assets in the participant fund (or in other participant funds) and a claim on other participants in the participant fund(s) affected, plus a loss-sharing arrangement. Through its charge over purchased assets, CDS may allow a defaulting participant until close on S+1 to satisfy a payment obligation

Key features of securities transfer systems in the G-10 countries		
	France	
	A. Structure	
A.1. Name of system	Saturne	RELIT (REglement-LIvraison de Titres)
A.2. Date operations commenced	September 1988	October 1990
A.3. Instruments	TBs, CDs, medium-term notes	All securities quoted on the stock exchange (shares, bonds, government bonds), non-quoted securities for primary and grey market SICAVs (mutual funds)
A.4. Ownership	A department of the Bank of France	A non-profit-making intercompany syndicate (GIE RELIT) has been set up with three tasks: developing and testing the system, informing participants of project requirements, financing the whole project
A.5. Operator	Bank of France	Operational responsibility rests with SICOVAM (the French central securities depository) and Société des Bourses Françaises (SBF)
A.6. Securities depository	Bank of France	SICOVAM
A.7. Settlement bank for funds	Bank of France	Bank of France
A.8. Participants	Banks, securities houses, brokers, insurance companies, pension funds, foreign central banks, international financial institutions, Cedel/Euroclear	Commercial banks, securities houses, stockbrokers
A.9. Separation of accounts	Customer securities can be separately identified by system en bloc (or a series of blocks) or individually at participant's discretion	The securities holdings of participants include securities held for customers as well as the participant's own holdings. The customers' securities can be separately identified in the system's records
A.10. Overseer or regulator	No official oversight; Bank of France provides day-to-day management oversight	Société des Bourses Françaises (SBF) and Conseil des Bourses de Valeurs CBV)

Key features of securities transfer systems in the G-10 countries		
	France	
	B. Trade confirmation and trade netting	
B.1. Confirmation of terms	Dual confirmation, operated by Saturne, in real time	Four sub-systems: ISB (Inter-Société des Bourses) which handles the clearing house function for broker-to-broker trade comparisons and netting; SBI (Société de Bourse-Intermédiaires) for bank-to-broker transactions, including trade confirmation and affirmation; SLAB (Service des Livraisons par Accord Bilatéral) for matching of trades made off - exchange by all participants (over-the-counter); "Dénouement", or final settlement and accounting, guaranteeing DVP and applicable to all market participants
B.2. Trade netting	No netting	Only in ISB sub-system
	C. Securities transfers	
C.1. Initiation	Saturne initiates transfers	SICOVAM
C.2. Basis and timing	At least four clearing processes per day; trade-by-trade processing. If seller cannot deliver matched bargain, his account at Bank of France automatically debited with penalty amount to buyer's account	From 8 a.m. to 12.30 p.m. on a real-time basis for free-of-payment transfers. Between 2 and 4 p.m. batch processing of against-payment transfers for those trades settled on T+3.
C.3. Finality	Transfers of securities are provisional (see E.3 for circumstances under which transfers would not be completed)	Transfers of securities are provisional (see E.3 for circumstances under which transfers would not be completed)
C.4. Securities overdrafts	No	No
C.5. Borrowing/lending	No provision by system; but sellers may borrow OTC to satisfy temporary default	Only in ISB sub-system (i.e. only for broker-to-broker trades): the clearing house may borrow securities in case of temporary default
C.6. Limits on borrowing	-	Lenders set their own limits
	D. Funds transfers	
D.1. Initiation	Saturne initiates process	Transfers are initiated by the sub-system "Denouement"
D.2. Type of funds	Cash accounts at central bank	Cash accounts at central bank
D.3. Settlement	After each clearing process	Net transfers at end of afternoon
D.4. Separation	Settled with all other transfers	Settled with all other transfers

Key features of securities transfer systems in the G-10 countries		
	France	
	D. Funds transfers (contd.)	
D.5. Unwinding	If settlement account in debit after the last clearing process, Bank of France may arrange repo for defaulter; securities transfer cancelled, unless securities on-delivered free for same value date	Funds transfers are final
D.6. Credit facilities	See above	No credit facilities provided by the system, but Bank of France may accept an overnight debit against collateral
D.7. Credit limits	-	See above
	E. Linkages between final transfers of securities and funds	
E.1. Synchronisation	No	Prior to the beginning of the settlement process, each participant gives SICOVAM an undertaking to provide its cash account at the Bank of France with sufficient cover to meet a certain maximum net debit position. SICOVAM then begins its settlement process. At the end of the process SICOVAM informs the Bank of France of the net funds debit or credit position of each participant
E.2. Order of transfers	Securities may occur first; funds after each clearing process with same value date as securities transfer. Free transfers may be made before final funds transfer	Securities transfers provisional until Bank of France verifies that sufficient provisions in fact exist to cover all net debit positions (see E.3)
E.3. Consequences of payment failure	Failure to meet part of final payments leads to partial reversal of payment instructions, and cancellation of corresponding securities deliveries	If a participant has insufficient cash balances in its account (and insufficient collateral to support a credit extension), the Bank of France asks SICOVAM to reinitiate the settlement process, imposing a new (lower) limit on the participant's net funds debit position based on its actual balances

