

## **Risks and Developments in Payment Systems**

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The purpose of this paper is to discuss payment systems, their risks and developments and the international work of establishing universal standards for payment systems. It also discusses how payment systems in various countries adhere to international agreed upon standards for payment systems. The paper draws extensively on the work done by the Basel based Committee on Payment and Settlement Systems (CPSS) and findings under the IMF-World Bank joint Financial Sector Assessment Program (FSAP).<sup>2</sup>

### **Standards for Payment Systems**

Payment system issues have become increasingly important during the last 10-15 years, and central banks as well as private operators and payment system participants have put in a lot of resources to analyze various payment system risks. A contributing factor to the increased interest has been the growing internationalization of financial markets, partly as a result of the abolishment of foreign exchange and capital controls in many countries, which have increased the movements of funds cross border. Several incidents in the financial market have also shown that there could be major financial risks embedded in payment systems. Risks that, if not managed in a prudent way, could create a systemic risk situation in which the financial market could stop functioning, leading to potential catastrophic development in a country's economy affecting, if grave enough, even the world economy.

In 1985, for example, a major clearing bank in New York in the U.S. payment system and the U.S. Government securities settlement system, experienced a computer breakdown, which forced the Federal Reserve Bank of New York (FRBNY) had to make overnight loans totaling USD 22 billion. In connection with the September 11, 2002 events, and the World Trade Center disaster, FRBNY, which overnight lending is normally very low, lent USD 81 billion to market participants, to make sure that the major payment systems in the country would be able to settle.

In cases, when central banks are forced to lend to banks, in order to avoid a situation in which the payment system would cease to function, the central bank is taking a considerable credit risk. This risk still exists albeit it is lower, even if the central bank receives securities

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<sup>2</sup> Financial Sector Assessment Program—Experience with the Assessment of Systemically Important Payment Systems <http://www.imf.org/external/np/mae/pay/2002/eng/041902.htm>

as collateral for its lending and has valued the securities below market value. This is because the market for those securities could "disappear", making it impossible for the central bank to sell the collateral without making a loss.

In the late 1980, the central bank governors of the G-10 countries expressed concern about issues involved in cross border payments.<sup>3</sup> They decided to create a study group that published a report in 1990,<sup>4</sup> which analyzed issues affecting cross-border and multi-currency payment netting schemes. The report established minimum standards, and more general goals for the design and operation of such schemes as well as principles for their cooperative oversight by central banks. These "Lamfalussy Standards" named after the chairman of the group, Alexander Lamfalussy became widely accepted and increasingly applied, not only in the specific field for which they were developed, but also to payment, clearing and settlement systems of many other types. The reason being that, in part, the standards are applicable also to other types of settlement systems, but also as a consequence of the lack of other standards for payment systems.

The G-10 Governors also decided to create the Committee on Payment and Settlement Systems (CPSS) and a secretariat under the auspices of the BIS. The CPSS has since, through several working groups, studied a number of payment, clearing and settlement issues also covering securities settlement systems and settlement of foreign exchange transactions. It has published a number of descriptive and analytical reports.<sup>5</sup> One important contribution has been the country specific *Red-Books* (for G-10 countries and others), which give a detailed description about countries' payment systems. These *Red-Books* have had followers in the form of the *Blue-Books* (for EU countries and EU accession countries), the *Yellow-Books* (Western Hemisphere/CEMLA) and the *Green-Books* (South African countries/SADC).<sup>6</sup>

### **Core Principles for Systemically Important Payment Systems (CPSIPS)**

A number of international initiatives were taken from the mid 1990 with the purpose of maintaining financial stability world-wide by strengthening the financial infrastructure.

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<sup>3</sup> G-10 consists of, Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, Switzerland, United Kingdom, United States,

<sup>4</sup> *Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten countries*, BIS, November 1990.

<sup>5</sup> Reports can be obtained from the CPSS Secretariat, Bank for International Settlements, and many also from the CPSS web site <http://www.bis.org/cpss/cpspubl.htm>

<sup>6</sup> European Central Bank; <http://www.ecb.int>; CEMLA/WHI (Centro Estudios Monetarios Latinoamericanos/Western Hemisphere Payments and Securities Clearance and Settlement Initiative); SADC (Southern Africa Development Community); Links to country specific payment system information can be found on CPSS website <http://www.bis.org/cpss/paysysinfo.htm>.

In 1998, the G-10 governors asked the CPSS to look into the issue of establishing more uniform standards that could be used for different types of major payment systems.

In January 2001, a task force consisting of members from 23 countries and from the IMF and the World Bank published its report *Core Principles for Systemically Important Payment Systems* (CPSIPS). Ten principles had been created and also four responsibilities for central banks in applying these Core Principles.

The report drew extensively on previous work of the CPSS and related groups,<sup>7</sup> most importantly on the “Lamfalussy Report”. The Core Principles extend the Lamfalussy Standards by adding several new core principles and apply the core principles more broadly to *Systemically Important Payment Systems* (SIPS) of all types. A SIPS is a payment system which, if it is insufficiently protected against credit, liquidity, legal, operational and other risks, disruption within the system could trigger or transmit further disruptions among its participants, or generate systemic disruptions in the financial markets or more widely across the economy. Every country has at least one payment system, which role in the economy is so critical that it is regarded as being a SIPS. Examples of SIPS are (i) if it is the only payment system in the country, or the principal system in terms of the aggregate value of payments; (ii) if it handles mainly payments of high individual value; or (iii) if it is used for the settlement of financial market transactions or for the settlement of other payment systems in the same currency.

The CPSIPS report’s discussion of central banks’ responsibilities in applying the Core Principles similarly adds to the principles for cooperative central bank oversight contained in the Lamfalussy Report and extends them to domestic systems. The Lamfalussy Standards were instrumental in encouraging designers, operators and overseers of netting systems to consider and address risks and to achieve certain minimum standards. Best practice, however, has over time become more demanding and an increasing number of systems have recognized the benefits of, for example, being able to withstand the failure of more than the single largest net debtor in the system.

The ten core principles<sup>8</sup> can be divided into different issues; legal foundation; understanding and management of risks; settlement finality; settlement assets; operational reliability; efficiency; access criteria and governance.

