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THE ANALYSIS OF RISK AND RISK MITIGATION TECHNIQUES IN PAYMENT AND SECURITIES SETTLEMENT SYSTEMS AND THE IMPACT ON CENTRAL BANK'S OVERSIGHT

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The analysis of risk and risk mitigation techniques in payment and securities settlement systems and the impact on central bank oversight

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Abstract

This paper investigates the risks and risk mitigation techniques which are in use within the Luxembourg-based payment and securities settlement systems and evaluates what could be the impact of risk analysis on central bank oversight. It indicates how overseers can make use of different tools to assess the availability and appropriateness of risk mitigation techniques implemented by market practitioners and to further promptly react in case of contingency.

Executive summary

The risks, which arise within payment and securities settlement systems, can be of different nature and different can be their probability of materialisation. Overseers are particularly concerned about the occurrence of systemic risk and all other risks which might, directly or indirectly constitute a threat to financial stability. Hence overseers attach importance to assessing how systems' operators and technical agents currently mitigate the exposures which arise within the systems[1] they operate.

Due to the fact that risks can be different within payment or securities settlement systems, the mitigation techniques implemented by risk-takers, such as operators and technical agents, can be varied. Risk-takers can be confronted with the need to find a balance between their business needs, the market demand and the risk-adverse attitude adopted by overseers. Hence their capability to fully mitigate risks might need to be seen in the light of what would theoretically represent a first best solution under a risk-adverse attitude, on one hand, and what currently represents best practice on the market on the other hand. The first chapter of the study provides a description of the different systems' exposures followed by an explanation of the scope of the respective mitigation techniques and the way they are currently implemented within the Luxembourg environment. In this context, Clearstream Banking Luxembourg operates the Luxembourg-based securities settlement system, while LIPS-Gross and LIPS-Net represent the Luxembourg payment systems.

The evaluation of exposures and of the availability and appropriateness of risk mitigation techniques is an exercise which overseers, for their part, might undertake continuously. Hence, the second chapter describes an oversight framework which can be applied indifferently to payment and to securities settlement systems. The tools, which are described in the text, have been shaped in such a way as to assess both exposures and mitigation mechanisms. Their aim is to:

(a) enable an understanding of existing risks in the context of payment and securities settlement systems and to foresee possible future exposures which might arise from systems' developments or external threats. Tools which satisfy this aim can be defined as research tools;

(b) enable the assessment of the availability and appropriateness of risk mitigation mechanisms currently in use on the market. Tools which satisfy this aim can be defined as assessment tools;

(c) enable overseers to react promptly in case of contingency and to contribute, when possible, to a timely reduction of the costs incurred by counterparts after an exposure has materialised. Tools which satisfy this aim can be defined as intervention tools and/or procedures.

[1] When made use of the word "system" in the text, it refers to both payment and securities settlement systems.

The use of the different instruments is interconnected. Research tools permit systematically the gaining of a wide understanding of the threats arising from the financial market and the achievement of knowledge about the vulnerabilities within a system. The result of such research enables the dynamic identification of the roots of exposures, the assessment, in turn, of whether the risk mitigation techniques adopted by overseen systems might be adequate and if current mitigation mechanisms could cover new threats which are in the process of development. This evaluation permits to shape at best the procedures and the intervention mechanisms to be used by overseers in case of crisis and contingency.

Hence, the aim of assessing risks and risk mitigation techniques in the context of central bank oversight of payment and securities settlement systems can be defined as an ongoing process which finds its major root in the developments overseen systems are subject to and finds one of its major "raisons d'être" in the developments overseers might achieve in terms of safety and efficiency within the systems they oversee.

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1 Introduction

The risks which arise in payment and securities settlement systems - SSS[2] - can be of different nature and different also can be the mitigation techniques which are implemented by operators[3] and technical agents[4] to mitigate them. Due to the fact that the link between payment and securities settlement systems is increasing, overseers might need to develop a general framework which could easily help them to assess exposures and mitigation mechanisms in both, payment and securities settlement systems.

Furthermore, the philosophy behind risk assessment has been slightly changing recently; the emphasis is, among other factors, less on risk measurement but increasingly on the communication with the risk-takers. Hence, operators and technical agents might be overseen according to their awareness of risks, their capability to mitigate exposures[5] and their ability to adapt quickly to changing environments.

The purpose of overseers in assessing risks and risk management is, among other factors, to contribute to the identification and prevention of those risks which could arise in payment and securities settlement systems and of those risks the operator and/or technical agent is exposed to by virtue of its activities, followed by the evaluation of the availability and adequacy of the risk mitigation techniques used by overseen entities. One of overseers' priorities in this context is, among others, to enforce the reduction of systemic risk[6]. As a direct effect of risk mitigation, confidence of the counterparts in the payment and securities market can be promoted.

The process has its major focus not only on the operator or the technical agent themselves, but might include also the parent company as the subsidiaries, branches and representative offices, where they have a bearing on risk and potentially an impact on payment, payment-related systems or SSSs and financial stability.

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[2] In the paper the term SSS is broadly used and defines systems which settle securities transactions and which can be embedded with payment system to settle the cash leg of securities transactions.

[3] An operator has been defined in *BCL's Policy and Procedures* for the Oversight of payments and securities settlement systems as the "central system organisation providing products and services and the owner of the system".

[4] A technical agent has been defined in *BCL's Policy and Procedures* as "a supplier of service where an operator has located a significant portion of its operational or IT infrastructure or where several payment- or securities settlement-related operational or IT infrastructures are centralised".

[5] The term "exposure" is used as synonym for "risk".

[6] Systemic risk has been defined in *BCL's Policy and Procedures* as "the inability of one institution to meet its obligations when due will cause other institutions to fail to meet their obligations when due. The possibility that the liquidity and credit problems precipitated by these failures to perform will disrupt financial markets and impair the functioning of payment and settlement operators is of particular concern".

2 Risks and risk mitigation techniques

The possibility that a transaction might not be settled as expected or not settled is usually defined as settlement risk and comprises the occurrence of several other types of exposures. Overseers are particularly concerned about the occurrence of systemic risk and all other risks, which may constitute, directly or indirectly, a threat to financial stability[7].

Within payment and securities settlement systems, the risks and the mitigation techniques involved are of different nature. The exposures treated in this chapter represent only a limited group of risks which have been mostly treated in literature[8] and which are, to a large degree, highly interrelated one to the other. Other risks do nevertheless exist.

The chapter sets out a short description of risks[9] and mitigation techniques in securities settlement and payment systems respectively, followed by a short explanation of the scope and use of the mitigation mechanism and its main implementation within the Luxembourg environment.

The settlement of securities transactions involves the processing of two legs of the same operation; the securities and the cash leg. Hence, the risks which arise in this context, partly relate to the processing of securities and partly to the processing of the funds, while the risks which arise within payment systems mostly relate to fund transfers. For this reason, securities settlement systems have been treated in the text as the first issue. Clearstream Banking Luxembourg - CBL - operates the Luxembourg-based securities settlement system, while LIPS-Gross and LIPS-Net are the Luxembourg payment systems which have been analysed in the context.

2.1 Securities settlement systems - SSSs -

2.1.1 Legal risk

2.1.1.1 Definition

Legal risk occurs when:

- a counterpart might suffer a loss because relevant laws or regulations do not support the rules of the system in which it participates;

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[7] The vast interrelationships between payments' and SSSs' participants raised concerns after the first counterpart failure, which triggered systemic risk. A major example has been the failure of Bankhaus Herstatt on the 26th June 1974. On that day the Bundesaufsichtsamt fuer das Kreditwesen withdrew the banking license of Herstatt, a small bank in Cologne, which was active in the foreign exchange market, and ordered the liquidation of the institution during the banking day at the close of the interbank system in Germany. Prior to the announcement of the failure, several counterparts of Herstatt had irrevocably paid DEM to Herstatt through the German payment system against receipts of US$ later during the day in New York in respect of maturing transactions. When Herstatt business was terminated during the day, Herstatt's New York correspondents suspended outgoing US$ payments from Herstatt's account. This left Herstatt's counterpart banks exposed for the full value of DEM payments made (credit exposure). Those counterparts, which had entered into forward trades with Hestatt not yet due for settlement, incurred in the loss of replacing the contracts on the market (replacement risk).

[8] General literature in this filed usually involves the "*Core Principles for Systemically Important Payments Systems*" (BIS; January 2001), "*Recommendations for securities settlement systems*" (BIS; November 2001) and the "*Report of the Committee on Interbank Netting Schemes of the central banks of the Group of Ten countries*" (BIS; November 1990).

[9] The definitions of the different risks which are given in this chapter are taken from the *BCL's Policy and Procedures for the Oversight of payments and securities settlement systems*, 5 December 2001.

- the application of the relevant laws and regulations is uncertain; or
- the system is not adequately protected against crime, terrorism and money laundering activities.

The exposure itself arises with the finalisation of the trade and lasts until the counterparts have discharged their bilateral obligations.

2.1.1.2 Possible risk mitigation techniques

One of the basic principles in order to ensure a reduction of legal risk is to achieve clarity on a number of issues which might have, directly or indirectly, a significant impact on the functioning, safety and efficiency of the system. As a general rule, the major issues are:

- timing of finality of the transaction and of irrevocability of the transfer order[10];
- relevance of national and foreign laws which may be applicable to the overseen system and relevance of participants' home jurisdictions;
- nature of the entitlement to securities held in the system;
- level of enforceability of risk management measures[11];
- bilateral/multilateral obligations of systems' operator, technical agent and participants;
- to ensure the traceability of transaction orders[12] etc..

2.1.1.3 Situation in Luxembourg

The legal and regulatory framework of CBL, the Luxembourg-based SSS, is defined by European legislation[13], by national laws[14] and by CBL's General Terms and Conditions (which are governed by Luxembourg law). The legal competence of the Banque centrale du Luxembourg - BCL - in the field of the oversight of payment and securities settlement systems is laid down in the national law of 12 January 2001[15] implementing the Directive 98/26/EC of the European Parliament and of the Council of 19 May 1998 on settlement finality in payment and securities settlement systems, into the Law of 5 April 1993 relating to the financial sector, as amended. In addition BCL's competence in the field of payment systems results from the European Community's legislation[16]. BCL's responsibilities as concern the promotion of the smooth operation of payments and securities settlement systems and hence the stability and integrity

[10] According to the transposition of the Settlement Finality Directive into Luxembourg law of 12 January 2001, the point of irrevocability corresponds to the point of entry of a transaction order into the system.
[11] As general rule, risk management measures are enforceable to the extent they are covered through sound contractual agreements.
[12] Important in the context is the circular BCL 2002/172 of 28 June 2002 ("*Protection des systèmes de paiement et de règlement des opérations sur titres contre le crime et le terrorisme*").
[13] European legislation involves the Treaty establishing the European Community and the Protocol on the Statute of the ESCB and of the ECB. Furthermore a Memorandum of Understanding on cooperation between payment systems overseers and banking supervisors in Stage Three of Economic and Monetary Union has been endorsed by the Governing Council on 18 January 2001.
[14] The major national laws relevant in this context are: (i) the law of 12 January 2001, implementing the EU's settlement finality directive, which gives the BCL formal responsibilities for payment and securities settlement systems and (ii) the law of 1 August 2001, pertaining to the circulation of securities and other fungible instruments. The competence of the Banque centrale du Luxembourg in this field is furthermore laid down in the circular BCL 2001/163 of 23 February 2001 ("*La surveillance par la Banque centrale des systèmes de paiement et de règlement des opérations sur titres au Luxembourg*") and the circular BCL 2001/168 of 5 December 2001 ("*Politique et procédures en matière de surveillance des systèmes de paiement et de règlement des opérations sur titres au Luxembourg*"). The circulars can be found at www.bcl.lu.
[15] Published in Mémorial A-n°16 of 6 February 2001.
[16] Article 105 of the EC Treaty and articles 3 and 22 of the Protocol on the Statute of the ESCB and of the European Central Bank.

of the financial infrastructure, are set out in BCL's Policy and Procedures. Its institutional and legal responsibilities are furthermore extensively laid down in BCL's circular 2000/163 of 23 February 2001 "La surveillance par la Banque centrale des systèmes de paiement et de règlement des opérations sur titres au Luxembourg" as in the Bulletin 2002/2 "Stabilité financière"[17].

In the event of participants' insolvency, Luxembourg bankruptcy law protects the holder of securities. His property rights, in fact, remain unaffected in case of default of the operator of the securities settlement system. The book-entry procedure[18] confers to the holder of the securities account at CBL the ownership right over the securities booked on it. This right consists:

- of a claim on a given number of non-individually identified securities of the same type held by the central securities depository on behalf of the community of all owners of the same type of securities; and
- of a right to reclaim them in the event of insolvency of the SSS.

The potential for cross-jurisdictional conflicts is partly covered by the "lex rei sitae principle", which stipulates that the applicable jurisdiction as regards bearer notes is the one of the place where the securities are located (i.e. for notes deposited in CBL it corresponds to Luxembourg law). Due to the mobile nature of bearer notes and of dematerialised securities in general, this principle often becomes contestable. On these grounds a preliminary convention on "The law applicable to certain rights in respect of securities held with an intermediary" is under preparation[19]. Under this convention, the law applicable to proprietary rights in securities is the law of the State where the account holder maintains a securities account and where the relevant intermediary in a system (e.g. CBL) has an office engaged in a business or activity of maintaining securities accounts[20]. This principle is known under the name of PRIMA (**P**lace of the **R**elevant **I**nter**m**ediary **A**pproach).

Further within this framework, a specific working group, the ESCB - CESR[21] Working Group, has been created as forum of discussion between central banks and securities regulators to define oversight standards and recommendations for the European Union in the context of securities settlement systems.

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[17] Publications relating to the institutional competences of the BCL can be found on www.bcl.lu.

[18] The Grand-Ducal Règlement of 17 February 1971 provided the statutory basis for book-entry custody, clearing and settlement of securities and defined the interest of an investor in securities held through accounts with a financial intermediary in Luxembourg as a right of ownership. The law of 1 August 2001 on mobilisation of securities (article 6) replaced the Decree of 1971 and defines the proprietary rights as "real and incorporeal rights" of ownership on behalf of the investor over the pool of assets. Clearstream Services (CS) currently operates the book-entry system on behalf of CBL.