Key features of securities transfer systems in the G-10 countries		
	Germany	**Japan**
	A. Structure	
A.1. Name of system	Deutscher Kassenverein AG (DKV)	"DVP-NET" (development of BoJ-NET)
A.2. Date operations commenced	1937 (legal arrangement for book entries); 1969/1970 (implementation of DVP system)	In planning stage
A.3. Instruments	Listed fixed interest and dividend-bearing securities	Japanese government securities (registered and book-entry)
	Stockholders (Banks)	Bank of Japan
	DKV (seven branches)	Bank of Japan
A.4. Ownership	DKV	Bank of Japan
A.5. Operator	Central bank	Bank of Japan
A.8. Participants	All banks active in trading/custody of securities; securities brokers and trading firms in respect of own holdings. Admission criteria must be met	Banks (full access); securities houses, insurance companies etc. (limited access - indirect through bank for funds settlement facilities). Some major securities houses with funds accounts at Bank of Japan may conduct principal transactions through these accounts
A.9. Separation of accounts	DKV holds and identifies customer securities separately or collectively; the customer's rights are fully protected, and his securities cannot be pledged for liabilities of the intermediary	System will not separately identify customer holdings unless they are registered securities
A.10. Overseer or regulator	DKV is a specialised bank subject to official supervision by Federal Banking Supervisory Office	Bank of Japan provides day-to-day management oversight
	B. Trade confirmation and trade netting	
B.1. Confirmation of terms	1. DKV receives contract notes which are confirmed by both counterparties. 2. Holders and recipients of securities may instruct DKV to transfer stock, free or for payment; DKV tries to carry out transfers for payment only if they match	Transferee confirms
B.2. Trade netting	No netting of trades, but optimisation of delivery obligations does occur by the official broker after stock exchange session	Real-time for gross transfers, designated time for net transfers
	C. Securities transfers	
C.1. Initiation	Seller initiates transfer directly or by confirming delivery lists	Transferor sends instructions

Key features of securities transfer systems in the G-10 countries		
	Germany	**Japan**
	C. Securities transfers (contd.)	
C.2. Basis and timing	One batch cycle at 12.45 p.m. daily, gross (trade-by-trade) delivery	Either real-time gross transfers, or batch process at 3 p.m.
C.3. Finality	Transfers become legally binding only when payment finally booked and securities account statement delivered, normally at 2 p.m.	Provided securities in account, Bank of Japan will effect transfer; if not, transferor must borrow or cancel transfers (with consent of transferees). If inadequate funds, BoJ may decide to request cancellation. For real-time transfers, no transfer unless both sides adequately in credit
C.4. Securities overdrafts	No	No
C.5. Borrowing/lending	DKV arranges borrowing/lending between participants, but does not itself lend or borrow. Consortium of approx. twenty banks provides guarantees for any losses up to DM 50 million. Bilateral lending between individual participants also occurs without DKV being involved	No central facility
C.6. Limits on borrowing	10% of issue (fixed interest) or widely held stock (equity) in total, 5%/1% respectively per participant. Borrowers must also post collateral with DKV (cash or securities at a discount)	-
	D. Funds transfers	
D.1. Initiation	DKV instructs Land central banks to debit/credit participants' accounts	See securities transfers
D.2. Type of funds	Deposits at central bank	Deposits at central bank
D.3. Settlement	Net daily at 12.45 p.m.	Irrevocable transfer either real-time or batch at 3 p.m. (gross or net respectively)
D.4. Separation	Separate settlement for all securities transfers	Batch process will combine with other transfers. Real-time would be separate
D.5. Unwinding	Transfer orders not executed until cover available for all payments, and may only be withdrawn by DKV; cannot be reversed once executed	Irrevocable once settled
D.6. Credit facilities	No credit provided by securities settlement system. In addition to balances in giro accounts with the central bank available Lombard facilities may be used as cover	Bank of Japan may extend credit to banks in extreme cases; but no explicit credit facilities
D.7. Credit limits	-	Against collateral

Key features of securities transfer systems in the G-10 countries		
	Germany	**Japan**
	E. Linkages between final transfers of securities and funds	
E.1. Synchronisation	Theoretically simultaneous (but securities account statements not delivered until 2 p.m. though payment final at 12.45 p.m.)	Both real-time and batch simultaneous
E.2. Order of transfers	Payment first, though seller cannot then stop securities transfer. Funds are final and can be moved before securities account statement is delivered	-
E.3. Consequences of payment failure	If a participant fails, all its securities and cash transfers are taken out of settlement. But if a moratorium is declared, the banking industry guarantee fund responsible for the participant may take the place of the defaulter	Cancellation of corresponding securities deliveries