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<sup>7</sup>The past work of the CPSS and related groups has included detailed analysis of payment and settlement system infrastructure in both developed and emerging economies. Although most of the earlier work has been analytical rather than prescriptive, in some areas – notably in its work on cross-border and multi-currency netting and on foreign exchange settlement risk – more specific guidelines and strategies have been developed to reduce risk, particularly systemic risk.

<sup>8</sup> The Core Principles and the Central Bank Responsibilities in applying the Core Principles are presented in Annex.

*Legal foundation:* the system should, according to Core Principle 1, have a well-founded legal basis under all relevant jurisdictions and the rules and procedures of a system should be enforceable and their consequences predictable. A system, which is not legally robust or in which the legal issues are poorly understood could endanger its participants. The reason being that the lack of understanding can give participants a false sense of security, leading them, for example, to underestimate their credit or liquidity exposures.

A payment system's legal environment includes the general legal infrastructure in the relevant jurisdictions (such as the law relating to contracts, payments, securities, banking, debtor/creditor relationships, and bankruptcy), as well as specific statutes, case law, contracts (for example, payment system rules) or other relevant material. It is important to clearly specify the jurisdiction under which law the system's rules and procedures should be interpreted. In most cases, the most important legal environment will be the domestic one, but if a system involves participation of foreign banks or foreign currencies, it will also be necessary to consider whether there are any material legal risks stemming from other relevant jurisdictions.

*Understanding and management of risks:* the system's rules and procedures should enable participants to have a clear understanding of the system's impact on each of the financial risks they incur through participation in it (Core Principle II). Participants, the system operator, and other involved parties in some cases including customers, should understand clearly the financial risks in the system and where they arise. The system's rules and procedures are crucial for knowing where these risks are borne. For that reason, the rules should define clearly the rights and obligations of all the parties involved, and all parties should be provided with up-to-date explanatory material. It is also important that the relationship between system rules and other components of the legal environment are clearly understood and explained, and the key rules relating to financial risks should be publicly disclosed.

The system should have clearly defined procedures for the management of credit risks and liquidity risks,<sup>9</sup> which specify the respective responsibilities of the system operator and the participants, and which provide appropriate incentives to manage and contain those risks (Core Principle III). The rules and procedures are not only the basis for establishing where credit and liquidity risks are borne within the system, but also for allocating responsibilities for risk management and risk containment. They are, therefore, an important mechanism for

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<sup>9</sup> *Credit risk:* the risk that a counterparty (or participant in a settlement system) will not settle an obligation for full value, either when due or at any time thereafter. In exchange-for-value systems, the risk is generally defined to include replacement cost risk and principal risk.

*Liquidity risk:* the risk that a counterparty (or participant in a settlement system) will not settle an obligation for full value when due. Liquidity risk does not imply that a counterparty or participant is insolvent since it may be able to settle the required debit obligations at some unspecified time thereafter.

addressing the financial risks, which can arise in payment systems. A system's rules and procedures therefore need to ensure that all parties have both the incentives and the capabilities to manage and contain each of the risks they bear. Limits on credit exposure are likely to be of particular relevance in systems involving netting mechanisms, and such systems should have limits for the maximum level of credit exposure that can be produced by each participant.

There are a number of ways in which risks can be managed and contained using both analytical and operational procedures. The analytical procedures would include on-going monitoring and analysis of the credit and liquidity risks participants pose to the system. Operational procedures would include the implementation of risk management decisions through limits on exposures, by pre-funding or collateralizing obligations, through the design and management of transactions queues or through other mechanisms.

*Settlement finality*; Knowing when a settlement is final, is a very important part of a payment system participant's risk management process, and for that reason, a system should be able to provide prompt final settlement on the day of value, preferably during the day and at a minimum at the end of the day (Core Principle IV). Between the time when payments are accepted for settlement by the payment system (including satisfaction of any relevant risk management tests, such as the application of limits on exposures or availability of liquidity) and the time when final settlement actually occurs, participants may still face credit and liquidity risks. These risks are exacerbated if they extend overnight, in part because a likely time for the relevant authorities to close insolvent institutions is between business days.

In countries, with large volumes of high-value payments and sophisticated financial markets, it would be a clear advantage—not to say absolutely necessary—if the payment system could provide real-time final settlement during the day. In order to achieve this, experiences show that an effective intraday liquidity mechanism is necessary for achieving efficient real-time final settlement.

Core Principle V, states that a system in which multilateral netting takes place 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 settlement obligation. Most multilateral netting systems defer settlement of participants' obligations to one (end of day) or several points in time during the day. Such a deferred multilateral netting system could create the risk that, if a participant is unable to meet its settlement obligations, other participants will face unexpected credit and liquidity risks at the time of settlement. The amount at risk could also be much greater than the net amounts due. The combination of multilateral netting and deferred settlement was the focus of Lamfalussy Standard IV, which specified that, at a minimum, such netting systems must be able to withstand the failure of the largest single net debtor to the system. Such systems therefore need strong controls to address this settlement risk, and many payment systems that settle on a net basis have introduced arrangements to limit credit and liquidity risk and to ensure access to liquidity in adverse circumstances.

Systems, which satisfy only this minimum standard, are still exposed to the financial risks of the failure of more than one institution during the same business day. The circumstances in which one large net debtor is unable to meet its settlement obligations to the system, may well be those in which other institutions are also under liquidity pressure. Best international practice now is, therefore, for such systems to be able to withstand the inability to settle of more than one participant with the largest single settlement obligation.

Alternative system designs (such as real-time gross settlement systems or hybrid systems) are increasingly being adopted to reduce or eliminate settlement risk.<sup>10</sup> Core Principle V adopts the wording of Lamfalussy Standard IV almost unchanged, and it remains a universal minimum standard for multilateral netting systems, which should be exceeded wherever possible. The principle is not relevant for real-time gross settlement systems. If systems of other types, such as hybrid systems, involve multilateral netting or the deferral of settlement, the central bank may need to consider whether the risks are similar. If they are, a similar approach of applying at least the minimum standard, and preferably a higher standard, should be followed.