[19] The draft convention is under preparation by the Hague Conference on Private International Law.

[20] Article 4(1)-(2).

[21] **C**ommittee of **E**uropean **S**ecurities **R**egulators.

2.1.2 Credit risk

2.1.2.1 Definition

Credit risk represents the possibility that a counterpart does not fulfil its obligations for the full value, either on the due date or at any time thereafter and can be sub-divided in replacement cost risk and principal risk.

Replacement cost risk, i.e. the risk of unrealised gains on unsettled contracts with a defaulting participant, relates to the possibility that the counterpart defaults before any transfer of securities has been carried out. The exposure arises when the original transaction becomes legally binding and lasts until the respective counterpart has discharged its obligations.

Principal risk relates to the possibility that the counterpart defaults once the transfer of funds or securities has begun but has not been completed yet. The exposure arises when one party in the transaction has fulfilled its obligations (payment or transfer of securities) and lasts until the counterpart has fulfilled its respective obligations.

2.1.2.2 Possible risk mitigation techniques

The creation of a central counterparty - CCP - reduces counterpart credit risk. This institution provides for the novation of the original contracts by substituting itself as respective counterpart. From a market participant point of view, counterpart credit risk is substituted by the risk of default of the CCP. Due to the fact that CCPs implement strong risk mitigation techniques, their probability of default is usually less than the one of market participants.

Countries, which do not have a CCP, implement other mitigation techniques to cover credit risk, such as the reduction of the settlement cycle (the period ranging from the trade execution to the settlement). The longer the settlement cycle, the greater will be the risk that one counterpart will become insolvent or default on its obligations. This, in turn, will increase the replacement cost risk if the price of the security transacted might diverge from the original price. Usually[22], the maximum acceptable timeframe is represented by a delay of three business days after the trade date to settle the cash transaction. Different markets may have different practices in use. Depending on the costs of reducing settlement cycles and on the benefits in terms of risk reduction, different instruments can have different settlement cycles.

Delivery versus payment mechanisms - DvP - furthermore mitigates credit risk by linking a payment system and an SSS to ensure the irrevocable and simultaneous exchange of securities against cash. However this mechanism can either eliminate replacement cost risk nor liquidity risk. Three models of DvP have been defined[23]:

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[22] The Group of Thirty's 1989 recommendations regarding securities clearance and settlement require that final settlement of cash transactions should occur on t+3, which means three business days after the trade date (recommendation 7).

[23] BIS, Committee on Payments and Settlement Systems of the central banks of the Group of Ten countries, *Cross-border securities settlement*, March 1995.

- model 1 DvP[24] settles transfer instructions for both securities and funds on a trade-by-trade basis (transfer of securities is final simultaneously to the transfer of funds);
- model 2 DvP[25] settles securities instructions on a gross basis (the transfer of securities is final immediately), while funds instructions are settled on a net basis (the transfer of funds is final at the end of the processing cycle);
- model 3 DvP[26] settles transfer instructions for both securities and funds on a net basis with final transfer of both at the end of the last settlement cycle. During the processing day, the securities transfers are marked as provisional until the cash settlement is completed later during the day.

Risks in this context can arise from the link between SSSs using different models of DvP. If a model 1 DvP is receiving securities from a model 3 DvP, transfers in the books of the former are final immediately when processed, while transfers in the books of model 3 DvP may remain provisional for many hours after they have been processed. The exposure increases when the transfer to a participant in model 1 DvP is considered as final and the system is granting credit on the basis of the collateral received. Due to the fact that in a model 3 DvP unwind can be permitted in case of a participant's default to settle cash obligations, the corresponding securities transfer might be unwound with possible effects on the participants in model 1 DvP. Further mitigation techniques are:

- the implementation of a loss-sharing arrangement between participants;
- the existence of a guarantor syndicate composed by a group of banks;
- the possibility of realising collateral when a participant becomes insolvent;
- insurance coverage, etc..

SSSs which, in order to enable a smooth settlement of securities transactions, might grant credit to their customers on the basis of internal credit ratings assigned to customer institutions rather than on their available collateral, might raise additional risk concerns. The belief that the creditworthiness of a customer institution can transform an unacceptable risk into an acceptable one, a result which no amount of collateral could in principle achieve, and an eventual granting of unsecured credit lines on a short-term basis for creditworthy customers, could however be considered as non-consistent with the general philosophy expressed by international standards according to which clean credit risk should be eliminated through the use of full collateralisation.

Unsecured credit lines

Potential reasons which could lead SSSs to grant unsecured credit lines might be:

- The existence of SSSs' night-time processing;
  SSSs might give customers the possibility to settle transactions during day-time as night-time

[24] SSSs settling via model 1 DvP: CBL (Luxemburg), EOC (Belgium), CREST (UK), etc..
[25] SSSs settling via model 2 DvP: APK (Finland), Clearstream Banking Frankfurt (Germany) operates model 2 DvP, but has nevertheless a procedure available for participants who want to use model 1 DvP, etc..
[26] SSSs settling via model 3 DvP: Bank of Greece Securities Settlement System (Greece), Interbolsa (Portugal), Vaerdipapircentralen (Denmark) gives the possibility to settle via model 1 and model 3 DvP, etc..

processing cycles. Participants might need to use heavily unsecured credit lines during the night-time processing (intra-day). As result of this need the end-of-day figures on the use of those lines might result as relatively low, even if their use intra-day might have been relatively high.

- The way credit lines are granted;
  A further reason why unsecured credit lines might be inflated could depend on the way those lines are granted. Indeed, credit lines can be granted for each customer or for each settlement account. In the latter case if customers have more than one account, those lines could be in excess of the real needs.

- The cross-border settlement activities of SSSs;
  For SSSs with significant cross-border settlement activities, the differences between the operating hours of SSSs/Central Securities Depositories (CSDs) and the differences between settlement practices (e.g. finality rules, cut-off times, etc.) of national payment systems and local CSDs, might require SSSs to grant credit extensions of large amounts and for a certain duration to participants, in order to reduce the opportunity cost of maintaining cash and securities balances to meet settlement obligations. This opportunity cost is usually represented by a loss of days in value.

Inter-bank placements

SSSs might have in place a network of cash correspondents through which the settlement of the cash leg of securities transactions is performed. Participants need usually to provision their cash accounts in order to settle their operations and at the end of the business day, depending on the treasury management of the different participants in a system, more or less significant amounts of funds might be left on the participants' cash accounts at the operators' cash correspondent network. In this context, the operator has the possibility, through an active treasury management, to invest this liquidity overnight on the inter-bank market. Cash left by single participants on their respective accounts might be of negligible amounts, nevertheless the sum of all funds left overnight by the totality of the participants in a system might represent a significant amount, which invested, might represent an additional income for the operator of the system.

Concerns within this context arise if it is considered that inter-bank placements might entail a credit risk which is proportionate to the creditworthiness of the banks chosen by the operator to place its participants' overnight funds it has at disposal. The operator has therefore a credit risk towards its placement banks and an exposure towards its participants because it is liable towards them for returning their funds at the start at the next business day. The analysis of inter-bank placement risk achieves therefore importance as concerns credit exposures within SSSs.

2.1.2.3 Situation in Luxembourg

At the time the characteristics of the national financial market does not seem to justify the implementation of a CCP:

- transactions' volumes and values are low;
- volumes and turnover of derivatives traded on the stock exchange are currently limited, which does not justify the implementation of a CCP to minimise the use of collateral;
- as a general rule the settlement facility is provided by CBL which supplies pre-settlement matching of trade transactions;
- the stock exchange has operated an automatic trading system since 1996 (Système Automatisé de Marché). Orders are matched electronically and participants do not have the possibility to choose their counterpart in the deal, which might reduce their capability to mitigate credit risk. Nevertheless, stock exchange members operate under the common rules of the exchange[27] , which foresee sanctions in case of members' non-compliance.

Concerning the settlement cycle, CBL operates a multiple batch processing procedure (free of payment - FOP -) for Eurosystems' credit operations purposes, while it uses DvP settlement in commercial bank money for other settlement procedures. The multi-batch process allows a shortening of the settlement cycle and as result, the system receives and processes trade confirmations from the different markets several times during the day. The date on which the settlement instruction will be processed depends on the type of transaction[28].

Due to the fact that CBL operates a model 1 DvP system, which implies that the transfers of securities and funds become final[29] simultaneously in the books of CBL (on the buyer's and seller's account), participants are not exposed to credit risk. In the event of a counterpart's default, CBL would block all the accounts of the concerned participant, so that no further settlement of transactions will be possible. Customers would nevertheless remain exposed to a change in value of the securities that should have been delivered against the agreed transaction price, which is in turn mitigated by the application of haircuts. Furthermore, in order to cover credit risk, the following controls are undertaken internally by CBL:

- CBL never acts as principal to securities transactions;
- access criteria are based on the creditworthiness of the participant;
- customer ratings are reviewed yearly by an Internal Credit Group;
- collateral valuation is performed daily;

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[27] Règlement d'ordre intérieur de la Bourse de Luxembourg, Chapter VIII, IX, X.

[28] Bridge transactions are processed in the overnight cycle for the required settlement date and internal transactions are processed in the day-time settlement cycle for the required settlement date. For settling receipt of securities from a foreign counterpart, the crediting of the security and the debiting of cash in CBL is done upon confirmation of settlement in the domestic market.

[29] Irrevocability is achieved when the parties can no longer revoke their instruction and unconditionality when there are no longer any circumstances that could cause the SSS to unwind the transfer. If transfers are provisional at the time of processing, even if DvP is achieved, the risk remains that transfers may have to be unwound later if finality cannot be achieved. In a transaction between two accounts of CBL's system, the finality occurs during the next settlement cycle, while for a bridge transaction, the transfer becomes final at the time the SSS, which is delivering securities, receives the other SSS's feedback transmission accepting the proposed delivery. For links with other SSSs the transfers of funds and securities become final in accordance with the local rules of the foreign domestic markets.

- a loss-sharing arrangement is present. CBL reserves the right to reverse any erroneous debit or credit entries to any account at any time. Such errors shall include a debit or credit made in connection with a transaction which becomes subject to a reversed order. Losses in a collective holding of a particular class of securities are to be borne jointly and pro-rata by the co-owners of the collective holding on the basis of the credit balance existing at the time where the loss occurred;
- in the event that the customer has a debit balance in a security, which can only occur in the case of an unwind, and he does not credit the account within seven business days, CBL may purchase collateral on the market at the expense of the defaulting customer.

Credit evaluation process

The Internal Credit Group (ICG) is a sub-committee of the Group Executive Management[30]. Its approval is required for all credit proposals, admission of new customers, setting of credit lines and changes to them, setting or changing limits to exposures on any counterpart as for the appointment of depositories and cash correspondents. The ICG is also responsible for periodic reviews of credit lines and limits to exposures as further for the review of products and operational issues which might trigger credit implications. The Credit Advisory Group, whose members are representatives of international banks having expertise in credit analysis and monitoring particular geographical areas, advises the ICG. Only the Credit Unit can define or alter the credit parameters which are defined for customer's accounts within Clearstream Banking.

As concerns admission of participants to the system, access is granted for a number of institutional types which are listed in the credit policy guidelines of CBL, while ineligibility is evaluated on a case-by-case basis.

Provision and collateral checks

The provision of collateral is required for:

- all settlements in which CBL extends credit to customers, except for non-collateralised credit facilities;
- securities borrowing and lending facilities (see section "securities lending facilities" 2.1.3.3 for details);
- transactions settled through repurchase agreements (see section "securities lending facilities" 2.1.3.3 for details).

[30] Clearstream Banking, *Disclosure Framework Report*, BIS-IOSCO Disclosure Framework for Securities Settlement Systems, The Clearstream Banking S.A. Luxembourg Response, 3.2002.

The Securities Lending and Borrowing Syndicate - SLBGS[31] - ultimately evaluates and bears the underlying country, currency and issuer risks of collateral eligible in CBL's system according to eligibility criteria, such as the size of the issue, its currency of denomination, its liquidity or its volatility. At the beginning of the settlement process, the system re-evaluates the outstanding exposures and collateral available based on which securities are deposited in the account and on the market price of the security. CBL agrees with the syndicate, which securities are eligible and which haircut[32] to apply.

Provision and collateral checks are performed by the system during the processing. The former ensures that securities and cash are available on the participants' account or through securities borrowing and credit facilities, while collateral checks ensure that sufficient collateral is available to cover outstanding obligations. Indeed when evaluating the collateral available in an account to secure a certain exposure, CBL takes into account:

- which securities are available in the customer's account and eligible to secure transactions for settlement;
- the market price of the security;
- the exchange rate, where relevant; and
- the haircut to be applied to the security.

If the exposure resulting from the instructed transactions were in excess of the exposure which can be secured by the collateral available in the account, the transaction would not settle.

2.1.3 Liquidity risk

2.1.3.1 Definition

Liquidity risk arises virtually in every settlement distress scenario. Both parties in a trade might be exposed to it on the settlement date, but in different ways. This risk includes the possibility that the seller/buyer of a security who does not receive payment/delivery in due time (for the full or the partial value) may have to borrow or liquidate assets to fulfil its obligation. The costs associated with it, depend on the liquidity of the markets in which the security is needed and are inversely proportioned to it. The exposure arises at the start of the transaction settlement date and lasts until the settlement has taken place during the day.

In the absence of a direct link between SSSs and payment systems or embedded payment systems, the occurrence of liquidity risk is more likely. As the execution of a transaction may be dependent from settlement of other trades, this, in turn, may prevent other participants from meeting their obligations (gridlock).

[31] Citibank, UBS, Dexia, BGL, BBL, Kredietbank SA and NV, HSBC-CCF currently compose the SLBGS.
[32] Cash is accepted with a 0% haircut; commercial papers with 5-10% haircut; zero coupon bonds with 20% haircut; equities with 34% haircut.