Key features of securities transfer systems in the G-10 countries			
		Italy	
		A. Structure	
A.1.	Name of system	"liquidazione dei titoli"	"conti accentrati in titoli"
A.2.	Date operations commenced	The most recent adaptation of the procedures dates from May 1989	September 1990
A.3.	Instruments	All typed of securities (shares, bonds, govt. ECU securities)	TBs, ECU TBs, Treasury certificates and bonds
A.4.	Ownership	Bank of Italy	Bank of Italy
A.5.	Operator	Bank of Italy (and CED-Borsa, operator of comparison system)	Bank of Italy
A.6.	Securities depository	Monte Titoli for shares and corporate bonds; Bank of Italy for government securities	Bank of Italy
A.7.	Settlement bank for funds	Bank of Italy	See D.1
A.8.	Participants	Credit institutions, brokers, commission dealers, securities investment firms	Banks (incl. local branches of foreign banks), financial institutions, brokers, international clearing houses (Cedel/Euroclear), securities investment firms. All participants in "liquidazione titoli" must also participate in this procedure
A.9.	Separation of accounts	Since January 1992 the system allows participants to send separate notifications for customers' transactions	Since January 1992 every participant holds two accounts, one for his own holdings and one for his customers' holdings
A.10.	Overseer or regulator	Oversight by Bank of Italy; participants supervised by Bank of Italy or CONSOB (brokers/dealers)	Bank of Italy manages and supervises
		B. Trade confirmation and trade netting	
B.1.	Confirmation of terms	Dual confirmation, operated by the "liquidazione titoli" procedures	Single reporting by transferor
B.2.	Trade netting	Multilateral netting of trades	Continuous, gross processing; it is also linked with "liquidazione", so that the multilateral net balance is entered into this system
		C. Securities transfers	
C.1.	Initiation	Bank of Italy performs automatic debits and credits to accounts at central securities depositories	By transferor's instruction
C.2.	Basis and timing	On settlement day	Continuous transfers (8 a.m. - 4.30 p.m.)

Key features of securities transfer systems in the G-10 countries		
	Italy	
	C. Securities transfers (contd.)	
C.3. Finality	Final transfers	Final, unless specifically requested to be conditional by transferor (transfer is then effected, but transferee denied access to securities for a number of days)
C.4. Securities overdrafts	No	No
C.5. Borrowing/lending	No provision by the system at present	No provision by the system
C.6. Limits on borrowing	-	-
	D. Funds transfers	
D.1. Initiation	Bank of Italy	No linked payment system; uses national clearing system or Bank of Italy's continuous settlement system
D.2. Type of funds	Deposits at Bank of Italy. Non-bank participants in system must use settlement banks, which alone have central bank accounts	See D.1
D.3. Settlement	Multilateral net settlement at end-of-day. Debit balances first, then credits	See D.1
D.4. Separation	Settled with other funds transfers	See D.1
D.5. Unwinding	Once cash items fed through central bank settlement, no reversal	Same as column on left
D.6. Credit facilities	No system provision (though Bank of Italy is lender of last resort to the banks)	Same as column on left
D.7. Credit limits	No provision by the system	Same as column on left
	E. Linkages between final transfers of securities and funds	
E.1. Synchronisation	Virtually simultaneous, as securities balances (debit and credit) are all settled on the settlement day value date, whereas cash balances are settled on the settlement day	No. Payment is not linked in the system
E.2. Order of transfers	Securities debits, then cash debits and credits, then securities credits (securities debits on S-1 on daily rolling settlement, on S-2 for monthly account settlement). Securities deliveries (to participants) occur after cash transfers	Either may occur first

Key features of securities transfer systems in the G-10 countries		
	Italy	
	E. Linkages between final transfers of securities and funds (contd.)	
E.3. Consequences of payment failure	Stockbrokers' Executive Committee performs defaulter's bargains, recalculates (at today's rates) the participant's position. Any losses not offset are covered by certificate of credit from Committee giving participants claim against defaulter's assets	No provision for unwinding transfer orders