*Central Bank Money:* in most payment systems, the settlement takes place over the banks accounts in the central bank, but if that is not the case, the other assets that are used should carry little or no credit risk and little or no liquidity risk (Core Principles VI). Where an asset other than a claim on a central bank is used, the system's safety depends in part on whether the asset leaves the holder with significant credit risk or liquidity risk. This form of credit risk arises if there is more than a negligible risk that the issuer of the asset could fail. Liquidity risks arise if the asset is not readily transferable into, for example, claims on a central bank or other liquid assets. In either case, the system could face a crisis of confidence, which would create systemic risk. It is to be noted that if the system settles in a central bank, which is not the central bank of issue of the currency that it settles, a liquidity risk will still exist.

*High degree of security and operational reliability:* the payment system should incorporate commercially reasonable standards of security appropriate to the transaction values involved. In order to ensure completion of daily processing, the system should maintain a high degree of operational resilience (Core Principle VII). This is, however, not just a matter of having reliable technology and adequate backup of all hardware, software and network facilities. It is also important to have effective business procedures and well-trained and competent personnel who can operate the system safely and efficiently, and ensure that the correct procedures are followed. This, together with good technology, will help to ensure that payments are correctly and quickly processed and that risk management procedures, such as limits, are observed. The importance of having adequate back-up systems located at a certain distance from the primary site is important, and became very clear in connection with the World Trade Center disaster.

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<sup>10</sup> These systems are described on page 11-13.

*Efficient and practicable:* it would be possible to build an almost 100 percent safe payment system, however, the cost for making payments in such a system may be too high for the participants, thus making them use less safe systems. Operators, banks and their customers as well as overseers of systems all have an interest in the efficiency of a system. They want to avoid wasting resources and, other things being equal, would wish to use fewer resources. Typically, there will have to be a trade-off between minimizing resource costs and other objectives, such as maximizing safety. Within the need to meet these other objectives, the design of the system, including the technological choices made, should seek to economize on relevant resource costs by being practical in the specific circumstances of the system, and by taking account of its effects on the economy as a whole (Core Principles VIII). The relevant costs are not just those passed on to users through system charges, but those of the total resources used by the system and its users in providing the payments services. One will need, for example, to take into account any indirect costs to users, such as the costs of liquidity and collateral.

The availability of liquidity in a system is an important element in its smooth operation. Recipients like to be paid in funds, which are immediately reusable and would therefore value the advantages of systems with intraday settlement. Payers, however, may face costs in raising liquidity to enable them to pay early, and systems that have inadequate intraday liquidity mechanisms, are likely to face slow turnover or even gridlock (each participant is waiting for someone else to make the first payment). Efficiency aspects speak for providing participants with adequate incentives to pay promptly and the supply of intraday liquidity is particularly important for systems with real-time settlement.

Interbank markets for intraday liquidity are very rare, and in most payment systems where intraday liquidity is available, the central bank is the lender of that liquidity, normally against adequate collateral and without interest charges. Central bank monetary policy operations are based on overnight or longer market operations. For that reason, intraday lending by the central bank, normally does not have any monetary policy implications. In case an intraday lending is not repaid by the end of the day, it automatically becomes a lending overnight. If the amount is sizeable, and the central bank does not neutralize this lending by a reverse market operation, the level of the overnight rate could be affected. Also, should a central bank apply an interest charge on its intraday lending that is close to the overnight rate that could also have monetary policy implications.

The technology and operating procedures used to provide payment services should be consistent with the types of services demanded by users, reflecting the stage of economic development of the markets served. The design of the payment system should therefore be appropriate for the country's geography, its population distribution and its infrastructure (such as telecommunication, electrical power capacity, transportation and banking structure). A particular design or technological solution, which is right for one country, may not be right for another country.

Systems should be designed and operated so that they can adapt to the development of the market for payment services both domestically and internationally. Their technical, business and governance arrangements should be sufficiently flexible to respond to changing demands, for example, in adopting new technologies and procedures.

*Objective and publicly disclosed criteria for participation:* access criteria should encourage competition amongst participants in order to promote efficient and low-cost payment services. This advantage, however, may need to be weighed against the need to protect systems and their participants from participation in the system by institutions that would expose them to excessive legal, financial or operational risks. It is important that any restrictions on access should be objective and based on appropriate risk criteria, which should be stated explicitly and disclosed (Core Principle IX). The rules of the system should also provide for clearly specified procedures for orderly withdrawal of a participant from the system, either at the participant's own request, or following a decision by the system operator that the participant should be expelled from the system.

*Governance arrangements:* the system's governance arrangements should be effective, accountable and transparent (Core Principles X). The arrangements should encompass the set of relationships between the payment system's management and its governing body (such as a board of directors), its owners and its other stakeholders. These arrangements provide the structure through which the system's overall objectives are set, how they are attained and how performance is monitored. SIPS have the potential to affect the wider financial and economic community, and it is therefore important to have in place an effective, accountable and transparent governance regardless if the system is owned and operated by the central bank or by the private sector.

Effective governance provides proper incentives for management to pursue objectives that are in the interests of the system, its participants and the public more generally. It also ensures that management has the appropriate tools and abilities to achieve the system's objectives. Governance arrangements should provide accountability to owners and, because of the system's systemic importance, to the wider financial community, so that those served by the payment system can influence its overall objectives and performance. An essential aspect of achieving accountability is to ensure that governance arrangements are transparent, so that all affected parties have access to information about major decisions affecting the system and how this decisions are taken. The combination of an effective, accountable and transparent governance also provides a foundation for observance of all the CPSIPS as a whole.

### **Central Banks' Responsibilities in applying the CPSIPS**

The CPSIPS report also encompass, as mentioned above, four responsibilities for central banks in applying the core principles, and also for cooperative central bank oversight.

*Responsibility A: The central bank should define clearly its payment system objectives and should disclose publicly its role and major policies with respect to systemically important payment systems.*

Designers and operators of private sector payment systems, and participants and other users of all systems, as well as other interested parties, need to have a clear understanding of the central bank's role, responsibilities and objectives in relation to payment systems. They also need to understand how the central bank intends to achieve those objectives, whether by formal powers or other means. Thus, enabling those parties to operate in a predictable environment, and to act in a manner that is consistent with the central bank's objectives, and policies.