2.1.3.2 Possible risk mitigation techniques

Securities lending or borrowing permit the reduction of liquidity as credit risk. Borrowing securities might in fact be more cost-effective than bearing the cost associated with a settlement failure. On the other hand borrower and lender face the risk that securities lent might not be returned when due[33]. Those facilities partly shift credit risk from the counterpart in the original transaction to the lender/borrower (outside the original transaction), who, in case of default, might need to acquire the securities on the market at higher costs.

Intra-day credit, from its part, is often extended to participants in order to ensure timely settlement and avoid gridlock. It is usually provided by the Central Securities Depository as principal and takes the form of intra-day loans or repurchase agreements.

Beside the supply of lending or borrowing facilities and of intra-day credit, in order to provide for additional liquidity for settlement purposes to participants, the operator of an SSS might consider the possibility to enable customers to pre-advise the entry of funds from cash correspondents for credit to a customer's account held at the operator itself. This methodology involves the risk that the pre-advised funds might not be paid as advised, which in turn might have an impact on the treasury management of the system's operator. Indeed, the procedure enables customer to be credited with good value, nevertheless a non-receipt of funds would impact the operator's funds position towards its cash correspondents.

Especially in contingency situations, a system's operator might be faced with the need to mitigate liquidity risk and would therefore rely on a liquidity contingency plan. The latter could include for example, revolving credit facilities or, the possibility to issue commercial papers to raise additional liquidity on the market. Due to the fact that raising liquidity on the market is interlinked with the rating a company has, a downgrade in the rating of a system's operator would imply not only a reputational damage but also a reduction in its capability to raise additional liquidity in contingency situations.

2.1.3.3 Situation in Luxembourg

Final funds transfers are made in CBL's system as debits and credits to customer's cash accounts which CBL holds via a network of correspondent banks on behalf of its customers. In order to minimise settlement failures, CBL provides automatic securities lending programmes and credit facilities:

- for settling purposes;
- within the limits of the customer's credit facilities; and
- fully collateralised (with the exception of unsecured credit lines).

[33] Because of counterpart's default, operational failure, etc..

A syndicate of guarantors establishes limits on securities lending and CBL itself sets placement limits for major banks.

Securities lending facilities

A securities loan is an agreement in which securities are lent to a counterpart against cash or other collateral, to avoid participants' settlement failure. CBL merely acts as an intermediary between lenders and borrowers and manages three major different types of securities lending programmes:

- Automated Securities Lending (ASL);
- Disclosed Automated Securities Lending (DASL); and
- Strategic Securities Lending (SSL).

Under the DASL and the ASL programmes, borrowers have access to a large pool of lenders; whereas under the SSL, securities loans are transacted bilaterally between lenders and borrowers. Within the ASL programme, the collateral provided by the borrowers is pledged to a syndicate of guarantors, which in turn guarantees all securities loans, while CBL does not bear any underlying risk. Within the DASL and SSL arrangement, collateral is directly pledged to the lenders and the risk is borne by the customers. Lenders can specify to which borrowers they are willing to lend and up to which limit.

CBL administers the repurchase transaction through the use of a Tripartite Repurchase Service, which implies the transfer of the securities from the seller to the buyer against cash and the agreement of the seller to repurchase the securities at a specified time in the future or on demand at a pre-defined price[34]. CBL:

- performs eligibility checks to review if the securities correspond to the agreement;
- calculates the cash countervalue of securities;
- performs the matching and the settlement of the transaction;
- makes margin calls if needed and checks that each party fulfils its obligations.

Credit facilities

Credit facilities supplied by CBL to its customer base are made available to participants at CBL's discretion and can therefore be cancelled without prior notice. The facilities might also be unavailable or restricted in less liquid currencies. There is a limit for the use of each facility. Two major type of facilities can be supplied, such as;

- Unconfirmed Funds Facility; and
- Technical Overdraft Facility.

[34] The reverse repurchase is the same transaction from the point of view of the buyer of securities.

Unconfirmed funds can be used for settlement purposes in addition to an overdraft facility. The facility is discretionary and the limit imposed represents the maximum amount of secured intra-day credit available for each customer which is very much dependent on the financial standing of the institution in whose name the account is opened. It covers intra-day exposures[35] where CBL allows customers to use incoming cash for settlement purposes only, prior to confirmation that CBL has received the cash. Unconfirmed funds are constituted on the basis of outstanding pre-adviced instructions, i.e. a time-lag exists between the value date and the time when the receipt of funds is confirmed by CBL's cash correspondent, and on the basis of instructions for deliveries of securities against payment, i.e. a time-lag exists between the expected value date of the funds to be received and the time when confirmation of settlement is received from the depository. In case of a customer's default, his account will be blocked and he will be charged a penalty interest.

The Technical Overdraft Facility on the other hand permits highly rated customers to borrow cash short-term[36]. The goal is to finance customers' purchases in the event of unexpected transaction failures which prevent them meeting their obligations. The credit line is usually fixed in US$ but can eventually cover other currencies if agreed with the customer.

In this context, CBL constantly supervises credit exposures and credit lines granted to its customers.

Additional resources

The objective of liquidity management is to ensure CBL's ability to meet all legitimate demand for funds from depositories, all facilities committed to borrowers and to enable a smooth settlement activity of participants' obligations. The liquidity management of CBL takes into account, inter alia, pre-advised funds which are sent by customers on the basis of funds to be received by CBL's cash correspondent banks -CCB -. Within this context, the CCB's network[37] manages the intra-day incoming and outgoing funds timing and performs the regular services such as the execution of payments, receipts of funds, reporting through cash statements and transaction reports, handling of claims and investigations and interest calculation. The CCBs maintain intra-day and overnight credit lines to guarantee timely execution of CBL's payment obligations to customers and other business partners (called uncommitted short inter-bank lines).

In contingency situations, Clearstream might need to raise additional funds. It disposes therefore, inter alia, of the following major resources:

- uncommitted short inter-bank lines;
- Euro Commercial Programme -ECP- ;
- multi-currency revolving credit facility[38].

[35] The exposure lasts for 24 hours maximum.
[36] The exposure lasts for 48 hours maximum.
[37] The network involves currently around 70 cash correspondents and depositories. Only in the euro area CBL has 25 CCBs and depositories.
[38] The revolving credit facility is established for a stated period of time, but does not have a fixed repayment schedule. The borrower pays a commitment fee to use the facility and may draw down the line at any time, or repay in full without penalty.

Both the revolving credit facility and the ECP, a facility in which CBL issues commercial papers to raise liquidity on the market, are considered as "last resort" measures. They are regularly tested in order to ensure that the market reacts promptly to liquidity constraints; their use has nevertheless to be approved internally.

CBL has currently a short-term rating of A1+ and a long-term rating of AA+ from S&P and Fitch IBCA.

The night-time link CBL/BCL

The development of the night-time link between CBL and BCL enables participants to request that liquidity held at BCL be made available as collateral for credit granting during CBL's night-time processing with Euroclear - EOC-. The goal is to increase the participants' liquidity management possibilities[39].

The results of the link processing are the following:

- collateral for the processing is provided in central bank money;
- participants have a better liquidity management because they have the possibility to use their liquidity held at the central bank even overnight;
- participants potentially reduce on average their need to provision their cash accounts at CBL.

2.1.4 Risk of settlement bank failure

2.1.4.1 Definition

The settlement bank is the institution across whose books transactions are settled. It supplies the settlement asset, which transferred among counterparts, provides respective obligations to be discharged. This asset can take the form of an account balance at the central bank, which represents a claim on the central bank (settlement in central bank money), or can take the form of an account balance at a commercial bank, which represents a claim on the commercial bank (settlement in commercial bank money). The safety of the system depends on the possibility of the asset issuer's failure, leading to systemic risk.

The exposure arises when the claim of a participant towards its settlement bank is transformed into a transferable asset used to discharge an obligation and lasts until the asset is re-transformed into a claim of the counterpart towards its settlement bank.

[39] On the day previous to the settlement date (t-1), the customers estimate the collateral needed in EUR for the night-time settlement process (date t) and transmit to CBL a collateral proposal. CBL submits the customers' proposal to BCL which checks whether the customer's credit balances and a potential intra-day credit cover the request. BCL confirms to CBL the extent to which the requests are covered by available funds hold at BCL. Upon receipt of confirmation, CBL records the credit line in the customers' CBL account for the duration of the night-time processing. After the night-time processing CBL calculates for each customer the amount used during the night for the net settlement of securities and cash transactions and sends a withdrawal of funds request to BCL to pay the used amounts to its account at BCL. BCL then transfers the amount used from the account of the participant to the account of CBL and BCL will release the unused amounts of the credit line into the account of the customer.

2.1.4.2 Possible risk mitigation techniques

Access to central bank money can be desirable under the risk profile. In terms of safety, the provision of central bank money has the following advantages:

- it reduces settlement risk, because central banks "de facto" do not fail;
- it reduces liquidity constraints on the market, because the settlement asset is liquid; and
- central banks have objectives targeted on the safety of the financial markets and therefore behave risk-adversely.

In terms of efficiency, the use of central bank money:

- suffers currently from a lack of economy of scale. The costs for supplying the settlement account for central banks include the costs of opening and maintaining an account, making funds transfers and providing credit. Because generally central banks have a limited customer-base compared to commercial banks, they might be not able to fully realise economies of scale. A wider use of central bank money could increase the possibility of achieving economies of scale. On the other hand, increased efficiency can be achieved if the management of the participants' accounts at the NCB would be outsourced to an SSS.
- is concentrated at a common settlement institution. The use of commercial bank money on the other hand would encourage a competition between commercial banks for the provision of the settlement asset.
- remote participants do, as a general rule, suffer certain limitations when participating in a securities settlement system settling in central bank money, such as:
  - no access to intra-day liquidity provided by the host national central bank -NCB-;
  - cash liquidity held on an account with a host NCB does not count in terms of minimum reserves and is not remunerated; and
  - no access to the deposit facility for the end-of-day liquidity on accounts at the host NCB.

2.1.4.3 Situation in Luxembourg

As of today, CBL does not settle operations in central bank money. The securities leg of ESCB credit operations is settled via free of payments transactions into the securities pool of the BCL. No payment leg exists for collateral movement. For non-ESCB transactions, funds transfers achieve finality under the form of a debit or credit on customers' accounts. When customers give instructions to deliver or receive securities against funds, each securities transfer is linked to the specific payment. CBL holds its customer's cash via a network of cash correspondent banks.

The SSS undertakes a selection of its cash correspondents based, among other factors, on the creditworthiness of the institution. The Internal Credit Group with the support of the Credit Advisory Group performs the credit analysis of the potential suppliers. Clearstream uses more than one cash correspondent for funds transfers in euro[40], but as concerns non-euro currencies accepted for settlement, CBL concentrates the cash service supply on one cash correspondent for each non-euro currency.

2.1.5 Operational risk

2.1.5.1 Definition

Due to the fact that clearing and settlement become increasingly dependent on information systems, the reliability of these arrangements is a key factor which influences operational risk, together with inadequate control mechanisms, errors and delays in processing or failures to follow instructions.

The exposure arises when a transaction order has to be inputted into a system for processing and lasts until the settlement of the instruction enables the settlement of the respective counterparts' obligations.

2.1.5.2 Possible risk mitigation techniques

All key areas and functions of systems should be secured in terms of access controls, be reliable, scalable and able to handle crisis and distress. Contingency, backup, recovery and capacity-stress plans are generally the major mitigation techniques used. In the ideal scenario, all those facilities should be immediately available and fully operational in case of emergency in order to recover operations and data processing without interrupting further the settlement process. Cryptographic techniques are generally used to ensure the reliability of communication networks and the prompt transmission of data.

2.1.5.3 Situation in Luxembourg

CBL's business continuity plan includes both organisatorial and technical elements. It relies "in primis" on a corporate business continuity policy which outlines Clearstream's objective to continue operations in contingency situations and defines further responsibilities in case of disaster scenarios. It further comprises formal crisis management and emergency response procedures, business unit, IT[41] and facilities recovery plans. The plan ensures the restart of mission critical functions within 1-2 hours and full recovery within 4 hours and is tested regularly[42].

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[40] CBL currently uses ten euro cash correspondents such as: Erste Bank (Austria), KBC Bank (Belgium), Deutsche Bank (Germany), Banco Bilbao (Spain), Nordea Bank Finland (Finland), Crédit Commercial de France (France), Citibank (Greece), AIB Bank (Irland), IntesaBci (Italy), Kredietbank (Luxembourg).

[41] **I**nformation **T**echnology.

[42] Full business continuity tests and data recovery tests are performed yearly.

The contingency mechanisms of Clearstream's Group have proved to be reliable and efficient. When a terrorist attack made Clearstream's office in New York unavailable on the 11th of September 2002, Clearstream International core business operations were running as normal and customer service support was provided to the North American market from CBL's offices in London, Luxembourg and Mexico City.

2.1.6 Custody risk

2.1.6.1 Definition

Custody risk arises when intermediaries become insolvent, act negligently or commit fraud. The degree of custody risk is influenced, among other factors, by:

- the accounting practices and safekeeping procedures employed by the custodian;
- the custodian's choice of the sub-custodians and of other intermediaries;
- the contractual allocation of the risk of securities loss; and
- the law governing the custodian relationship.

The exposure arises with the signature of the depository agreement between the depository bank and the SSS and lasts until one of the parties extinguishes the legal arrangement.

2.1.6.2 Possible risk mitigation techniques

The mitigation mechanisms used by custodians can be based on:

a. insurance and ad hoc internal controls to protect customers against misappropriation and risk of theft;
b. segregation between the custodian's own securities and the customer's securities administered by the depository;
c. regular reconciliation of their records to ensure that the total volume of securities maintained in the accounts of participants equals the volume of securities deposited by the issuer;
d. direct relationship between the issuer and the SSS[43].

Furthermore immobilising[44] or dematerialising physical securities may reduce significantly the cost of owing, trading, custody and settlement of securities and may decrease the occurrence of errors and delays in manual processing. Major issuances are currently done under the form of global notes, which represent the whole issue, while all rights and obligations are registered through book-entry procedures in the respective SSS. This mechanism:

- is a precondition for shortening settlement cycles and therefore reduces replacement cost risk;
- facilitates the implementation of DvP arrangements and therefore reduces principal risk.