Key features of securities transfer systems in the G-10 countries		
	Netherlands	
	A. Structure	
A.1. Name of systems	Effectenclearing (Securities Clearing Corporation)	Clearing Institute of Netherlands Bank
A.2. Date operations commenced	1963	1986
A.3. Instruments	All types of securities traded at the Amsterdam Stock Exchange (ASE), e.g. equities, corporate bonds, government bonds, warrants	CP, CDs, MTNs
A.4. Ownership	ASE (100%)	Netherlands Bank
A.5. Operator	Effectenclearing	Netherlands Bank
A.6. Securities depository	Necigef	Netherlands Bank
A.7. Settlement bank for funds	Kas-Associatie	Netherlands Bank
A.8. Participants	Banks, securities houses (brokers), jobbers. Not institutional investors. ASE members only	Banks, money brokers with central bank credit facility, Euroclear, Cedel
A.9. Separation of accounts	Client accounts not separated from principal accounts in participants' holdings at Necigef	Not required and no individual client records kept centrally
A.10. Overseer or regulator	Minister of Finance, delegated to the "Securities Board", which delegated day-to-day supervision to ASE	Central bank operates system, but no official external oversight
	B. Trade confirmation and trade netting	
B.1. Confirmation of terms	ASE's Trade Support System (TSS) gives trade confirmation on trade date. Effectenclearing confirms trades on T+1	(CP etc.). Dual confirmation. No pre-netting of trades
B.2. Trade netting	Multilateral daily netting by Effectenclearing of both securities and cash	Multilateral netting of both securities and payments
	C. Securities transfers	
C.1. Initiation	Effectenclearing (if authorised) or seller initiates transfer of the securities, in the books of Necigef to account of Effectenclearing. Effectenclearing credits buyer's account	Participants instructed by market traders following trade
C.2. Basis and timing	Net transfer once a day, early morning	MTNs 9 a.m.; CP and CDs 1 p.m. All net
C.3. Finality	Transfers to Effectenclearing, and from Effectenclearing to buyers, are final	Final transfers

Key features of securities transfer systems in the G-10 countries			
		Netherlands	
		C. Securities transfers (contd.)	
C.4.	Securities overdrafts	No	No
C.5.	Borrowing/lending	No centralised provision for securities borrowing and lending at present, but under discussion	No borrowing/lending facilities
C.6.	Limits on borrowing	-	-
		D. Funds transfers	
D.1.	Initiation	Transfer initiated by Effectenclearing simultaneously with securities transfer, across accounts at Kas-Associatie	Participants instruct Clearing Institute to debit cash account at central bank; transaction only executed when adequate funds to do so
D.2.	Type of funds	Deposits with Kas-Associatie (60% subsidiary of ASE)	Central bank deposit
D.3.	Settlement	One batch settlement of net amount, in morning	Net batch settlements at 9 a.m., 1 p.m.
D.4.	Separation	Transfer uses same account as other money transfers of these clients	"Real-time" funds transfers precede securities transfer (but availability of securities checked)
D.5.	Unwinding	Transfers final	Transfers final
D.6.	Credit facilities	Kas-Associatie provides customers with usual commercial credit facilities	Credit facilities at central bank
D.7.	Credit limits	Usual credit limits/caps. Collateral required from broker clients of Kas-Associatie which are indirect participants of Necigef	Limited by collateral/normal central bank rules; in Dutch guilders only
		E. Linkages between final transfers of securities and funds	
E.1.	Synchronisation	Effectenclearing "synchronises": deliveries to Effectenclearing at Necigef first; Effectenclearing delivers to buyers only when payment assured by Kas-Associatie	Virtually simultaneous
E.2.	Order of transfers	Transfers unconditional (see above). Securities transfer (to Effectenclearing) final	-

Key features of securities transfer systems in the G-10 countries		
	Netherlands	
	E. Linkages between final transfers of securities and funds (contd.)	
E.3. Consequences of payment failure	Effectenclearing guarantees transactions and will substitute for failing payer. If member cannot meet obligation to Effectenclearing, Effectenclearing can rely on guarantee fund. If participant fails to make funds transfer, delivery of corresponding securities to it will not take place and securities will be booked in the account of ASE at Kas-Associatie	If inadequate funds on cash account, Clearing Institute will determine which transactions to withdraw and start new netting procedure

Key features of securities transfer systems in the G-10 countries			
		Sweden	**Switzerland**
		A. Structure	
A.1.	Name of system	The VP system	SEGA (Swiss Securities Clearing Corporation
A.2.	Date operations commenced	The implementation of the book-entry system started in late 1989 and was completed in 1990	1982 (DVP mechanism)
A.3.	Instruments	Equities, bonds	Shares, bonds, notes, warrants
A.4.	Ownership	Owned and operated by Värdepapperscentralen AB (VPC). VPC is jointly owned by the Government (50%), by the issuing companies (25%), and by the stockbrokers (25%)	Some 170 Swiss banks
A.5.	Operator	VPC	SEGA
A.6.	Securities depository	VPC	SEGA
A.7.	Settlement bank for funds	Sveriges Riksbank	Swiss National Bank
A.8.	Participants	Stockbrokers, banks (acting as stockbrokers), one insurance company	Banks subject to Swiss Banking Law
A.9.	Separation of accounts	Customers' holdings are identified individually	System's records do not individually identify client securities
A.10.	Overseer or regulator	The Financial Supervisory Authority (which also supervises participants individually)	No official oversight
		B. Trade confirmation and trade netting	
B.1.	Confirmation of terms	Confirmation by both parties required	"Automatic Trade Processing System" of Association Tripartite des Bourses (ATB) confirms trades; ATB is a cooperative venture involving Zurich, Basle and Geneva Exchanges
B.2.	Trade netting	Multilateral netting of payments	Trades are not netted
		C. Securities transfers	
C.1.	Initiation	Transfers initiated and effected by the VPC immediately after the transfer of payments through the interbank clearing at the Riksbank. The latter takes place at 12 noon	Both sides send SEGA DVP/PVD instructions
C.2.	Basis and timing	Net transfer once a day, shortly after 12 noon	Transfers processed in batch once a day, net, on T+2