*Responsibility B: The central bank should ensure that the systems it operates comply with the Core Principles.*

*Responsibility C: The central bank should oversee compliance with the Core Principles by systems it does not operate, and it should have the ability to carry out this oversight.*

The central bank's oversight of systems should have a sound basis, and there may be a wide variety of means by which this can be achieved, depending on the country's legal and institutional framework. Countries may have a statute-based system of oversight with specific tasks, responsibilities and powers assigned to the central bank, and sometimes also to other agencies. Others have regimes based on custom and practice, which rely on non-statutory approaches. Either approach can work in its own setting depending on the legal and institutional framework of the country concerned and the acceptance of the approach by the institutions overseen. The potential benefits of a statute-based approach to oversight, however, deserve serious consideration in countries newly establishing or significantly revising the oversight role and related policies. The reason being to give the central bank the tools to act should a system operator, for whatever reason, refuse to implement measures suggested by the central bank.

The central bank should ensure that it has the expertise and resources to carry out its oversight functions effectively. It is important that the central bank does not use its oversight role to disadvantage private sector systems relative to those, which it owns and operates itself, but to ensure that the combination of public and private sector provision meets the public policy objectives. For that reason, central banks should clearly separate the responsibilities of operating payment systems and overseeing payment systems. This separation of responsibilities should take place as high up in the central bank organization as practically feasible.

*Responsibility D: The central bank, in promoting payment system safety and efficiency through the Core Principles, should cooperate with other central banks and with any other relevant domestic or foreign authorities.*

A number of different authorities can have an interest in the safe and efficient functioning of payment systems. In addition to central banks, in their capacities as operators or overseers, they can include, for example, legislative authorities, ministries of finance, supervisors and competition authorities. It should be noted that, oversight of a country's payment systems, surveillance of its financial markets and supervision of financial institutions are complementary activities, which may be carried out by different agencies. A cooperative approach is likely to assist the fulfillment of all the relevant public policy goals.

Payment system oversight concentrates on the stability of a payment system as a whole, while the supervisors of individual banks and other financial institutions focus on the risks to specific participants. In particular, in assessing payment system risks, overseers may need to take into account the ability of individual participants to fulfill their responsibilities in the system. In monitoring the financial risks for an individual institution, the supervisors may need to take into account risks to which participants can be exposed as a result of participation in the systems and which could affect the viability of the institution. Regular exchanges of views and information between supervisors and overseers, including, where relevant, about key individual participants, can assist these complementary objectives. It is preferable to formalize and disclose these arrangements by a Memorandum of Understanding.

### **From Net Settlement Systems and Real-Time Settlement Systems to Hybrid systems**

#### *Net Settlement Systems*

Payment systems can take the form of net settlement systems, gross settlement systems and hybrid systems. There exist different types of net settlement systems; *bilateral net settlement systems* and *multilateral net settlement systems*. If the settlement of obligations or transfers in a net settlement system (see below) is effected at some later time than when they are presented to the system, which is normally the case, such a system is called a *deferred net settlement* (DNS). A DNS can make payments in real-time, and it is only the final settlement of these payments between the participants that takes place at a designated time.

In bilateral net settlement systems, the settlement occurs when the participant that has a net debt position against another participant, pays that net amount to that participant. In multilateral net settlement systems, all the participants' payments are netted giving respective participant either a net debt position or a net credit position. At a predefined time, which could be either once a day, or several times during the day, the participants with a debt position are required to pay their respective net amount to a settlement agent. Upon the receipt of the total amount of all the participants' debt positions, the settlement agent will pay the participants with a credit position their respective amounts.

The major advantage with a multilateral net settlement system is that it is liquidity saving, as the participants will only have to fund their net debit position, while the gross amounts that they intend to pay out are multiple times higher. These systems, however, also have some clear disadvantages. The major one being that, if one single participant in the system defaults

on a debt position regardless of the size of that position, no other payments in the system will be made, not even between participants that have not defaulted.

One way of solving a default situation would be to delete all or part of the transactions that concerns the defaulting participant. This is called *unwinding*, and could be a very difficult task to perform, due to the large number of transactions that normally go through net settlement systems. An unwinding could also have the effect that participants that were expecting funds from the defaulting participant would not be able to make their net payments, resulting in a new default and a subsequent unwinding. Such failures may cause significant liquidity or credit problems and, as a result, might threaten the stability of financial markets.

The kind of risk that such an event would create is called systemic risk, the formal definition being: the risk that the failure of one participant in a transfer system, or in financial markets, generally, to meet its required obligations will cause other participants or financial institutions to be unable to settle their obligations (including obligations in transfer systems) when due.

Unwinding is, according to the CPSIPS, not an acceptable solution for large value payment systems. Ways to guarantee that a defaulting participant will not stop the settlement process, include having limits on the respective participants exposure to other participants in the system. These exposures will need to be supported by guaranteed funds that the participants have set aside. Such a fund should be handled either by the system operator or the central bank, and the participants should have no recourse to the fund, unless in a default situation.

### *Gross Settlement Systems*

A few countries, including USA, Denmark, Finland, Norway and Sweden, have for a number of years, instead of making payments through multilateral net settlement systems developed systems that work on a gross basis. This means that each payment obligation that a participant has, is being made as a separate payment, without taking into account eventual incoming payments. This way of making payments has the advantage of allowing the payment system process to continue between "surviving" participants even if one participant defaults. A Real-Time Gross Settlement Systems (RTGS) settles a payment at the same time as it has been accepted by the system. This occurs if the paying participant has sufficient funds in its account with the settlement agent, which in most cases, is a central bank, even if the system is operated by a private organization. An RTGS system does not create any credit risk for the receiving participant as it receives the funds at the same time as it receives the confirmation of the payment.

The only disadvantage of RTGS systems is the fact that it requires more liquidity than net settlement systems, as liquidity has to be available for each individual payment. There is, however, several way to mitigate this liquidity problem. The system could have rules for how fast payments should be made in the system. RTGS system, and/or the participants can

develop queuing features, and algorithms that calculate the order of which payments should be made in order to get a smooth flow of payments.