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[43] Standard three of the "Standards for the use of EU securities settlement systems in ESCB credit operations" ("no undue custody risk"), requires SSSs to have a direct and unique relationship with the issuer as to have in place procedures to check that the total amount of securities in the participants' accounts is equal to the total amount of securities deposited by the issuer in common depositories and safe-kept on behalf of the SSS.

[44] In CSDs.

2.1.6.3 Situation in Luxembourg

a. Insurance reduces the cost of mitigation techniques up to the limit of liability of the contract. Contracts signed off by the parent company CI cover risks arising in CBL as in Clearstream Banking Frankfurt - CBF -. Major insurances are:

- a *crime and depository indemnity* for customer claims for which Clearstream Banking would be liable according to its General Terms and Conditions[45] (this insurance is aimed at covering custody and fraud risk); and
- an insurance of all risks of *physical loss or damage* for losses or damage of instruments held by Clearstream Banking on behalf of its customers or in transit in Clearstream Banking's system (this insurance is aimed at covering custody risk).

b. A network of depository banks[46] around the world undertakes the safekeeping of securities accepted by CBL. CBL allocates each issue to a single depository, which executes customers' instructions for physical or book-entry transfer of securities into or out of CBL's system. All depositories have to comply with standards of performance required by CBL. The Internal Credit Group of CBL performs a risk assessment of potential suppliers of depository services while an external council provides for a legal opinion on the ability of the depository to fulfil its obligations under the depository agreement[47] signed with CBL.

Beside the links towards other SSSs, which have been assessed as eligible for ESCB credit operations, CBL uses three types of depository banks for national and/or international securities: common, Euro- and domestic depositories. EOC and CBL jointly appoint common depositories, whereas Euro- and domestic depositories are appointed by CBL only.

Common depositories are generally used to facilitate the launch of new issues of Eurobonds[48] and international securities. Both CBL and EOC enter into an agreement with the common depository, according to which the latter acts as an agent for both ICSDs, supplies them custody services and, on their behalf, receives global notes. Following the night-time processing, both EOC and CBL notify on a daily basis to common depositories the changes that have occurred in the volume of the securities represented by a global note. Common depositories verify the correspondence of the notifications and record the transfer of interests in the global notes.

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[45] CBL is liable for direct damages to its customers, in the event it acts with negligence or willful misconduct (negligence can be defined as "the violation of a pre-existent obligation", while willful misconduct can be defined as "the non-execution of an essential obligation defined in a contract") and indirect damages as a result of CBL's depositories, sub-depositories, custodians, sub-custodians acts, etc., in the event it acts with gross negligence or willful misconduct (gross negligence can be defined as "the intentional violation of an obligation").

[46] Functions of a depository bank are (i) the safekeeping of securities in its vaults, (ii) the receipt of securities for entry into CBL's system and confirmation of receipt and (iii) the execution of instructions of CBL and collection of interests and dividends on the holdings. Sub-depositories are not allowed to sub-deposit the holdings without written approval of CBL.

[47] The depository agreement defines the parties, the settlement, depository and safekeeping procedures, insurance coverage and further bilateral obligations of CBL and the depository.

[48] Bonds issued by a borrower outside the domestic market, denominated in a Eurocurrency, underwritten and sold by an international syndicate of financial institutions.

As concerns Euro depositories, they provide safe custody and other administrative services for Eurobonds and Euro-instruments in general on the basis of a depository agreement between the entities, but their services are also accessible to other financial institutions. Domestic depositories on the other hand are mainly, but not exclusively, used to provide CBL's customers with a facility to settle cross-border transactions in domestic markets.

c/d. Common depository banks are appointed by CBL and EOC in order to simplify the procedures for distributing new issues. The responsibility for the reconciliation procedures and the safekeeping function for global notes is undertaken by the fiscal agent, which usually corresponds to the common depository.

2.1.7 Inefficiency risk

2.1.7.1 Definition

Inefficiency risk arises at the time a system does not adequately meet its obligation to its counterparts (members and suppliers)[49] and when the system is unable to meet customers' requests without leveraging on prices. It lasts until these conditions are fulfilled.

2.1.7.2 Possible risk mitigation techniques

Operators and technical agents need to have in place mechanisms to periodically review:

- the service level supplied;
- the possible improvements that need to be undertaken;
- the pricing strategy; and
- the operational reliability of the system operated.

Those considerations have to be implemented in the light of current volumes and values transacted by the system and of possible future developments. The relative size of the participants in the system also has some importance for the profitability of the operator due to the fact that small or medium sized clients do not have a strong negotiating position and might be charged higher fees compared to the one charged to larger clients.

Due to the fact that inefficient systems can concentrate risks on a limited group of users and lead to other type of exposures, unnecessarily restricted access criteria might also be important in assessing the efficiency level of a system.

[49] The ability of a system to meet its obligations can be judged according to its financial resources and considering how other systems meet their obligations.

2.1.7.3 Situation in Luxembourg

Admission and termination criteria within CBL are based on the risk profile and creditworthiness of participants. The latter are furthermore subject to a money laundering review. Access to CBL is, as general rule, not restricted on the basis of participants' geographical origin but rather on the assessment of what impact a new participation could have on the system's safety and efficiency. Hence, the customer base in CBL is broad, highly diversified and internationally oriented.

Fees charged to customers are split between custody fees, which are charged on the basis of the account's average daily balance in securities during the month; processing fees, reporting fees and securities lending and borrowing fees. CBL supplies specialised services for its small and medium-sized customer base, while EOC, for example, provides standardised services for high-volume clients. The revision of the competitiveness of the pricing policy is done regularly by CBL.

2.1.8 Cross-border risk

2.1.8.1 Definition

Various types of risks may affect cross-border securities transactions (details of the settlement process are described in first annex). Within a cross-border environment, the settlement processing might involve the use of different intermediaries, such as local agents, global custodians or the use of links between CSDs or ICSDs.

Non-residents normally settle through *local agents*, which have accounts at the local CSD. Whether principal risk exists, depends on the fact that the local CSD implements DvP settlement.

As a general rule, the settlement can be completed under the condition that the system has checked if the seller and the buyer have sufficient securities and funds respectively or have access to securities and fund loans. Determining that both conditions are satisfied in a cross-border environment, supposes an exchange of information which might last some days in the worst case. The seller might therefore need to pre-position securities or borrow them some days before the settlement day. The same can be true for the buyer.

The custody risk and cash deposit risk incurred by non-resident participants are furthermore increased by other factors. Usually, CSDs extend intra-day, credit to their participants to enable them to economise on liquidity holdings. Non-residents firms hold their securities through a local agent and have to look upon the local agent to receive intra-day cash loans. If this possibility is not available, a non-resident might need to hold larger cash and securities balances compared to the balances a direct participant would need to hold to settle the same set of transactions, and incurs therefore higher opportunity costs.

As regards replacement cost risk in a cross-border environment, the risk pattern depends on the volatility of the security's price and on the time lag between trade and settlement. If the settlement is undertaken according to the local market settlement practices and timing, the replacement cost exposure is the same for resident and for non-resident counterparts.

Global custodians, as opposed to local agents, settle trades and safe-keep securities in many countries through their network of sub-custodians, which in turn settle through their account at the local CSD. The sub-custodians have no direct relationship with the customers of the global custodians and have therefore no knowledge of the interest in securities the customers held. The custody risk borne by the customer is covered by the contractual relationship between the global custodian and the sub-custodian.

When cross-border settlement is done through the use of *links between CSDs*, the number of intermediaries involved in the transaction chain remains limited. As a consequence, operational, legal and custody risk is reduced. On the other hand links might increase legal and operational exposure because the participants in a cross-border transaction operate under different legal and operational frameworks. The use of links might furthermore increase liquidity constraints and spill them over to different markets.

As concerns the settlement through *ICSDs*, settlement trades with other participants of the same ICSD[50] does not suffer from principal risk if DvP is implemented. Furthermore ICSDs which provide for multiple settlement cycles during the day achieve same-day receipt and delivery of securities. Hence the cash deposit and opportunity risk are limited.

2.1.8.2 Possible risk mitigation techniques

In case of cross-border linkages between SSSs or the use of intermediaries such as commercial intermediaries as sub-custodians, the structure and conditions under which the link is operational becomes crucial for the mitigation of the risks involved. Due to the fact that it is the SSS which usually concludes the agreement with third parties/intermediaries, importance is achieved by the functions the intermediary performs, its risk management procedures, under which conditions the SSS advances funds or securities on behalf of third parties and which are the standards used to select intermediaries by the SSS.

The cross-border costs and risks are heavily influenced by the practices in the local markets in which intermediaries are located and have their activities. In case of bridges, i.e. links between ICSDs, cash deposit and liquidity risk can be mitigated by the introduction of multiple settlement cycles. Bridges can further involve other risks as result of their processing especially if considering automated bridges operating a series of night-time settlement runs. The

[50] Settlement trades with other participants of the same ICSD are named "internal settlement trades" because they are effected on the ICSD's own books without any intervention of intermediaries.

following describes the major risks which could arise and the corresponding risk mitigation which could be implemented during a bridge processing, such as:

- *principal risk*; if during the bridge processing transfer instructions are settled against credit on customer's accounts, the bridge might be defined as delivery-versus-credit - DvC - settlement process. DvC reduces principal risk;
- *replacement cost and liquidity risk*; if the time-lag between the proposal of securities deliveries and its acceptance by the counterpart ICSD is limited to the same overnight cycle, this can reduce replacement cost and liquidity risk in case of delays in settlement or failed transactions;
- *credit risk*; if both ICSDs credit their participants' accounts before knowing that the final delivery to and the corresponding final payment from the corresponding ICSD has taken place, once finality is achieved, the resulting credit exposure could be covered by a letter of credit, which each system can receive for example from a syndicate of banks. An initial credit exposure might furthermore arise in case an ICSD sends settlement instructions first and/or when proposals for the delivery of securities have to be maximised.
- *risk of fraud* or loss of the deposited securities; those exposures could be covered more or less extensively within the insurance framework of both ICSDs respectively for the amount specified in the insurance contract.
- *opportunity costs*; if participants are able to receive settlement reports early in the morning or even during the night from the ICSDs, participants' cash management possibilities could be improved;
- *liquidity risk*; if lending facilities are available during each settlement run and participants are exempted from charges for securities borrowed in one settlement run if these are reimbursed in a following run during the same night-time processing, liquidity risk could be reduced;
- *operational risk*; if systems provide the possibility of automatically recycling unsettled bridge transactions so that participants do not have to manually re-enter them for settlement on the following day, operational risk could be reduced.

Further exposures might arise, such as;

- *backlog exposure*;
  The backlog exposure might arise when unsettled transactions at the end of the night-time processing are settled during the following night-time cycle.
- *net-end cash exposure*;
  At the end of the settlement process, a net cash exposure results. This exposure can be covered for example by a letter of credit in favour of each ICSD respectively. If the amount of the letter of credit were based on a peak intra-day exposure, the inter-system exposure would be totally covered, but the ICSDs would have to bear high costs in order to negotiate for a high letter of credit. On the other hand, if the amount of the letter of credit were to be based on the peak end-of-day exposure, the inter-system exposure might not be totally covered, but the ICSDs would bear less costs to negotiate for a lower letter of credit. In the latter case, in order to avoid risk-spreading, the amount in excess of the letter of credit resulting at the end of the settlement process, could be covered by a loss-sharing agreement by which, in case of the default of an ICSD in paying the net cash position in excess, its participants would pay.

2.1.8.3 Situation in Luxembourg

CBL makes use of direct[51] or indirect links via intermediaries on local markets in which it has activities. To enable an efficient settlement and to provide tailor-made services for its diversified customers' base, CBL has put in place arrangements with a network of global custodians and sub-custodians which have in turn direct access to local clearing and settlement services. Depending on the characteristics of the local market infrastructure[52], those intermediaries might provide their customers, besides custody services, with fiscal or cash settlement services. In case custodians do not have the possibility of settling cash positions nor that of granting intra-day credit to participants, customers will have to look to cash correspondents to settle the cash leg of their securities transactions.

With reference to the bridge arrangement between CBL and EOC, finality of bridge transactions occurs when the ICSDs accepts the securities deliveries proposed by the counterpart SSS. Until that moment in time the cash and securities credits and debits remain provisional (see second annex for details concerning bridge processing).

The end net cash exposure which results from the book-entry settlement of bilateral positions on CBL's and EOC's accounts during the bridge, is covered by a letter of credit. Only the SSSs' exposure in excess of the amount guaranteed by the letter of credit, if any, remains an exposure on the other respective SSS.

At the end of the process, unsettled transactions will be settled during the following night-time cycle (backlog transactions[53]). The customer's collateral value of the securities debited is maintained until confirmation of the acceptance/refusal of the transaction is received in the following night-time processing. In this context, the extension of the bridge processing is a first step to the fully automated day-time bridge between CBL and EOC. CBL's customers benefit from this extension due to the fact that they are able to settle backlog transactions resulting from the previous night-time processing, while EOC's participants benefit from the fact that they will be able to propose deliveries to CBL's customers if they have received additional provision as result of the settlement of backlog trades. The settlement efficiency can therefore be increased.

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[51] Direct links involve the maintenance of a account on the name of CBL at the local CSD. CBL has direct links with SSSs in Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Slovak Republic, United Kingdom.

[52] Such as operating hours, different cut-off times, etc..

[53] A backlog transaction is a free or against payment transaction for delivery to a bridge counterpart where provision to execute the delivery becomes available on the deliverer's account in CBL, through a purchase or free receipt for the first time, at the end of the night-time processing. In order to respect the settlement sequence given by the customer, the provision is debited from the account, but, as EOC does not accept any additional delivery for the same night-time processing, the transaction is held in the backlog for day-time bridge settlement or the next night-time bridge processing. (CBL's customer handbook, p. 3-15).