Key features of securities transfer systems in the G-10 countries		
	Sweden	**Switzerland**
	C. Securities transfers (contd.)	
C.3. Finality	Transfers are final	Transfers provisional pending completion of funds transfers - by 11 a.m. on T+3 (S+1)
C.4. Securities overdrafts	No	No
C.5. Borrowing/lending	VPC provides no borrowing/lending facility; system supports borrowing/lending arrangements conducted outside system	No borrowing/lending facilities
C.6. Limits on borrowing	-	-
	D. Funds transfers	
D.1. Initiation	At 10 a.m. on settlement day stockbrokers and other non-bank participants are requested to place a bank guarantee in the VPC. At 11 a.m. every bank must have sufficient funds - or a sufficient credit line - in the Riksbank, covering both their own debts and payments due from the stockbrokers they have guaranteed to pay for. At 12 noon funds transfers are initiated by the VPC over accounts in the Riksbank	See securities transfers
D.2. Type of funds	Deposits at the Riksbank	Deposits at Swiss National Bank
D.3. Settlement	Net settlement, once a day (see above)	On T+3, until 11 a.m., net
D.4. Separation	Settlement integrated with the general interbank clearing at noon	Settlement combined with other funds transfers executed across accounts at SNB
D.5. Unwinding	Transfers guaranteed and irrevocable when the participating banks have proven their availability of funds at 11 a.m., i.e. one hour before settlement	In principle, SNB could unwind if participant could not cover debit balance on account by 11 a.m.
D.6. Credit facilities	No credit facilities exist within the VP system or the VPC in itself. Banks can borrow intraday and overnight in the Riksbank, thereby creating an indirect credit facility in the system	SNB offers collateralised credit lines (lombard credit) which may be drawn down for this purpose, at a penalty rate
D.7. Credit limits	See above. Banks' borrowing in the Riksbank - intraday as well as overnight - will be collateralised for amounts exceeding certain limits. This will be implemented during 1992	Limits set by SNB

Key features of securities transfer systems in the G-10 countries		
	Sweden	**Switzerland**
	E. Linkages between final transfers of securities and funds	
E.1. Synchronisation	Final transfers virtually simultaneous	Transfers of securities provisional pending funds transfers (and therefore DVP is "simultaneous")
E.2. Order of transfers	Payment first	Securities first. Transfer not final until funds final
E.3. Consequences of payment failure	If a stockbroker is unable to provide a bank guarantee for its payments by 10 a.m. on settlement day or if a bank is unable to provide enough funds or central bank credit by 11 a.m. on settlement day: the party's trades have to be cancelled and settlement recalculated. In other words, the VP system does not provide any payment guarantee by itself and does not act as central counterparty	All funds transfers unwound if participant fails to make final payment by 11 a.m. T+3 and if amount of payment exceeds collateral posted by participant. If payment fails, all securities transfers to and from participant reversed

Key features of securities transfer systems in the G-10 countries		
	United Kingdom	
	A. Structure	
A.1. Name of system	CGO (Central Gilts Office)	TAURUS (Transfer and Automated Registration of Uncertificated Securities)
A.2. Date operations commenced	1986	Planned for 1993
A.3. Instruments	Stocks registered at Bank of England	Equities and fixed interest corporate securities
A.4. Ownership	Office of Bank of England, responsible to JMC, a joint Bank of England and Stock Exchange committee	London Stock Exchange
A.5. Operator	CGO	London Stock Exchange
A.6. Securities depository	CGO	TAURUS
A.7. Settlement bank for funds	Intraday claims on assured payment (or guarantor) banks; end-of-day settlement at Bank of England	Intraday claims on CHAPS settlement banks; end-of-day settlement at Bank of England
A.8. Participants	All participants in gilt-edged market, including market-makers, brokers, discount houses, banks nominee companies	Banks, brokers, market-makers, custodians, institutional investors
A.9. Separation of accounts	Separation not required, unless under Financial Services Act. CGO cannot identify owners of participants' stock	Operator will be able to separately identify client and principal ***transactions*** not ***holdings***
A.10. Overseer or regulator	CGO governed by Stock Transfer Act of 1982; no formal external supervision; JMC provides oversight	Operator provides day-to-day supervision; DTI oversees operator
	B. Trade confirmation and trade netting	
B.1. Confirmation of terms	Dual confirmation required, through CGO (and "checking")	Dual confirmation through "checking"; operator matches deal and notifies account controllers (TACs) to obtain acceptance of bargain
B.2. Trade netting	No netting of securities trades	Gross transfers, no netting of stock; payments, however, netted multilaterally
	C. Securities transfers	
C.1. Initiation	Sender inputs details, receiver confirms transfer, and settlement effected	After confirmation, and acceptance of transfer by relevant TACs, operator will effect transfer on receipt of payment instructions
C.2. Basis and timing	Continual processing of transfer input, usually on T+1	Once a day batch processing, gross transfer; morning