Another way to facilitate the operation of RTGS systems is intraday lending by central banks. Such lending means that a participant borrows from the central bank during the day and repays all such lending before the payment system closes at the end of the day. In almost all countries, where the central bank provides intraday lending, this is done without charging any interest but against adequate collateral.

### *Hybrid Systems*

The high liquidity needs that RTGS systems demands, and the cost that liquidity carries<sup>11</sup>, has resulted in development of a new type of system—*hybrid systems*— that could be seen as a mix between RTGS and DNS systems. Countries that have developed such systems include Canada, France, Germany and the United States. These systems are able to take into account both the advantage of RTGS systems for making immediate payments, while at the same time allowing for continuous bilateral and/or multilateral netting of payments.

The legal basis and operational features of hybrid systems vary from one system to another, but their underlying characteristic is frequent netting or offsetting of payments in the course of the operating day with immediate final settlement. The “netting/offsetting” can take the legal form of netting or of the offsetting/simultaneous settlement of payments, which legally remains gross (involving simultaneous settlement).

A typical approach would be to hold payments in a central queue and to net/offset them continuously, or at frequent intervals against payments from other participants. To the extent that the resulting net debit positions are fully covered—for example, by balances in the participants’ settlement account or by incoming payments— they could be settled immediately. Payments that could not be settled continue to be held in the queue for the next round of netting and settlement. In some cases, the procedure to deal with payments remaining in the queue towards the end of the day would be to return them to the sender. This would also be the case in real-time gross settlement systems, if there were insufficient liquidity. Another approach could be to conduct a last batch of netting and settlement at the end of the day. In systems that undertake netting and settlement at predetermined times, one such time is usually at the end of the day.

The frequent netting in hybrid systems is designed to reduce the liquidity needed relative to a real-time gross settlement system. At the same time, much of the risk associated with deferred net settlement can be avoided by two features:

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<sup>11</sup> It should be noted that even if central banks are providing intraday liquidity without charging interest, collateral requirement for such lending is a cost for the participant.

- A. only payments that give rise to covered net positions are included in each round of netting; and
- B. final settlement of the net positions occurs immediately on each round of netting.

Systems differ in the degree of freedom participants have to use their settlement balances in the course of the day. In some systems, they can be used only to fund payment obligations within the system. In others, settlement balances may be withdrawn to or replenished from other accounts, for example settlement accounts in other payment systems.

Although the design features may vary, typical features include a queue (usually centralized), facilities for real-time message transmission, and complex algorithms to process payments. A variety of optimization routines can be used to match, offset or net queued payments in batches, which can be quite frequent. These routines are designed to select only those payments that can be matched, offset or netted bilaterally between pairs of participants or multilaterally by comparing payments among several participants simultaneously. Additional design features may include setting bilateral or multilateral credit limits, the option to settle some individual payments by debiting the settlement accounts directly, and providing additional liquidity against collateral.

### **Payment Systems and the Financial Sector Assessment Program (FSAP)**

The level of knowledge about risks in payment systems world-wide has increased during the last years. A major contributing factor to this development has been the Joint Financial Sector Assessment Program (FSAP), which the International Monetary Fund and the World Bank embarked on in 1999. Under this program, countries' financial sectors are, among other things, assessed against a number of internationally agreed standards, including the CPSIPS. Between mid-1999 and the end of 2001, 57 SIPS in 42 countries have been assessed. The aims of assessing a country's SIPS are four-fold: (i) to contribute to an overall assessment of the risks and vulnerabilities of that country's financial system; (ii) to assist in identifying areas of further reform of the payment system; (iii) to show how that system compares with the core principles; and (iv) to show how the country's oversight regime compares with the central bank's responsibilities for applying the principles.

The assessments seek in particular to identify the strengths and weaknesses of the SIPS. They identify any risks to, or vulnerabilities in the monetary system, or the financial markets or across the economy, which result from weaknesses in the SIPS, or from its potential to transmit shocks, including shocks originating in other countries. The assessments, as appropriate, recommend changes or reforms to the SIPS. They also help to make the authorities aware of those aspects of their SIPS that should be kept under review as the economy and financial markets develop.

### **The Assessment of Payment systems against the CPSIPS**

### *Main findings*

Overall, the assessments are revealing substantial weaknesses in many SIPS. These weaknesses suggest that many of them may be vulnerable to shocks—internal or external—which could lead to instability in the system as a whole, and pose potential systemic problems. The extent of observance of each principle, and of each of the central bank responsibilities for applying the CPs, varies widely among these systems. Many of the SIPS do not observe CPs II and III in full, and are therefore vulnerable to potentially widespread problems, if a member is unable to settle its obligations in full and on time. CP II covers the need for SIPS participants to understand the risks they run as members of those systems, while CP III addresses the means available to them to manage and control those risks.<sup>12</sup> It is important to recognize that an inability to settle, may be caused not only by liquidity or a solvency problem, but also by a variety of other problems, including operational or technical failures at a single member or at a central facility.

This possibility is addressed by CP VII, which covers the security and operational reliability of a SIPS. Most systems do not observe this principle in full, and may therefore be vulnerable to failures that can prevent the daily settlement being completed in time by one or more participants, or vulnerable to fraud or misuse that can damage an individual participant. Many systems fail to observe CP IV in full; and a significant majority of the net settlement systems do not observe CP V in full. CP IV states that a SIPS should ensure prompt final settlement on the day of value, and CP V requires every multilateral net settlement system to ensure its ability to settle on the due day, even if one of the participants is unable to meet its payment obligations. These findings indicate further vulnerabilities in the systems, since a settlement problem at one participant could rapidly spread to other participants, and ultimately force the central bank to step in as emergency lender of last resort.

The above weaknesses are compounded by the relatively large proportion of SIPS that do not observe CP I, which requires all SIPS to have a well-founded legal basis under all relevant jurisdictions. Where a system has an uncertain legal basis, the impact of a settlement problem for one participant is more liable to be compounded by steps taken by the other participants to protect their own interests.