2.2 Payment systems - PS -

The approach implemented when analysing securities settlement systems has been consistently used for payment systems. The risks, which are common to both systems, have not been further defined or described in this section, but reference has been made to the analysis carried out in the context of securities settlement systems.

2.2.1 Legal risk

2.2.1.1 Definition and possible risk mitigation techniques

The definition of the exposure and the possible mitigation mechanisms correspond to the ones provided in this context for SSSs.

2.2.1.2 Situation in Luxembourg

The systems LIPS-Net and LIPS-Gross and its participants are all companies incorporated under Luxembourg law. The following legal framework refers to both systems.

Finality

Within LIPS-Gross *irrevocability*[54] is achieved when the current account of the sending participant held at the BCL is debited. Payments become final for the sending participant when his account held at the BCL is debited (funds have been blocked on the account) and for the receiving participant when his current account at the BCL is credited. The blocking of funds in LIPS-Gross during the netting process in LIPS-Net is irrevocable when settlement has taken place in LIPS-Gross.

In LIPS-Net a transaction becomes irrevocable when the order is transmitted to the central application at Cetrel and becomes final when the current accounts of the participants at BCL with multilateral net debit/credit positions are debited/credited.

Dispute resolution

The respective rights and obligations of counterparts are set out in the rules of the system. In case of dispute, each participant has the right to request the opening of a conciliation procedure in order to find a solution concerning the dispute, its impact and damages.

[54] According to the transposition of the Settlement Finality Directive into Luxembourg law, the point of irrevocability corresponds to the point of entry into the system.

2.2.2 Credit risk

2.2.2.1 Definition

Credit exposure between participants in a payment system arise when there is a delay between the processing of an instruction for settlement and the final settlement of the payment and lasts until finality has been achieved.

Some deferred net systems[55] provide for the possibility of unwinding a transaction in the event of a participant's failure and might create therefore an incentive for counterparts not to manage credit risk adequately. On the other hand, if the recalculation of the net position results in a different exposure compared to the original one, participants might be left with inadequate funds to meet other obligations in due time.

2.2.2.2 Possible risk mitigation techniques

Tools to manage credit risk involve the use of:

- real-time gross settlement systems;
- limits on the credit exposures the counterparts can take in the system based on participants' creditworthiness. Those limits can be set either according to the multilateral net exposures a single counterpart has to all other participants or according to the bilateral net exposure between the two counterparts in a transaction;
- loss-sharing arrangements. If the value of participants' contribution in the collateral pool might be different from the loss they would borne in case a transaction fails to be settled, participants might have an incentive to default on loss-sharing obligations and to shift the cost to post collateral on other participants;
- full collateralisation of exposures.

2.2.2.3 Situation in Luxembourg

Credit risk in LIPS-Gross is mitigated through:

- the use of real-time settlement with immediate finality;
- the need for counterparts to have sufficient funds available or a fully collateralised credit line to enable the settlement;

[55] The distinction between real-time gross settlement systems and deferred net systems relates to the form and timing of the settlement and not to the way payments are processed. Deferred net systems can handle payments in real-time, they nevertheless settle in batches of net positions at designated times, either during the business day either at the end of the day. RTGS systems settle transactions one by one as soon as sufficient available funds are present. Concerning deferred net systems, participants are exposed to credit risk from the acceptance of the payment instruction into the netting system for settlement to the moment the net positions are booked and finality is achieved. RTGS systems do not involve credit risk, but liquidity risk for those payments not accepted for settlement. Hybrid systems (e.g. LIPS-Net) combine finality of settlement in real-time gross settlement systems with an efficient use of liquidity. Their main characteristic is frequent netting of payments during the day or at intervals to the extent that the resulting debit positions are fully covered. Payments that cannot be settled are kept for the next settlement cycle.

- the application of collateral management criteria. As general rule, the value of the collateral provided to cover a transaction diminished by a valuation haircut, has to be in value constantly superior or equivalent to the total value of the operations for which the collateral has been provided for, augmented by an initial margin as buffer measure. The Eurosystem applies different valuation haircuts according to the different characteristics of the collateral supplied. The mark-to-marketing mechanism (variation margin) enables the central bank to call for additional collateral (margin call) if the market value of the collateral pledged to the NCB becomes inferior to a predetermined limit. Where the collateral value exceeds the amount needed by the customer to cover the transaction, increased by the initial margin, the central bank will return the collateral in excess;
- the respect of the criteria specified by the ECB[56] for eligible collateral.

As concerns LIPS-Net, the system settles its positions in LIPS-Gross in central bank money and it is protected by the same mitigation techniques implemented for the gross system. It does not enable transactions to be unwound and does not provide for a loss-sharing arrangement in case a participant defaults. The need to implement those arrangements seems nevertheless to be limited, due to the fact that the system currently processes payments of low value and the resulting net positions are limited in value.

2.2.3 Liquidity risk

2.2.3.1 Definition

Liquidity risk arises in different ways in a deferred net settlement system and in a real-time gross settlement system. In RTGS systems, liquidity needs to be available on accounts of counterparts to allow payments to be accepted for settlement. Insufficient liquidity can result in a gridlock. A similar situation can occur in deferred net settlement systems in case credit limits prevent large payments from being settled. A queuing mechanism which is based on the principles that the first instruction inputted into the system is also the first instruction settled (FIFO), might create additional delays for large payments.

2.2.3.2 Possible risk mitigation techniques

The central bank can provide liquidity to participants in a number of ways:

a. making a loan by crediting the funds on the participant's settlement account;
b. granting a lending facility in the form of an overdraft on the participant's settlement account;

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[56] Eligible assets for ESCB monetary policy operations and for securing intra-day credit are listed in the Tier One and the Tier Two lists published by the ECB. The Tier One list consists of marketable assets which fulfil the following criteria:
- are listed or quoted on regulated market or non-regulated markets as specified by the ECB;
- are denominated in euro;
- are issued by entities located in the European Economic Area;
- are transferable in book-entry form;
- are deposited with an NCB or with a Central Securities Depository.

The Tier Two list consists of additional assets which the NCBs consider of particular importance for their national financial markets and banking system. They can be marketable or non-marketable financial obligations or equities on a regulated market. Normally they have to be denominated in euro, located in the euro area and issued or guaranteed by entities located in the euro area. Luxembourg does not have a Tier Two list.

c. entering into a sale and repurchase arrangement (repo) with the participant. In the sale leg of the operation, the funds are credited to the participant's settlement account and the title of the securities transferred to the central bank. In the repurchase leg, the funds are credited to the central bank and the title of the securities transferred back to the participant.

Gridlock resolution, queuing and monitoring mechanisms permit the reduction of liquidity constraints of counterparts within the system. Net deferred settlement systems might provide for special protection in case of liquidity tensions stemming from the inability to settle of the participant with the largest individual settlement obligation by the use of a collateral pool combined with committed lines of credit.

2.2.3.3 Situation in Luxembourg

BCL, as settlement agent of LIPS-Gross and LIPS-Net, provides fully collateralised intra-day credit facilities to participants. Both systems implement FIFO as queuing mechanism. The participating banks themselves are responsible for setting priorities to the payments they whish to settle first according to the funds they have available on their accounts with the goal of avoiding unnecessarily long queues.

Queuing facility

Within LIPS-Gross, instructions are queued per settlement account if the liquidity available for settlement is insufficient (e.g. because the participant has breached the limit) and are reconsidered for settlement every time:

- sufficient funds are received under the form of a credit posted to the participant's account or additional collateral is made available;
- the payment at the head of the queue is cancelled or given a lower business priority;
- a new or existing payment for a lower value is given a higher priority than the one at the top of the queue;
- gridlock processing resolves the situation.

Gridlock facility

Gridlock occurs when two or more payment queues are blocked due to shortage of funds on a participant's account. The resolution algorithm in LIPS-Gross can be initiated by default or periodically by the settlement agent, provided that there is more than one queue blocked. The mechanism chooses a set of payments in consecutive order of arrival within payment priority starting from the head of each queue, which will be settled as a single unit. Each attempt to settle the payments selected either succeeds or fails for the whole unit. In case of failure, the algorithm finds otherwise the maximum number of payments which debit the account, by respecting the payment queue order, which could settle with the estimated available funds and selects those for the second reiteration and the process is repeated. The algorithm works under the optimistic assumption that all credits due to the account on which the iteration has been initiated will be honoured. The audit records of the settled payments will carry the same timestamp.

A selection algorithm is present also in LIPS-Net, within Cetrel's system. For each participant which is lacking funds in LIPS-Gross, the algorithm selects the last batches which exceed the amount available and postpones them to the next clearing cycle.

Monitoring facility

A monitoring facility within LIPS-Gross enables counterparts to identify and resolve liquidity constraints; particularly those relating to queues of payments and gridlock. The central bank workstation displays critical information continuously, but not in real-time, while non-critical information is available under the form of inquiries. Information which can be consulted continuously for each account relates to the:

- available funds and balance;
- account limit;
- queue blockages;
- whether the account is participating in a gridlock resolution;
- queue summary information (total credits queued, total debits queued).

Each participant is responsible for monitoring the settlement of the payments sent, the number and the amount of payments stored in waiting queues and the balance of its current accounts.

LIPS-Net participants on the other hand recieve information on their net positions via LIPS-Gross monitoring facility when funds have been blocked on their accounts.

Rules of good conduct and obligations

Within LIPS-Gross, bilateral obligations of participants and BCL are set out in the relevant rules, while within LIPS-Net, participants have to respect the rules of good conduct established by the operator. Those rules of good conduct set obligations on participants, which, inter alia, require customers to have sufficient credit available on their accounts not to impede the settlement of net positions; they furthermore require participants not to reduce their multilateral net position through dummy operations. In the event of violations, SYPAL-Gie can impose sanctions on participants.

2.2.4 Risk of settlement bank failure

2.2.4.1 Definition and possible risk mitigation techniques

The definition of the exposure corresponds to the ones provided in this context for SSSs.

The risk of settlement bank failure has to be seen in the context of two major factors. The first factor refers to the creditworthiness of the issuer of the settlement asset. The second factor relates to the capability of transferring the settlement asset into other liquid claims. The time-frame during which participants use the settlement asset to discharge their obligations, represents the duration of participants' involuntary exposure towards their settlement institution.

As a general rule, to mitigate the risk of settlement bank failure, use is either made of central bank money (please refer to section 2.1.4.2 for details) or the duration of the participant's voluntary exposure is reduced (e.g. through the use of real-time settlement).

2.2.4.2 Situation in Luxembourg

The real-time gross system and the net system both settle in central bank money.

2.2.5 Operational risk

2.2.5.1 Definition and possible risk mitigation techniques

The definition of the exposure corresponds to the one provided in this context for SSSs.

As for SSSs, contingency measures are the major mitigation techniques used. These mechanisms are generally kept as simple and practical as possible due to the fact that they have to work under stress conditions and the personnel is less familiar with them. For a real-time gross settlement system, the secondary site could be maintained in a hot standby mode with a continuous transfer of data from the primary to the secondary site. For end-of-day settlement systems, the resumption time can also be defined more broadly, i.e. in terms of hours rather than minutes. The location of the secondary site may vary depending on the type of threats and can also include different levels of services for different contingencies.

2.2.5.2 Situation in Luxembourg

LIPS-Gross has to meet the security and operational reliability standards as outlined by the TARGET Security Requirements, which include organisational and technical requirements on the physical access to RTGS locations, back-up and recovery procedures. Furthermore LIPS-Gross is subject to periodic risk analyses undertaken at EU and national level.

Different types of tests are carried out on a regular basis, ranging from:

- internal BCL testing;
- bilateral tests with the ECB;
- group tests with other NCBs.

In case of contingency, participants can transmit instructions by fax. Due to the fact that this procedure is done manually, it does not permit the processing of the high volumes of payments which are normally processed automatically. Some payments need therefore to be prioritised and settled first.

The technical agent Cetrel mitigates mostly operational risk within LIPS-Net. Besides Cetrel's internal audit controls on system's operability and reliability, the operator, SYPAL-Gie, commissions every year a technical audit on the system's functioning.

Contingency procedures for LIPS-Gross (TARGET)

In case one component of TARGET would remain unavailable for a longer time period, one or several NCBs will become service providers for the failed national RTGS and channel the payments from and to the failed component. Furthermore, in case of need, a delayed closing time procedure can be activated through which NCBs allow new critical payments to be received and debited after the TARGET 18:00 closing time. Under the legal provisions of the ECB, the recovery time of the secondary site is set at four hours.

Back-up procedures for LIPS-Net

LIPS-Net back-up procedures enable data exchange in the event of a telecommunication network failure in order to achieve manual settlement of at least one netting cycle per day. Each participant prepares a file with all the information needed to validate the transactions to be settled and forwards them to the settlement agent, BCL, which will calculate the net multilateral positions. The settlement agent has furthermore to verify manually the limits of the participants and subsequently proceeds to the settlement in LIPS-Gross. In case the limits are breached, the participant is required to cover the part exceeding the limit. At the end of the settlement, the two counterparts in the transaction exchange the files containing the settlement information.

Place an organisation in default

In emergency situations the central bank may need to prevent further processing of payments to or from any of the accounts belonging to a particular participant organisation. The management of BCL can place the organisation in default and, by doing so, the system LIPS-Gross will reject all payments to or from the account(s) owned by the defaulting member.

In case of participant's failure within LIPS-Net, the member's instructions are excluded from every settlement cycle from the moment the settlement agent has acknowledged the member's failure. The system rejects all instructions presented after that time-limit and returns to the sender all operations which have been already validated but no yet settled. On the other hand those transactions already settled within previous settlement cycles remain final and cannot be revoked.

2.2.6 Inefficiency risk

2.2.6.1 Definition

Efficiency of a system can be referred to as a measure for its cost-effectiveness (e.g. in terms of cost per payment charged to customers) or for its productivity (e.g. in terms of number of payments that the system is able to process).

Procedures and mitigation techniques generally cover settlement risk and do not directly address inefficiency risk by itself, because every abnormal situation might have an impact on

efficiency. Several symptoms of inefficiency can be seen in the inability of the system to cope with the level of demand, in long processing hours, in persistently excess capacity, in relatively high customers' fees compared to alternative payment systems, etc..