Key features of securities transfer systems in the G-10 countries		
	United Kingdom	
	C. Securities transfers (contd.)	
C.3. Finality	Transfers final, though title on register transferred S+2	Unconditional and final (with very limited exceptions)
C.4. Securities overdrafts	No (unless in redressing "bad deliveries")	No
C.5. Borrowing/lending	No central facility, but brokers, banks, etc., may agree borrowing between themselves. Any guarantees mutually agreed	No central service, but free transfers can be made within system
C.6. Limits on borrowing	No system limits. Intraday assurance through assured payment instruction; overnight loans secured typically by other gilts pledged	No central limits; prudential controls by Securities and Futures Authority
	D. Funds transfers	
D.1. Initiation	Delivery instruction generates payment obligation on sender's settlement bank	Operator calculates net settlement amount (S-1), initiates transfer on S (early morning) after consulting banks
D.2. Type of funds	Assured payments, i.e. irrevocable payment promises of settlement bank. (Intraday claim on settlement bank)	Assured payments, i.e. overnight bank guarantee S-1, payment undertaking on morning of S (through CHAPS, i.e. an irrevocable instruction)
D.3. Settlement	One net settlement at end-of-day across Bank of England accounts	Single net settlement in end-of-day CHAPS clearing at Bank of England
D.4. Separation	Separate from other clearings	Combined with other clearings at Bank of England
D.5. Unwinding	No reversal of transactions; claims on another settlement bank only	Irrevocable instruction, cannot be unwound
D.6. Credit facilities	Through settlement banks only; not through operator	No system facilities
D.7. Credit limits	No system limits; banks set customer limits, and may charge stock in member's CGO account	-
	E. Linkages between final transfers of securities and funds	
E.1. Synchronisation	Not simultaneous	Not simultaneous
E.2. Order of transfers	Securities first. Onward transfers possible before final payment made, but only against new payment. No free deliveries	Payment guarantees precede securities transfer, with final payment at end-of-day. Multiple transfers within single day's batch possible, each definitive; but buyer's bank will have incurred CHAPS obligation

Key features of securities transfer systems in the G-10 countries		
	United Kingdom	
	E. Linkages between final transfers of securities and funds (contd.)	
E.3. Consequences of payment failure	No unwind; failure of member does not affect settlement banks' obligations to one another. If a bank failed, bilateral net between banks would be calculated	No unwind; either bank incurs payment obligation or invokes "liquidity pot", ensuring all deliveries and payments to market counterparties completed

Key features of securities transfer systems in the G-10 countries			
		United States	
		A. Structure	
A.1.	Name of system	Fedwire (Federal Reserve Book-Entry Transfer System)	Depository Trust Company (DTC) Next-Day Funds Settlement System
A.2.	Date operations commenced	1967	1973
A.3.	Instruments	US dollar-denominated securities of the Treasury, federal agencies and international organisations	Principally equities, corporate debt and municipal securities, CDs, warrants and certain government securities
A.4.	Ownership	The twelve Federal Reserve Banks	NY and American Stock Exchanges, National Association of Securities Dealers and DTC's participants
A.5.	Operator	Federal Reserve	DTC
A.6.	Securities depository	Federal Reserve Banks	DTC
A.7.	Settlement bank for funds	Federal Reserve Banks	New York clearing house banks
A.8.	Participants	Commercial banks, thrift institutions, federal agencies and international organisations	Primarily banks and brokers/dealers, but also clearing corporations, insurance companies, pension funds, etc.
A.9.	Separation of accounts	System can support a limited number of segregated accounts, but does not attribute special significance to them or require segregation	System can support and identify customer securities separately, either as a bloc or individually
A.10	Overseer or regulator	Federal Reserve, overseen by the Board of Governors. US Treasury also oversees Fedwire operation as regards transfer and safekeeping of US Treasuries	Securities and Exchange Commission oversight as "clearing agency", NY State Banking Department as trust company; Federal Reserve Bank of NY as a member bank
		B. Trade confirmation and trade netting	
B.1.	Confirmation of terms	Government Securities Clearing Corporation (GSCC) compares trades between its members which includes most active dealers	May settle on sender's instruction. But most compared through National Securities Clearing Corporation (NSCC), or DTC's Institutional Delivery (ID) system (confirmation details sent to institutional investors)
B.2.	Trade netting	No netting within Fedwire. GSCC multilaterally nets trades among its members; these are then settled net on Fedwire	Most NSCC - compared trades eligible for Continuous Net Settlement (CNS) service - mulitlateral net, substituting NSCC as central counterparty to each trade
		C. Securities transfers	
C.1.	Initiation	Sender of security initiates transfer	DTC processes transactions fed in through NSCC interface, ID system or other participant links