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<sup>12</sup> A principle is considered *observed* when all assessment criteria are generally met without any significant deficiencies. It is considered *broadly observed* whenever only minor shortcomings are found, which do not raise major concerns and when corrective actions to achieve full observance of the principle are scheduled and realistically achievable within a prescribed period of time. It will be considered *partially observed* whenever the shortcomings are sufficient to raise doubts about the ability to achieve observance within a reasonable time frame. It will be considered *not observed* whenever major shortcomings are found in adhering to the assessment criteria. A principle will be considered *not applicable* whenever it does not apply given the structural, legal and institutional conditions.

The observance of CP VIII, covering the efficiency in payment systems, has proven to be difficult to assess, partly due to lack of adequate information. The assessors' argumentations for a particular level of observance grade are also showing large discrepancies. The vulnerabilities and potential instability of many SIPS are also reflected in the fact that almost half do not observe CP X—the governance of a SIPS should be effective. It is in practice not possible for an SIPS to observe this principle if it does not observe all, or most, of the other nine principles. A failure to observe any of the principles is, by definition, a proof of a less effective governance structure.

A less effective governance structure itself reflects failures by a majority of the central banks to observe in full their responsibilities B and C, which relate to the oversight of an SIPS. Less than half of the systems are subject to adequate oversight; if their central banks do not pay close attention to the structure and operations of the system, they may not be well placed to avert potential problems, or to manage problems that do occur. Indeed, it is notable that more than half of the SIPS that are operated by the national central banks are not subject to adequate oversight by the central bank in its capacity as the overseer of the system. In terms of the transparency practices relating to oversight of the SIPS, deficiencies were most pronounced in respect of the clarity of roles, responsibilities and objectives of central banks in their capacity as overseers.<sup>13</sup>

The most important strength disclosed by the FSAP assessments is shown by the extent of observance of CP VI—a SIPS should settle in central bank money as a risk-free asset. Nearly all of the systems settle in central bank money, avoiding imposing on their members an interbank exposure in respect of their settlement assets. Also CP IX—an SIPS should have objective and publicly disclosed criteria for participation—is observed by most systems.

### **FSAP findings about Payment Systems in different country groups**

In considering the extent to which the CPSIPS are observed by the SIPS assessed, a marked divergence was observed among different groupings of countries.<sup>14</sup>

#### *Developing countries*

The assessments suggest that a significant majority of developing countries are currently operating payment systems that suffer shortcomings in their design and operation, potentially exposing them to risks in the event of a problem. This may be a consequence of different priorities, lack of adequate skilled resources and the need for enhanced understanding of

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<sup>13</sup> Under the FSAP, in conjunction with the assessment of the CPSIPS and the associated central bank responsibilities, an assessment is also made of the transparency practices relating to payment system oversight, as set out in the IMF Transparency Code. As of December 2001, payment system transparency had been assessed in over 40 countries.

<sup>14</sup> The grouping of countries is based on that applied in the IMF's World Economic Outlook.

payment system risks. It has potentially important implications for central banks as lenders of last resort, and for their conduct of monetary policies. In some of these countries, payment system reform projects were already in progress, or planned, at the time of the FSAP assessments; successful implementation of these projects will reduce the systemic vulnerabilities in their SIPS.

Among the principles relating to financial stability, the SIPS in a significant majority of the developing countries fail to observe CPs II, III, and IV. The inability to manage liquidity risks in a SIPS is a serious weakness in countries with frequently illiquid interbank money markets. In practice, it appears from the detailed assessment reports that the central bank is often expected to cover this shortfall through such measures as granting unlimited and uncollateralized loans to the non-settling bank. Where the central bank has a discretionary power to provide this liquidity, the SIPS participants will typically assume that the central bank would always choose to lend. In effect, they assume a permanent central bank guarantee on the daily settlement of the SIPS.

Similarly, the multilateral net settlement systems in a significant majority of developing countries do not observe CP V, and therefore cannot be certain of their ability to settle if a member is unable to meet its obligations. Instead, some of the systems continue to rely on an unwinding arrangement, which is not acceptable in a SIPS; other systems have no provisions for such an event, or implicitly rely either on direct lending by the central bank or on obtaining access to a continuing high level of required reserves.

A significant majority of developing countries, the SIPS do not have a well-founded legal basis (CP I). The relevant legislation may not exist, or where it exists, it may not have been tested in court. For instance, a country with an electronic payment system may not have a law on electronic payments, but a law on checks. In another country, a private law contract governs the operation of the RTGS system, but it is uncertain whether its provisions would be upheld in the event of a challenge by the liquidator of a bank. The multilateral netting arrangements with a check-based SIPS, may not be backed by law, and again might not survive if challenged. There may also be substantial problems and extensive delays in realizing collateral, which exacerbates interbank credit risks as well as liquidity risks. In several countries, no attempts have been made to establish the legal rights and obligations of foreign banks under the host country's bankruptcy legislation.

Governance of the SIPS is an important weakness, with a significant majority of them failing to observe CP X. Similarly, the central banks do not fully observe their responsibilities to ensure adequate oversight arrangements, or to cooperate with other relevant authorities, domestic or foreign. In some countries, the central bank lacks the statutory authority to oversee those payment systems that it does not itself operate. In another country, no single function in the central bank has a clear mandate to carry out this task, leading to confusion between departments. In only a few countries are the SIPS judged to be efficient and practical (CP VIII).

*Countries in transition*

The SIPS of the countries in transition appear in general to be markedly less vulnerable than those of the developing countries. This largely reflects the fact that the countries, which are candidates to become members of the EU, with extensive assistance from the EU central banks and other institutions, have made major efforts to prepare their RTGS systems to be able to join the EU RTGS system, TARGET.<sup>15</sup> Among other measures, they have begun to amend their laws and regulations to be able to observe CP I and other principles in full. Where there are weaknesses, they are similar to those described above in respect of the developing countries.

Among the key financial stability principles, a significant majority of these countries observe CPs II, III, and IV. The remaining countries continue to incur liquidity risks, which they are not able fully to manage, and therefore implicitly rely on the central bank for emergency support. The multilateral net settlement systems in three countries fail entirely to observe CP V, but each of those countries also has an RTGS system, so that the impact of a default in the net settlement system may be more easily containable again, however, with reliance on the central bank.