2.2.6.2 Possible risk mitigation techniques

The major costs involved in processing a payment are usually:

- the costs borne by the central processing system;
- the operating costs borne by the participants; and
- the opportunity costs for participants to hold liquidity to fund payment obligations.

The totality of costs is generally reflected in fees charged to the customers. Pricing policies can create competitive pressure between systems and give an incentive to participants to migrate from a service supplier to a less costly but less reliable one. This incentive depends on the available alternatives on the market. Central banks, as system's operators for example, could easily choose to subsidise part of the cost of a payment processing in order to incentivate the development of financial markets or to encourage customers to choose more reliable systems. Subsidies can be justified generally on the ground of the need to correct market externalities but incur nevertheless in the risk of sending misleading price signals. Furthermore they may be difficult to be levied.

Operators can apply different pricing methodologies depending on the participants' volume of payments or on the time at which instructions are inputted into the system. According to the "cost recovery methodology" for example, the fees cover operator's fixed and variable costs and are based on an estimation of the volumes to be processed by each member. According to the "market based methodology", the fees cover all costs and a surplus which is based on forecasts on future market developments.

Beside the pricing policy, the participation criteria influence efficiency. Different levels of participation, such as direct or indirect membership, also give rise eventually to operational and credit risk.

2.2.6.3 Situation in Luxembourg

At the time LIPS-Gross was first implemented, costs were divided between BCL and the at the time existing participants. New participants need currently to pay a fixed transaction fee, an entrance fee and an annual fee[57], which varies depending on the usage of the system. The account holder also bears the cost of interfaces, communication services and security arrangements. The pricing policy is based on a full-cost recovery principle. The system has a limited customer base.

[57] The domestic transaction fee is currently € 0.8 and cross-border fees per transaction vary from € 1.75 to € 0.8 depending on the volumes processed, the entrance fee is currently around € 125 000 and the annual fee is between € 12 000 and € 42 000.

Prerequisites for participation include the maintenance of an account with the BCL, operational capacity and solvency[58]. Access is granted to Luxembourg-based institutions or enterprises which are authorised to exercise activities in Luxembourg and subject to prudential supervision in the country.

Within LIPS-Net, the costs of the operator are recovered according to their nature:

- variable costs are recovered through entrance, annual and transaction fees[59];
- investment costs are recovered through contributions on the basis of members' processing volumes.

The operator approves the investments to be undertaken, which are recovered at the end of the financial year, i.e. each participant contributes pro rata. The pricing policy is based on a full-cost recovery principle.

[58] The institutions listed in the rules of the system are entitled to be member. In terms of operational capability they need to have access to SWIFT, have a Bank Identifier Code, be a member of the RTGS-Gie user group set up by SWIFT, make use of the participant workstation, etc.. In terms of financial soundness, each participant is deemed to be financially sound if listed on the official list published by the competent supervisory authority. Furthermore in terms of legal soundness, the BCL can ask for legal opinion on participants' capability to comply with access criteria.

[59] The entrance fee varies between € 50 000 and € 250 000, the annual fee varies between € 2 500 and € 12 500 and transaction fees vary between € 0.160 and € 0.230.

3 Oversight responsibility and risk mitigation

Overseers are responsible, among other tasks, for contributing to the efficiency and stability of payment and securities settlement systems. One of their ultimate goals is to reduce systemic risk. The potential for a system to transmit disruptions, does significantly depend, among other factors, on the type of system (payment or securities settlement), the value of the transactions it processes, the resources of the participants in aggregate and in individual form and the nature of the transactions processed. On the other hand, the tools which overseers might implement to evaluate how institutions mitigate risks, are not necessarily dependent on the type of system they oversee. Hence, the same oversight approach and tools can be implemented for securities settlement as for payment systems (the third annex provides a practical example of how to assess an exposure and its respective risk mitigation techniques according to the methodology described in this chapter).

The evaluation of exposures and of the availability and appropriateness of risk mitigation techniques is an exercise which might need to be undertaken continuously. Each malfunctioning or external threat has the potential to increase the probability that a risk materialises. Overseers can focus their evaluation on the system's ownership, its operators' and technical agents' risk management function and risk policies. A risk assessment can involve:

- the evaluation of internal procedures and policies;
- the evaluation of statistical reporting (e.g. volumes and values, etc.) and the forecast of future trends;
- the assessment of external threats to the system;
- the evaluation of risk mitigation techniques and of the follow-up on incidents;
- the review of the systems' functioning;
- the review of contingency procedures and testing plans; and
- the evaluation of action plans to achieve full operational reliability within a reasonable time-scale.

3.1 Risk mitigation and oversight

As concerns risk mitigation, the aim of oversight can be defined as follows:

- to develop (an) objective(s) in terms of safety of the overseen systems;
- to systematically identify and analyse potential risk-based scenarios and compare them to the objective(s) defined;
- to develop tools to dynamically assess the availability and appropriateness of risk mitigation techniques in use by overseen systems; and
- to develop recommendations to further contribute to the reduction of systemic risk in the light of past and future developments.

This chapter defines guidelines intended to assist the evaluation and the assessment of risk mitigation techniques, risk policies and their implementation in the context of payment and securities settlement systems. Those guidelines have been shaped as comprehensively as possible so that they can be easily adapted when that is considered necessary.

Supervisory tools can be defined according to three major types and principles:

- *Research tools*;
  Research tools should enable overseers to gain an understanding of the existing exposures in the context of payment and securities settlement systems and to foresee possible future exposures which might arise as result of systems' developments or of new external threats. This might be achieved on one hand through the use of risk evaluation tools (the goal is to research exposures) or through the use of scenarios (the goal is to define under which conditions risks can arise and better be mitigated);

- *Assessment tools*;
  Assessment tools should enable the evaluation of the availability and appropriateness of risk mitigation techniques implemented by operators and technical agents; and

- *Intervention tools and/or procedures*;
  Intervention tools and/or procedures should enable overseers to react promptly in case of contingency and to contribute, when possible, in reducing the impact, caused by a transaction failure, on the different counterparts.

The use of different supervisory tools is interconnected. Research tools permit the systematic gaining of a wide understanding of the threats arising from the financial market and the achievement of a knowledge of the system's vulnerabilities. The result of the research permits the dynamic identification of the roots of exposures, to assess in turn if the risk mitigation techniques adopted by overseen systems might be adequate and if current mitigation mechanisms could cover new threats in the process of development. This evaluation permits the optimal shaping of procedures and the intervention mechanism to be used by overseers in case of crisis and contingency.

Different supervisory tools have different fields of application and can be implemented as follows:

- continuously or ad-hoc;
- a priori (when a risk exists but has not yet materialised in a transaction failure) or a posteriori (when a risk has materialised in a transaction failure).

Research tools can be implemented in both ways. On one hand they can be used a priori and continuously with the goal of analysing the roots of exposures, to evaluate their nature, map them, estimate their future developments on the basis of historical data and to define which corrective actions can be implemented to reduce them. On the other hand they can be used a posteriori and ad hoc once a new exposure arises.

Assessment tools focus on the analysis of risk mitigation mechanisms in use by overseen institutions and can be implemented continuously and a priori. Their goal is to ensure that risk mitigation techniques:

- are adequately shaped to cover all major exposures which currently exist;
- realistically limit the probability of risks' materialisation without leveraging excessively on the costs the system's operators or technical agents have to bear;
- cover, when possible, the damages created by the materialisation of a risk.

Intervention tools on the other hand, can be implemented a posteriori and ad hoc in order to ensure a timely reaction of overseers in case of contingency.

3.1.1 Research tools

Research tools can be various in structure and in nature. Their major goal is to permit overseers to gain, among other factors, an understanding of *which* risks exist or might arise in payment and securities settlement systems and *how* they might arise, to evaluate their frequency and their possibility of materialisation. This methodology could be used for both, known as unknown risks; however the identification and the evaluation of unknown exposures might create particular challenges.

Research tools might be quantitative or qualitative in nature. Quantitative tools are generally based on the collection and the analysis of historical data; a methodology which enables overseers to evaluate the major pattern of exposures which have arisen in the past and to foresee what might be their future development possibilities. Qualitative tools, on the other hand, are based on non-quantifiable criteria (they might include, for example, the identification of the respective obligations and roles of counterparts involved in a transaction). Indeed, overseers need to maintain a balance between the use of the two categories of tools in order to express an assessment which is not biased in its scope.

Research tools need to summarise in a simplified structure (scenario) a multitude of variables, which might be difficult to group due to their different nature. When adopting this approach, one of the major issues consists in identifying under *which* scenario *which* exposure might arise, grade different scenarios in terms of probability of occurrence and rate the largest credible loss for each of the scenarios defined. This procedure can have the advantage of beeing able to:

- model reality by selecting the most important variables (internal and external to the system) which might have a critical impact on payment or securities settlement;
- provide overseers with the opportunity to foresee future developments by adding new variables in existing scenarios; and
- enable overseers to structure and define scenarios in such a way that they might be easily adjusted once they become obsolete.

The disadvantage of the approach is, on the other hand, that scenarios can only represent reality in a quite reductive form. The following sections give an overview of the different research tools which might be implemented by overseers.

3.1.1.1 Identification of risks

Unless a risk has been recognised it might not be adequately managed and mitigated. The identification of exposures has therefore the goal of highlighting which risks have occurred in the past, under which circumstances and which causes might be at the basis of such exposures. Identifying risks can be done through different means.

A first means can be through by the analysis of the standard life-cycle of a payment or securities settlement transaction (see the first annex for details concerning payment and securities settlement processing). This exercise can highlight, under normal circumstances, which can be the different stages of the settlement process and which are the different statuses that the transaction order achieves throughout the processing chain. The goal is to define:

- the exact moment at which the exposure arises and until when it lasts (within the description of the risks and risk mitigation techniques in chapter I, the text provides a short definition of the moment in time at which each exposure arises and until when it lasts); and
- the nature of the obligations of counterparts', operators' and technical agents' part in the transaction, with the goal of investigating what might be the causes of the exposure.

A second means of identifying risks relies on the analysis of the system's internal rules and procedures. This exercise enables overseers to gain an understanding of the system's design and to define precisely the roles and obligations of counterparts and operators in the different situations; e.g. which parties have to be notified under normal or exceptional circumstances, the timing of decision-making processes, the responsible entities or individuals for taking decisions in emergency situations, etc.. This information should highlight (besides the bilateral and multilateral obligations each party in the transaction has) what can be the degree of discretion different entities are able to exercise in taking decisions and what might be the impact on the functioning of the system. For example, the identification of the notification and escalation procedures provides an understanding of *who* bears ultimately the risk and *to which* extent the responsible person or entity bears this risk in case of contingency. Hence, the basis of the evaluation can be the understanding of which situations might not be foreseen or adequately covered by the internal rules, procedures or manual of instructions.

A third means involves the use of scenarios. This exercise is difficult to be laid down in a formal procedure; nevertheless the following issues are of importance in this context, such as:

a. the definition of the different exposures to be analysed;
b. the definition of internal and external variables (in scenario building, external and internal conditions have to be specified and simplified as much as possible. Nevertheless, the more conditions are taken into account, the more the scenarios will be a valuable approximation of reality);
c. the definition of a probability of occurrence for each scenario (this might give an appreciation of the importance of the results obtained);
d. the determination of objectives in terms of a system's safety;
e. the adoption of a risk-adverse approach when analysing the results of the simulations;

f. the analysis of real events to periodically review the scenarios and the simulation results[60].

One of the crucial issues might be to define what are the objectives in terms of a system's safety (point d.). Hence two types of objectives can be used:

- the "*clean objective*". It determines if and to which extent the system might theoretically bear certain risks under normal circumstances of operation[61].
- the "*acceptance objective*". It defines to what extent overseers consider certain risks acceptable from the oversight perspective in the light of the clean threshold. The philosophy behind the "acceptance objective" expresses the need to reduce exposures without necessarily eliminating them; it means furthermore checking that operators and technical agents are aware of risks and that their mitigation techniques can transform an unacceptable risk into an acceptable one.

The "acceptance objective" can differ from the clean one, but can also be similar to it. The operator and/or technical agent might be in a position to define the "clean objective" (in the light of simulations or statistical data analysis), while overseers might co-operate with the operator and/or technical agent in the definition of the "acceptance objective". The two types of objectives might need to be revised periodically as a result of new developments; internal or external to the systems.

3.1.1.2 Analysis of risks

So as to be able to categorise risks, exposures can be analysed according to three major characteristics:

- the *scale* of the risk, which gives an understanding of the severity of the exposure and therefore also of its potential impact on the system's functioning in case it materialises;
- the *duration* of the exposure; and
- the *frequency* at which the risk arises and at which it materialises.

Measuring the scale of exposures

The scale of a risk represents the proportional size of an exposure and is usually linked to its duration: the longer the duration, the more its scale will be significant.

Measuring the scale of risks can be done by evaluing the impact of a transaction failure on the system's functioning and on the participants involved in the transaction[62]. The proxy can include for example financial losses incurred by the non-defaulting counterpart when replacing the contract at market prices, the costs of claims presented by the clients for the non-execution of the transaction, reputation loss costs, etc..

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[60] The accident of 11 of September 2001 showed how the risks of terrorist attacks have been usually underestimated by systems as by insurance companies. As effect, crisis management has increased in importance after the accident.
[61] E.g.: Which is the maximum load of transactions that the system can process under normal circumstances?
[62] Through the use of historical data if available, such as industry pooled data.

Market surveys on the other hand represent an instrument which gives an appreciation of the duration of exposures and therefore of its scale. The objective is to identify best and sound practice on the market and where changes in local or international procedures can be necessary and practicable. The results highlight which perception market participants have of systems' risk management and the reliability of its internal controls. It furthermore enables overseers to evaluate the potential impact of a change in market practices. A change in the cut-off times or a change in the definition of the point of entry for settling instructions into a system, for example, can higher or lower the duration of participants' credit exposures to counterparts and therefore the scale of the risk.