Key features of securities transfer systems in the G-10 countries		
	United States	
	C. Securities transfers (contd.)	
C.2. Basis and timing	Gross real-time processing 8.30 a.m. - 2.30 p.m. (Eastern time) plus 30 minutes to adjust for errors. Times may be extended for high volumes, etc.	Transfers are trade-by-trade. Both CNS and ID transfers begin in evening and night of T+4, continue on T+5 until approx. 1.30 p.m.
C.3. Finality	Transfers final when processed. Federal Reserve cannot reverse them	Transfers generally provisional and may be unwound by DTC if payments are not received as required at end of day. See also E.1
C.4. Securities overdrafts	No. Transfer will not be effected if inadequate balance on account	No. Delivery orders recycled if balance on securities account inadequate
C.5. Borrowing/lending	No central facility provided within system	DTC provides no borrowing/lending facility; system supports borrowing/lending arrangements outside system
C.6. Limits on borrowing	-	-
	D. Funds transfers	
D.1. Initiation	In a DVP transfer, message sent by securities deliverer will also initiate a debit against the funds account of the receiver	Sender of security may specify delivery against payment - in which case DTC credits his money account at DTC and debits receiver's account (all NSCC CNS deliveries are free of payment)
D.2. Type of funds	Deposits at Federal Reserve	Deposits at DTC
D.3. Settlement	Real-time gross settlement simultaneous with securities transfer. Final on transfer	Debits and credits are posted continuously, for settlement of a final net balance between 4.30 and 5.30 p.m. Settlement by certified cheque on NY clearing bank (DTC's payments by draft). Next-day funds
D.4. Separation	-	Combined with other transfers within DTC related to dividends, interest and principal payments, etc.
D.5. Unwinding	-	If DTC exercises its right to unwind a securities transfer that was against payment, the funds transfer would also be unwound
D.6. Credit facilities	No central credit explicitly, though intraday overdrafts at Federal Reserve are allowed. Frequent and material overdrafts must be collateralised	No central credit facility, though supports pledging of securities to third parties for credit

Key features of securities transfer systems in the G-10 countries		
	United States	
	D. Funds transfers (contd.)	
D.7. Credit limits	Limits applied, but not binding at time of transfer. Intraday overdrafts limited by net debit cap (monitored after the fact), or (if frequent and material) by amount of collateral pledged	-
	E. Linkages between final transfers of securities and funds	
E.1. Synchronisation	Simultaneous and continuous	Generally simultaneous. Securities transfers are final when the receiver settles its net funds debit position at the end of the day. But if receiver retransfers the security (other than to NSCC) or withdraws the security prior to the end-of-day funds settlement, the initial securities transfer is deemed final at that earlier time
E.2. Order of transfers	-	As noted in E.1, in some cases final securities transfers (deliveries) may precede final funds transfers (payments)
E.3. Consequences of payment failure	-	DTC is entitled to unwind provisional transfers (either all transfers by the participant or enough to eliminate its net debit position); or to complete the transfers and sell sufficient securities to cover the net debit position

Key features of securities transfer systems in the G-10 countries		
	International Clearers	
	A. Structure	
A.1. Name of system	Centrale de Livraison de Valeurs Mobilières S.A. (Cedel)	Euroclear
A.2. Date operations commenced	1970	1968
A.3. Instruments	Full range of international and domestic securities	Full range of international and domestic securities
A.4. Ownership	Financial institutions	Financial institutions
A.5. Operator	Cedel (based in Luxembourg)	Euroclear Clearance System Société Coopérative, operated under contract by Morgan Guaranty Trust Co. of New York, Brussels (special unit called Euroclear Operations Centre)
A.6. Securities depository	Securities deposited with various depository banks (or domestic central securities depositories)	Securities deposited with various depository banks (or domestic central securities depositories)
A.7. Settlement bank for funds	Cash correspondent bank(s) in country of each currency used	Cash correspondent bank(s) in country of each currency used
A.8. Participants	Banks, securities companies	Banks, securities companies
A.9. Separation of accounts	System can support multiple accounts to facilitate segregation. Securities held in fungible or non-fungible form	System can support multiple accounts to facilitate segregation. Securities held on a fungible basis
A.10. Overseer or regulator	Supervise by Institut Monétaire Luxembourgeois as "professional depository for securities", a non-bank financial institution	Morgan Guaranty Brussels is supervised by the Commission Bancaire (Brussels), Morgan Guaranty Trust Co. of New York by the Federal Reserve System and the New York State Superintendent of Banks
	B. Trade confirmation and trade netting	
B.1. Confirmation of terms	Instructions can be matched and confirmed through ACE system, developed jointly by AIBD (now ISMA), Cedel and Euroclear	Instructions can be matched and confirmed through ACE system, developed jointly by AIBD (now ISMA), Cedel and Euroclear
B.2. Trade netting	No netting. Settlement of securities and cash on a gross trade-by-trade basis	No netting. Settlement of securities and cash on a gross trade-by-trade basis
	C. Securities transfers	
C.1. Initiation	Matched instructions are passed into settlement process by Cedel	Matched instructions are passed into settlement process by Euroclear Operations Centre