An important weakness continues to be shown in respect of legal certainty CP I, which a significant majority of these countries do not observe, although (as stated above) this aspect is being addressed at least in the EU candidate countries. There are also clear weaknesses in respect of their governance and oversight, including the oversight of the SIPS operated by the central banks themselves.

#### *Advanced economies*

The SIPS of the advanced economies are generally robust, and appear to be the least vulnerable to systemic shocks, among all those assessed by FSAP missions. Central banks in these countries (nearly all of which are members of the G-10 or the EU) have generally been well exposed to payment system issues and concepts throughout the last 10 to 15 years, and most of them have already taken very substantial steps to reform their payment systems.

Nearly all the SIPS in the advanced economies observe 7 out of the 9 applicable Core Principles,<sup>16</sup> including the principles that are key for financial stability—CPs I, II, III, IV, and V. The outliers already have implemented, or are in the process of implementing, projects to reform their payment systems so that they observe in full the CPs and the associated central bank responsibilities.

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<sup>15</sup> Of the 12 countries in this category, which have been assessed by FSAP missions, 9 are EU Accession Countries.

<sup>16</sup> CP V is only applicable to net settlement systems, and most of these countries do not have a SIPS that is a net settlement system.

## **Payment Systems and Emerging Cross-Sectoral Links**

When studying risk in payment systems, one cannot look at these systems just in isolation, but one has to take into account also other features that in certain ways could affect the payment systems. Such cross-sectoral links could be, for example, issues in securities settlement systems, as the cash side of securities transactions settles in the payment system. It could also be issues related to bankruptcy proceedings, where a decision by a liquidator could have direct effects on the settlement of a payment system.

### *Securities Settlement Systems*

Efficient and risk-free linkages with Securities Settlement Systems (SSS) are critical for a country's SIPS.<sup>17</sup> SSS are recognized as incurring the same inherent risks as those associated with SIPS. Moreover, the timely settlement of securities transactions, in the risk-free form of "Delivery-versus-Payment" (DvP), is critically dependent on the settlement of the associated payments.<sup>18</sup> Payment system participants are therefore vulnerable to any problems arising in the securities settlement process. A delivery fail could create a cash liquidity problem for the seller of the security; as could any problems in the payment system, such as payments being blocked by an operational failure. Linkages are increasingly required across borders, as securities held in one country may be settled through a system in another country, or are used as cross-border or cross-currency collateral.

Moreover, efficient SSS are essential for the timely delivery of securities to serve as collateral for payment system purposes, such as intraday borrowing from the central bank by pledge or repurchase agreement. They are also prerequisites for the development of collateralized money markets and for the central banks conduct of open market operations. Thus, there needs to be an effective interoperability of a payment system and the SSS, generally through a DvP facility, if these key market transactions are to be settled smoothly and efficiently in real time throughout the day.

The CPSS and IOSCO released in November 2001 *Recommendations for Securities Settlement Systems (RSSS)*.<sup>19</sup> The 19 recommendations and accompanying explanatory texts identify minimum standards that SSSs should meet. The recommendations are designed to

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<sup>17</sup> Securities Settlement Systems (SSS) incorporate the clearing and settlement function as well as the function of the central securities depository (CSD).

<sup>18</sup> A Delivery-versus-Payment facility establishes a link between the SSS and the payment system, such that the final transfer of title to the securities passes in the SSS from the seller to the purchaser if, and only if, a final and irrevocable payment has been made to the seller through the payment system.

<sup>19</sup> The Financial Stability Forum has included the RSSS in the list of standards and codes, under a single heading "Payments and Securities Settlements."

cover all types of securities, for securities issued in both industrialized and developing countries, and for domestic as well as cross-border trades. The CPSS-IOSCO Task Force, which produced the recommendations, is currently working on an assessment methodology for these recommendations, and the IMF and the World Bank participate in that work. In some FSAP missions, the soundness of securities settlement systems has been assessed based on the emerging standards, either by or in cooperation with the CPSIPS assessor.

### *Settlement of foreign exchange transactions*

Much attention has been paid in recent years to reducing risks—including liquidity and credit risks—on the settlement of foreign exchange transactions. A very high proportion of the daily flows through the SIPS of the globally traded currencies are accounted for by payments in settlement of interbank foreign exchange transactions. Any settlement failure could have an immediate impact on the smooth operation of those SIPS.<sup>20</sup> A new bank, Continuous Linked Settlement Bank (CLSB) is, after repeated delays, due to come into operation in the fall of 2002, with the intention of reducing this risk by means of a “Payment-versus-Payment” (PvP) facility. If, and only if, a member pays in to CLSB on the value date the currencies it has sold will it receive from CLSB the currencies it has purchased. One side-effect of the CLSB will be an increased vulnerability of each domestic SIPS to problems in another country’s SIPS, since in a PvP mechanism, if one currency is not paid in to the settlement agent, the counterpart currency will not be paid out, thus creating a cross-currency liquidity shortfall.

### *Resolution of problem banks*

There is an important and a bi-directional linkage between the rules and the operation of each payment system and the approach to the resolution of problem banks participating in the system. Clearly defined triggers are required before the authorities (typically the central bank) should intervene to resolve problems at any bank in a payment system. One such important trigger is the perceived inability of a bank to settle its obligations. This is because a system that relies, explicitly or implicitly, on overdrafts granted automatically and without limit by the central bank to participants suffering liquidity shortages could disguise the need for—and therefore could delay—a timely intervention to resolve more serious problems. This could provoke important losses for depositors, and also potential losses for the central bank. On the other hand, the suspension of operations of a failed bank can expose the payment system to substantial risk if the authorities decide that it is more important to use the bank’s available funds to protect its depositors, rather than to settle its position against other participants in the payment system. This situation is especially critical when the payment system concerned is of “systemic importance” and the amount involved in the settlement is high. The use of RTGS systems for large value payments can mitigate the challenge of dealing with a failing bank without endangering the payment system. In contrast, multilateral

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<sup>20</sup> These settlement flows are estimated to amount to between US\$3 trillion and US\$4 trillion per day.

net settlement systems that settle such payments exacerbate this challenge. If the netting process falters, all payments, including the ones, which are not affected by the defaulting participant, also get stopped.