Measuring the duration of exposures

The duration of an exposure identifies the moment in time at which the exposure materialises and the point in time at which is extinguishes. The operator and/or technical agent might be interested to investigate how long on average, at a minimum or at a maximum, each type of exposure lasts.

As concerns credit risks for example, two points in time can be relevant in identifying the exposure's duration; the unilateral payment cancellation deadline (irrevocability point) and the receipt-identification time. The cancellation deadline is defined as the last moment in time when a counterpart could unilaterally amend, delay or cancel its payment instruction. The receipt-identification time can be defined as the moment in time when the counterpart checks the information about the finality of the funds or securities received. The participant's actual exposure in a payment or securities settlement system lasts from the time the instruction can no longer be cancelled unilaterally until the time the payment (funds or securities) is received as final. The period of irrevocability may be followed by an uncertain period, which ranges from the moment in time after which the payment is due until the moment when the counterpart identifies whether or not it has received the transfer.

This kind of analysis facilitates the recognition, throughout the settlement process, when counterparts bilaterally discharge their obligations, so as not to under- or overestimate exposures' duration. Credit risk can be reduced, for example, by extending participants' cancellation deadlines and by bringing forward the receipt-identification time. Hence, the duration of the exposure could be reduced.

As regards systemic risk, measuring its duration, entails particular difficulties. This type of exposure might arise as result of transaction's failures, but may not have an idiosyncratic source. A proxy, which can be used to measure the duration of systemic risk, can be given by its contagion effect.[63]

[63] The contagion effect defines the impact a transaction failure has on counterparts which were not part in the original transaction.

Measuring the frequency at which exposures arise and at which they materialise

The frequency at which an exposure arises can be defined as the average between:

- the frequency at which the exposure has arisen in the past; and
- an estimation of the frequency at which it could possibly arise in future.

In the same way, the frequency at which a risk materialises can be given by the average between:

- the frequency at which the exposure has materialised in the past; and
- an estimation of the frequency at which it could possibly materialise in future.

With regard to credit risk for example, as concerns the frequency at which the exposure arises, every time two counterparts enter into a deal, a credit exposure arises. Hence the frequency at which credit risk arises seems to be very high.

As concerns the frequency at which the exposure materialises, the analysis of the creditworthiness of customers might show that the less creditworthy counterparts might be the ones which default more often on their obligations. A second reason might be of operational nature, i.e. in case instructions for payment or delivery of securities are wrongly formatted, this causes in turn delays in the execution of transaction orders.

It might be possible to design a template with a list of those counterparts which defaulted in the past, sub-dividing them according to the reason of default, indicating for which transaction values they have been defaulting on average and their respective frequency of default. According to this information it should be possible to calculate a moving average of their default frequency and foresee a future trend. The same approach can be applied consistently to other types of risks.

TEMPLATE 1: ANALYSIS OF RISKS

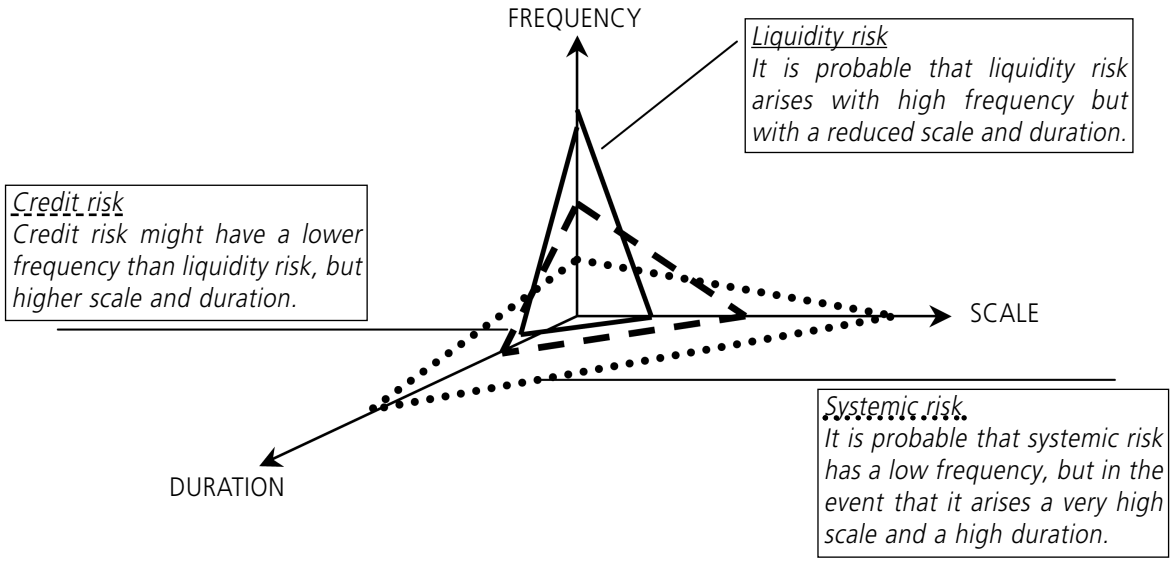
TYPE OF RISK: CREDIT RISK					
Counterpart	Creditworthiness of the counterpart	Absolute value of default	Relative value of default	Reason of default	Transaction value of default
….	…	….	….		
TYPE OF RISK: LIQUIDITY RISK					
Counterpart	….				
….	…	….	….		
TYPE OF RISK: ….					

Creditworthiness of counterpart: Based on rating agency evaluations, such as S&P.
Absolute default measure: No. of times within a year that the counterpart has defaulted.
Relative value of default: If 100% is the totality of defaults in the year, the relative value of default defines the percentage at which the counterpart has defaulted during the year.

3.1.1.3 Mapping of risks

Once risks have been analysed, they can be mapped on the basis of the three previously-mentioned criteria; the frequency, the duration and the scale. The following graph shows an example of mapping credit, liquidity and systemic risk and assumptions have been made on their relative frequency, scale and duration[64].

GRAPH 1: MAPPING OF RISKS



The mapping of exposures achieves importance when risks have to be prioritised (see following section for details).

3.1.1.4 Prioritisation of risks

The prioritisation of risks provides a view of the importance overseers attach to different exposures. This can be done according to the pattern each exposure has, i.e. according to the significance of its frequency, duration or scale, and on the basis of the extent risks are mitigated. Prioritisation enables overseers to select those risks which need to be monitored more closely and more frequently in order to be in a position to react promptly when appropriate.

Due to the fact that overseers are interested in an acceptable level of risks, "*full risk weights*" and "*derived risk weights*" can represent a tool to prioritise exposures. The "*full risk weight*" might define the significance of the risk's scale, frequency and duration. For example, exposures which have a high frequency, scale and duration, might have a high full risks weight, while risks which have only low frequency, scale and duration, might have a low full risks weight.

[64] The graph and the proportions used are taken as example and do not necessary correspond to reality.

Overseers can base their assessment not only on the analysis of risks, but also on the capability that operators and technical agents have to mitigate those exposures. Mitigation mechanisms can in fact transform an unacceptable risk into an acceptable one. Hence, each exposure can be seen in the light of the respective mitigation mechanism used to cover it. "*Derived risk weights*" represent a correction of full risk weights on the basis of the capability each risk mitigation technique has to reduce the exposure for which it has been developed. Certain risks might have a high frequency, scale and duration (and hence a high full risk weight), but if they are adequately covered by mitigation mechanisms, their derived risk weight might be consistently lower than their full risk weight.

The risk of the loss of a primary operational site (operational risk) might, for example, be an exposure with a low frequency, a quite variable duration (depending on the duration of the clearing and settlement process) and a high scale (the impact on the functioning of the system could be quite significant). Its full risk weight might be therefore medium (average value between a low frequency, medium duration and high scale). If nevertheless back-up and contingency arrangements are maintained in hot-stand-by mode and processing on the secondary site can be restarted without delays and loss of data, overseers might give a low derived risk weight to this exposure. Nevertheless, due to the fact that the scale can be seen as the more determinant criterion of this type of operational risk, overseers might be interested in increasing the sensitivity of operators and/or technical agents to develop further contingency planning and infrastructure (e.g. increase the number of secondary sites), if that is considered necessary.

As concerns systemic risk for example, as a general rule, the exposure is usually not directly addressed by specific risk mitigation techniques and its causes might be multiple in time and geographically. Its full and derived risk weight might therefore be high.

A template could group all the basic information on the various types of risks, ranging from their description to their different weights.

TEMPLATE 2: RISK WEIGHTS AND PRIORITISATION IN TERMS OF OVERSIGHT

TYPE OF RISK	**DESCRIPTION OF RISK**	**FULL RISK WEIGHT** **- FREQUENCY** **- DURATION** **- SCALE**	**DERIVED RISK WEIGHT**	**PRIORITISATION (in terms of oversight)**
Credit risk	….	….	….	…
Operational risk e.g. the loss of a primary system		Full risk weight: *medium* - low frequency - variable duration - high scale	*low-medium*	*medium* - focus on the scale
Systemic risk		Full risk weight: *high* - low frequency - high duration - very high scale	*high*	*high* focus on scale and duration
etc..	….	….	….	….

3.1.1.5 Market expectations

The analysis of known risks and of their future trends might not always be sufficient to determine *if* and *how* new exposures might arise. Risk-takers, such as systems' operators or technical agents are the entities which might best express expectations on how existing risks might change or on how new risks might arise. Major risk-takers can be:

- operators and technical agents of overseen systems
  (operators and technical agents of overseen systems might have expectations about new forms of operational exposures, due to the fact that they are usually involved in new technological developments);
- operators and technical agents of non-overseen systems
  (non-overseen systems might have the possibility, in future, to become overseen infrastructures. Operators and technical agents of those systems can be in the position of expressing an appreciation about new developments and possible future exposures.);
- remote participants
  (remote participants have knowledge of the constraints customers have to face when participating in foreign systems and might have expectations about how certain cross-border risks could be better mitigated).

Overseers might need to handle market risk expectations carefully and eventually limit their use due to the fact that those variables can be very volatile, can change significantly in a short time-frame, are mostly subjective and hence only partly reliable.

3.1.2 Assessment tools

Assessment tools complement the set of mechanisms which overseers have at their disposal to assess risks and their potential impact on payment and securities settlement and to evaluate the adequacy of risk mitigation techniques used in this context.

Mitigation mechanisms can be divided according to three criteria:

- *nature*;
  The nature of a mechanism defines the extent to which it mitigates different exposures. Mitigation techniques can have a multi-functional or a mono-functional nature. Multi-functional mechanisms cover more than one risk, while mono-functional mechanisms cover one specific exposure;

- *adequacy*;
  The adequacy of a mechanism defines its capability of significantly reducing the scale, the duration and the frequency of the exposure(s) for which the mitigation technique has been developed;

- *costs*;
  The cost of a mitigation mechanism defines the cost for the operator or technical agent of developing and implementing the mitigation technique. Certain mechanisms can be expensive to develop and to be implemented compared to the benefits in terms of risk mitigation they enable; others might be more cost-effective in their scope. As a general rule, multi-functional tools may be more cost-effective, while mono-functional ones might be quite expensive if they have to be developed to cover a specific exposure with a low frequency of materialisation.

  Market practitioners sometimes decide to grandfather exposures in order to be able to maintain a balance between the costs of implementing mitigation mechanisms and the costs of bearing a risk. Due to the fact that the market might have a less risk-adverse attitude compared to overseers and be less involved in the reduction of systemic risk, risk-takers might be biased in evaluating the need to develop and implement those techniques.

  The costs of implementing mitigation mechanisms represent one of the major factors which increase the resistance of operators and/or technical agents to the maximisation of risk controls. Other factors, which can increase this resistance, can include a false belief that the system operated might be "too big to fail" and a biased evaluation of the existing exposures under a risk-taking attitude which leads to a constant underestimation of risks.

In assessing mitigation techniques two further issues can be of importance. First, a change in the pattern of risks, due for example to new technological developments, might cause the obsolescence of the corresponding existing mitigation technique(s). This can further result in a need to adapt the current mitigation mechanism to the changed exposure[65] or to revise mitigation procedures periodically. Second, the use of a mitigation technique, which is targeting a specific exposure, might, as a possible side-effect, increase an existing risk or create a new type of exposure[66]. If a negative correlation between various types of risks exists, it might be difficult for operators or technical agents to cover one exposure without increasing at the same time another one. This, in turn, develops further their resistance to maximising risk controls.

The following sections give an overview on the different criteria overseers can implement to assess mitigation mechanisms.

3.1.2.1 Effectiveness of mitigation mechanisms

Mitigation techniques can have, inter alia, the goal of reducing the losses a counterpart incurs when a risk materialises in a transaction failure. The effectiveness of a mitigation mechanism defines its capability to reduce:

[65] The introduction of e-payments and e-money represent an example. Mitigation procedures currently used in order to ensure the reliability of settlement data might need to be reviewed in the light of new techniques, such as cryptography or public key infrastructure - PKI.

[66] E.g. an SSS can use DvP model 3 settlement to cover credit risk. If a link exists between a DvP model 3 and a DvP model 1, liquidity risk might be increased.

- the probability at which an exposure materialises - *preventive measures* - (e.g. the use of real-time gross settlement mitigates credit risk or the use of a CCP reduces counterpart's risk);
- the losses a counterpart incurs when an exposure materialises in a transaction failure - *corrective measures* - (e.g. through the use of insurance coverage).

As a general rule, preventive measures reduce the frequency at which exposures arise. Corrective measures on the other hand focus on the reduction of the scale and the duration of risks. The more a risk mitigation technique is effective in its scope, the more its derived risk weight will be possibly limited in value.

3.1.2.2 Nature of mitigation mechanisms

A cross-check matrix can be used to identify the nature of mitigation techniques (mono- or multi-functional) on one hand and the extent to which current mitigation mechanisms cover the existing exposures. Matrix 1 gives an example of how the market might grandfather some exposures under a risk-taking attitude.