Key features of securities transfer systems in the G-10 countries		
	International Clearers	
	C. Securities transfers (contd.)	
C.2. Basis and timing	Cut-off time for settlement instructions is 11 a.m. Luxembourg time, whether sent by mail, telex, S.W.I.F.T. or Cedel's proprietary network. Matched instructions entered into automated settlement process starting around noon on settlement date (move to overnight processing planned). Gross transfers executed in batch program	Cut-off time for settlement instructions is 10 a.m. Brussels time if sent by mail, telex or S.W.I.F.T. and 7.45 p.m. if sent by Euroclear proprietary network. Matched instructions are entered into automated settlement process during night prior to settlement date. Gross transfers executed in batch program
C.3. Finality	Simultaneous credits of securities and debits of cash, notified to participants in 5 p.m. report on settlement day. At this point final and irreversible	Simultaneous final credits of securities and debits of cash, notified to participants early in the morning Brussels time
C.4. Securities overdrafts	Not allowed	Not allowed
C.5. Borrowing/lending	Yes. Both automatic and discretionary borrowing and lending facilities. All lending guaranteed by Guarantor Syndicate (eight banks)	Yes. Both automatic and discretionary borrowing and lending facilities. Morgan Guaranty Brussels guarantees securities loans
C.6. Limits on borrowing	Limited to percentage of outstanding issues; all borrowings must be covered by collateral constituted by value of securities deposited (haircuts taken on marked-to-market value)	Limited to percentage of outstanding issues; all borrowings must be covered by collateral constituted by value of securities deposited (haircuts taken on marked-to-market value)
	D. Funds transfers	
D.1. Initiation	Cedel	Euroclear Operations Centre initiates transfers
D.2. Type of funds	Cash accounts in multiple currencies maintained with cash correspondent bank(s) in country of each currency used	Cash accounts in multiple currencies maintained with cash correspondent bank(s) in country of each currency used
D.3. Settlement	Gross trade-by-trade settlement during afternoon batch program, final balances notified in 5 p.m. report (move to overnight processing planned); see also C.2	Gross trade-by-trade settlement during overnight batch program, final balances notified early in the morning Brussels time; see also C.2
D.4. Separation	Funds transfers in and out of cash accounts through correspondent banks and domestic payment system of each currency involved	Funds transfers in and out of cash accounts through correspondent banks and domestic payment system of each currency involved
D.5. Unwinding	No unwind possible, risk of insolvency of Cedel, correspondent banks or domestic securities depositories	No unwind possible, risk of insolvency of Euroclear, correspondent banks or domestic securities depositories
D.6. Credit facilities	Overnight credit through "pre-advice" of funds or credit facilities provided by Cedel or third-party financing bank	Overnight credit through "pre-advice" of funds or credit facilities provided by Morgan Guaranty Brussels

Key features of securities transfer systems in the G-10 countries		
	International Clearers	
	D. Funds transfers (contd.)	
D.7. Credit limits	Limits set by Cedel or third-party bank and loans must normally be collateralised by value of securities deposited	Limits set by Morgan Guaranty Brussels and loans must normally be collateralised by value of securities deposited
	E. Linkages between final transfers of securities and funds	
E.1. Synchronisation	Simultaneous transfer of securities and funds during afternoon batch program (move to overnight processing planned)	Simultaneous transfer of securities and funds during overnight batch program
E.2. Order of transfers	No chronological order: automatic priority classes relating to settlement date and participants' priority code	Instructions are ranked according to participants' priority code, settlement date and nominal amount of transaction
E.3. Consequences of payment failure	No unwinds possible. Delivery made only against payment, on trade-by-trade basis. When cash or securities not available, instructions reprocessed in next afternoon cycle	No unwinds possible. Delivery made only against payment, on trade-by-trade basis. When cash or securities not available, instructions reprocessed in next overnight cycle

Annex 4

Minimum standards for cross-border and multi-currency netting and settlement schemes

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

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

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

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

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

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