A satisfactory approach to the resolution of a bank failure, therefore, requires in the legal framework for the payment system, a clear and practical definition of the precise moment when a failure to pay, or to settle, takes place. This also requires an effective mechanism for the fast coordination of responses among the relevant authorities. The first requirement—definition in the legal framework—does not present any problem apart from an adequate provision in the law. Regarding coordination, it has to be formal, automatic and prompt. This is crucial, as the fall in the value of the bank's asset base and contagion effects among other banks increase exponentially once the problem is known, if a quick solution has not been identified and communicated to the depositors.

## **Conclusions**

The increased focus on financial market stability issues has resulted, among other things, to an increased interest in payment, clearing and settlement issues, partly as a result of the IMF-World Bank Financial Sector Assessment Program. One can expect that, within a reasonable time frame, most countries would have embarked on payment system reforms, introducing modern large value transfer systems, many in the form of a hybrid system. There is also a possibility that we will see movements towards just one single payment system that would handle both small and large value payments system, in particular in smaller economies, but also in larger economies. We do not yet know what these systems would look like, but they are likely to be some kind of hybrid systems, which in an efficient way will be able to handle *non time critical* mass payments, while at the same time taking care of *time critical* large value payments.

The knowledge about risks in payment systems has increased tremendously since early 1990, and the safety in payment systems world wide has considerably improved. The risks that exist in payment systems have been clearly defined, and measures are taken to mitigate risks. Credit and liquidity risks could be handled by rigorous enforceable limit structures on the participants. Operational risks, including administrative procedures, hardware and software risks could be mitigated by extensive internal, as well as external, control and auditing regimes. Actions are also taken to handle risks relating to the legal and regulatory framework. These risks could, however, sometimes be difficult to handle and/or could take a considerable time.

There exist no clearly defined standards for what kind of legislative and/or regulatory framework that should be in place for a payment system. As a consequence, different models exist, from rather specific payments system acts and laws on central bank oversight to more general laws, sometimes also including passages in the banking law and in the central bank law. In some countries, the laws are very detailed, while in others, the authorities, be it the banking supervisor or the central bank has the power to decide upon the regulatory framework of the payment system.

It could be debated which one of the models that would be the best one to choose. If we purely look at the need for the payment system, one has to keep in mind that the payment system is under constant development, and that we do not know today, what kind of new developments we will see tomorrow. Nevertheless, I believe that the payment system market would benefit from a regulatory framework that includes less precise regulation in the form of a law, giving the overseer the power to regulate the system more in detail. This is not to say that there cannot be situations where a more detailed regulation has to be included in the law, but this should rather be the exception than the rule.

The legal and regulatory framework for payment, clearing and settlement systems are rather complex and cover a fairly large area. It would therefore be an advantage if a complete package of laws and regulations could be developed that could be used as a basis for countries that are reforming their payment system including its laws and regulations. This package should include a statutory based oversight role of the payment system for the central bank.

Reference material:

Bank for International Settlements/Committee on Payment and Settlement Systems;  
*Core Principles for Systemically Important Payment System*— January 2001.

International Monetary Fund/World Bank; *Financial Sector Assessment Program—  
Experience with the Assessment of Systemically Important Payment Systems*—April 2002.

## **The Core Principles and Central Bank Responsibilities**

### **Core Principles for Systemically Important Payment Systems**

- I. The system should have a well-founded legal basis under all relevant jurisdictions.
- II. The system's rules and procedures should enable participants to have a clear understanding of the system's impact on each of the financial risks they incur through participation in it.
- III. The system should have clearly defined procedures for the management of credit risks and liquidity risks, which specify the respective responsibilities of the system operator and the participants and which provide appropriate incentives to manage and contain those risks.
- IV.\* The system should provide prompt final settlement on the day of value, preferably during the day and at a minimum at the end of the day.
- V.\* A system in which multilateral netting takes place 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 settlement obligation.
- VI. Assets used for settlement should preferably be a claim on the central bank; where other assets are used, they should carry little or no credit risk and little or no liquidity risk.
- VII. The system should ensure a high degree of security and operational reliability and should have contingency arrangements for timely completion of daily processing.
- VIII. The system should provide a means of making payments which is practical for its users and efficient for the economy.
- IX. The system should have objective and publicly disclosed criteria for participation, which permit fair and open access.
- X. The system's governance arrangements should be effective, accountable and transparent.

\* Systems should seek to exceed the minima included in these two Core Principles.

### **Responsibilities of the Central Bank in applying the Core Principles**

- A. The central bank should define clearly its payment system objectives and should disclose publicly its role and major policies with respect to systemically important payment systems.
- B. The central bank should ensure that the systems it operates comply with the Core Principles.
- C. The central bank should oversee compliance with the Core Principles by systems it does not operate and it should have the ability to carry out this oversight.
- D. The central bank, in promoting payment system safety and efficiency through the Core Principles, should cooperate with other central banks and with any other relevant domestic or foreign authorities.

### **Biographical Sketch**

Kai Barvell joined the International Monetary Fund in June 2000. He has been with the Central Bank of Sweden between 1968-2000. Up until 1989 he was involved in foreign exchange market and foreign exchange reserve issues including being the Chief Dealer of the bank from 1977. In 1989 he was appointed Deputy Head of the Monetary and Exchange Rate Policy Department, and became a member of the central bank's monetary policy group.

He was appointed Director and Head of the Accounting Department in 1993, and was the following year appointed Director and Head of the Payment Systems Department. This department was responsible for operating the central bank's Real Time Gross Settlement System (RTGS); payment system oversight; the central bank's financial crisis organization and produced a bi-annual Financial Stability Report covering the financial market. The department also handled all back office activities related to the central bank's monetary and exchange rate policy transactions and international payments.

Kai Barvell has been a member of the Basel based Committee on Payment and Settlement Systems (CPSS), and a member of the task force that developed the Core Principles for Systemically Important Payment Systems (CPSIPS). He has been a member of the EMI/ECB working group on payment systems that developed the European payment system, TARGET, and a member of the Board of the Swedish Financial Supervisory Authority.