MATRIX 1: CROSS-CHECK MATRIX

RISK / MITIGATION TECHNIQUE	CR	LR	OR	SBF	CSR	UCL	SY etc.
Back-up arrangements			X			?	X
Contingency plans			X			?	X
Real-time settlement	X					?	X
DvP procedures	X					?	X
Central bank money				X		?	X
CCP						?	X
Collateralisation	X					?	X
Haircut application	X					?	X
Intra-day finality						?	X
Gridlock resolution		X					
Queuing facility		X					
Reconciliation procedures					X		
etc.						?	X

CR= Credit risk; LR= Liquidity risk; OR= Operational risk; SBF= Settlement bank failure risk; CSR= Custody risk; UCL= Unsecured credit lines (clean risk); SY= Systemic risk.

3.1.2.3 Availability of contingency mechanisms

All types of systems might be faced with contingency situations; hence overseers might need to assess the availability of contingency mechanisms, i.e. to which extent a system and its contingency mechanisms can cope with distress. For this reason:

- contingency mechanisms should be tested regularly by operators or technical agents. As concerns operational risk for example, risk-takers are usually undertaking ongoing tests and developing different disaster scenarios to ensure a timely recovery of processing within an adequate period of time. Concerning liquidity risk, operators or technical agents might have

in place contingency measures to raise finance on the market in case of crisis. Liquidity contingency measures are generally tested on a regular basis in order to ensure the possibility of promptly raising finances in case of need.
- crisis procedures should define which are the notification and escalation procedures in case of contingency. They should furthermore enable a co-operative framework between those risk-takers or overseers involved in the crisis in order to co-ordinate a joint response in a short time-frame.

Operators or technical agents might be less directly involved in the reduction of systemic risk, which remains one of the major concerns of regulators. Hence overseers might be interested in analysing the possibility according to which an exposure (or its materialisation) might have a spill-over effect on other systems (systemic risk). In this analysis the following variables are of interest:

- the time horizon of the crisis, i.e. how long is the crisis expected to last;
- the time horizon and scale of the impact, i.e. how long may the malfunctioning of the system last due to the crisis;
- the geographical dimension of the crisis, i.e. which could be the systems hit by the crisis, nationally and internationally.

3.1.3 Intervention tools

Intervention tools can have one of two different natures; a preventive or a corrective nature. *Preventive intervention tools* enable overseers to increase the risk-adverse attitude of market practitioners. They might include, inter alia, the use of moral suasion (for example with the goal of enforcing changes in market practices). *Corrective intervention tools* enable regulators to react promptly once an exposure has materialised and has the potential to trigger systemic risk (for example through the issue of recommendations to enforce the application of corrective actions envisaged by overseers).

The following sections give an overview of the different intervention tools which might be implemented by overseers.

3.1.3.1 Preventing intervention tools

Improving market discipline

Overseers have the possibility to set benchmarks, of quantitative or of qualitative nature, which systems' operators or technical agents should respect. The benchmarks represent the trade-off between the best practice currently in use by market practitioners, nationally and internationally, on the one hand and, on the other hand, what would theoretically represent a first best solution envisaged by overseers under a risk-adverse attitude.

Quantitative benchmarks for example, can be used to define a level of performance, with which the systems and its components should comply. Qualitative benchmarks can define objectives in terms of safety and efficiency of overseen systems.

Hence, the use of benchmarks can foster in the long-term both systems' safety and efficiency and market discipline. Due to the fact that overseers best use guidelines and moral suasion rather than prescriptions in the continuous dialogue with market practitioners, the prominent use of qualitative benchmarks or a mixed use of both criteria might be preferred.

Building a risk conscious culture

The practice of disclosing oversight results can add to the credibility and transparency of central banks as overseers of payment and securities settlement systems and might enable regulators to modify a risk-adverse culture, which, as general rule, is currently used by systems' operators and participants. It might furthermore add to the reduction of reputational risk of market practitioners.

Building a risk conscious culture is generally a long-term process which cannot easily be laid down in a written procedure, but finds its roots in the constant communication with the risk-takers and in the analysis of the feedback provided by market practitioners. The use of moral suasion enables overseers to reduce sanctions and prescriptions and enables a better acceptance by the market of those corrective actions which regulators might enforce in the context of their oversight activities.

3.1.3.2 Corrective intervention tools

Implementing a procedure for crisis situations

In case of crisis, overseers might have two needs. A first need would be to identify which are the causes of the crisis and to react as quickly as possible. A second need would be to co-ordinate a joint response to the contingency with those entities which have been hit by the crisis and with their respective oversight or regulatory institutions. This might achieve particular importance if the crisis has gained or has the potential to gain a cross-border dimension and might impact, or already have had effects on other systems beside the one directly involved in the contingency.

Hence, overseers might need to develop a contingency procedure with the goal of enabling a quick response to crisis and to exceptional circumstances. The contingency procedure(s) might be defined as a standardised protocol which permits overseers to make a first assessment of the crisis in a short-time frame. On the basis of the information acquired from market practitioners, regulators might define a follow-up to the situation and further develop a concrete action plan when considered necessary.

To ensure a timely reaction in case of contingency, a number of staff of regulators and market practitioners might need to intervene promptly. A contingency database could therefore include:

- the details of the oversight staff to be contacted in case of contingency (names of the staff members, phone numbers, fax numbers and e-mail address, etc.);

- the details of the staff of operators and technical agents of overseen systems to be contacted in case of contingency;
- the details of the staff of other regulatory bodies responsible for those systems which might be directly or indirectly hit by the crisis[67];
- the details of the notification and escalation procedures within institutions exercising oversight functions.

Contingency procedures might define a priori the timing and the location at which a joint meeting between regulators[68] might be organised.

TABLE 1: PROCEDURE FOR CRISIS SITUATIONS

No. Tasks	Responsible person	Details
1 Framework for co-operation	Mr. Crisis 1	Definition of the contact persons available in case of contingency.
- Details of the oversight staff to be contacted in case of contingency	Mr. Crisis 1 Tel: 00……. Mr. Crisis 2 Tel: 00 …….. Mr. Crisis 3 Tel: ……..	In case the first person is not available, the second on the list will be contacted.
- Details of the operator's and technical agents' staff of overseen systems to be contacted in case of contingency	……. ……. …….	In case the first person is not available, the second on the list will be contacted.
- Details of the staff of other regulatory bodies, which might be involved in the oversight of the concerned system(s), to be contacted in case of contingency	…….	In case the first person is not available, the second on the list will be contacted.
2 Consultation procedure *Organisation of a meeting between contact persons of the oversight institution, other regulatory bodies involved and operators and technical agents of overseen systems*	…….	In case of contingency, a meeting between regulators and market practitioners might be promptly organised at the premises "XY" if possible, otherwise at the premises "YZ". In case of need, the use of teleconference/video-conference should be considered.
3 Notification procedure *Reporting to the management of the overseer*	Mr. Crisis 1	Reporting to the management of the overseer on the result of the meeting between operators, technical agents and regulators on the causes of the crisis.
4 Escalation procedure *Overseer's internal decision taking process*	Internal Oversight Committee	Decision on how to follow-up and definition of an action plan to be implemented.
5 Joint decision-taking process *Discussion of the action plan*	Mr. Crisis 1	Discussion of the action plan with the other regulators involved. Finalisation of the action plan.
6 Enforcement procedure *Implementation of the action plan*	Mr. Crisis 1	Enforcement of the action plan, and communication of the corrective actions to the overseen systems concerned.
7 Reiteration process		Assessment of the results achieved by enforcing the corrective actions and evaluation if further corrective actions are needed. The assessment can be done by the overseer separately or jointly with the other regulators involved in the contingency, depending on the situation.

[67] Systems which are directly linked one to the other, have a potential to trigger systemic disruptions; hence a co-operation between the authorities responsible for overseeing different entities linked one to the other might be of help. E.g., due to the fact that CBL is directly linked to EOC through the night-time bridge, the Belgium and the Luxembourg overseers might co-operate in case a crisis hits the bridge processing.

[68] Regulators are referred to as the different authorities responsible for overseeing the system(s) which have been hit by the contingency.

In the long run, overseers might need to consult with market practitioners, in the light of the crisis, on:

- the need to review contingency or crisis management procedures of operators and technical agents; and
- if the pattern of external or internal threats are in the process of changing and what might be the implications.

3.2 Risk management and oversight

As concerns risk management, overseers have the goal of assessing how systems manage and systematically identify vulnerabilities and of evaluating the impact of risks and risk materialisation on systems' processing. Overseers might lay down the whole process in a "risk management action plan".

3.2.1 Risk management action plan

The "*risk management action plan*" has the aim of defining in a written procedure which goals overseers have when assessing risk management in the context of payment and securities settlement systems, of defining which corrective actions might be undertaken as concerns existing risks and how to follow-up those corrective actions. It includes therefore a policy statement, goals and objectives, monitoring and evaluation procedures and tools, risk management cost/benefit analysis, etc..

The easiest way to proceed in the construction of a risk management action plan, might consist in the definition of oversight objectives as concerns the assessment of risk mitigation and risk management implemented by overseen entities, followed by the description of the oversight tools used to assess risks and mitigation techniques currently in use on the concerned market and what can be the level of transparency overseers want to adopt as concerns their assessment results.

The structure of the risk management action plan can be as follows:

1. Oversight objective(s)

Oversight objectives define the aim of overseers as concerns risk mitigation and risk management implemented by operators and technical agents. This aim can be formulated under the form of a policy statement, such as:

The purpose of assessing systems' risk mitigation and risk management is, inter alia, to contribute to the systematic and comprehensive identification and prevention of those risks which could arise in payment and securities settlement systems and of those risks the operator and/or technical agent is exposed to by virtue of its activities, followed by the evaluation of the availability and adequacy of the risk mitigation techniques used by overseen entities. One of its priorities is to enforce the reduction of systemic risk.

The oversight process includes in its focus not only the operator or the technical agent as themselves, but also the parent company as the subsidiaries eventually, branches and representative offices, where such have a bearing on risk and potentially an impact on payment, payment-related systems or securities settlement systems and financial stability.

2. Oversight tools

This section can describe those tools overseers might adopt or have adopted to analyse the concerned overseen systems, such as:

- Research tools:
- *evaluation (identification and analysis) of exposures;*
- *prioritisation of risks;*
- *analysis of risk expectations, etc..*

- Assessment tools:
- *establishment of a cross-check matrix;*
- *assessment of the effectiveness of mitigation mechanisms ;*
- *assessment of the availability of mitigation mechanisms, etc..*

- Intervention tools:
- *improvement of market discipline;*
- *implementation of a procedure for crisis situations, etc..*

3. Assessment report

The assessment report will include the results of the analysis of the risks and mitigation techniques undertaken by overseers and the follow-up of issues still open. (The third annex gives an overview on how the evaluation of an exposure could be made according to the methodology developed in this chapter.)

4. Transparency framework as concerns assessment results

The assessment overseers make of the capability of payment and securities settlement systems' operators have to mitigate and adequately manage risks, is usually limited to those entities which are subject to their respective oversight framework. Similar exposures, which arise in the context of nationally overseen risk-taking institutions might arise in other systems which are located in other countries and are subject to a different oversight framework. Cross-border experiences might show how certain types of exposures can be more adequately covered within other jurisdictions or through different system designs. They might furthermore highlight new types of exposures and new forms of mitigation techniques. Hence a communication between overseers of different systems could provide further information on how to better enforce risk management and risk mitigation on the market concerned.

Besides communications with regulatory entities, communications with overseen institutions and with market practitioners more generally open an ongoing consultation process with risk-takers at national and international level.

The need for overseers to be transparent in their assessment results might be evaluated on a case-by-case basis according to the situation and to the need of the regulators. It could be rather broad in scope and in target; e.g. through the disclosure of the oversight assessment results to the general public if the system's operator does not comply with corrective actions set out by the overseer; or, rather limited in scope and target, e.g. through the discussion of the assessment results with operators and technical agents when considered of need.

This approach shifts the traditional view of risk management based on quantitative measures to the use of communication between risk-takers and risk-mitigating entities as a tool to enforce a risk-adverse culture between market practitioners. Risk-takers represent the individuals, which need to find a balance between market demand by systems' participants and the risk-adverse approach of the overseen community.

3.2.2 Reiteration process

The oversight of payment and securities settlement systems can be defined as an ongoing process which finds its major root in the developments overseen systems are or can be subject to. The results of the evaluations overseers undertake, can be communicated to risk-takers when considered necessary. The feed-back provided by the market might in turn influence the oversight framework. This mechanism can be referred to as reiteration.

The process starts with the identification of system's functions, boundaries and areas of responsibility through the study of its internal rules and procedures, legal and regulatory framework, followed by the identification of the internal and external threats to the system and the analysis of the existing and potential exposures. The evaluation of the scale, frequency and duration of risks gives an appreciation on which exposures might need to be targeted with priority and enables overseers to further evaluate the adequacy and effectiveness of the existing risk control measures currently in use. This permits in turn the evaluation of the extent residual systems' vulnerabilities exist, identifying corrective actions, enforcing them and reassessing the eventual residual exposures.

The reiteration mechanism is usually a long-term process which could easily be incorporated into the risk management action plan.

4 Conclusions

Overseers' task is to contribute to the smooth functioning of payment and securities settlement systems and in this way to reduce systemic risk. Risk-takers, such as operators or technical agents of overseen systems, have also an interest in reducing and managing the different exposures which arise in the context of those systems they operate.

As concerns operators, technical agents and participants, their interest in mitigating exposures can be of differing nature and extent. Risk-takers can be faced with the need to find a balance between their business needs, the market demand and the risk-adverse attitude adopted by overseers. Hence, overseers might need to consider, when assessing the capability of operators and technical agents to fully mitigate risks, what would theoretically represent a first best solution under a risk-adverse attitude and what represents currently best or sound practice on the market.

The philosophy behind this evaluation expresses on one hand the need for overseers to ask for the *elimination of those exposures* which are not adequately mitigated by market practitioners. On the other hand it highlights the possibility to *grandfather certain exposures* without necessarily eliminating them in case the respective mitigation techniques can adequately transform an unacceptable risk into an acceptable one.

Overseers' major interest relates to the systems' soundness, safety and efficiency. Their aim is to reduce the possibility that an overseen system might fail. For this reason overseers attach importance to the identification and analysis of the different exposures which could arise within those systems they oversee and to evaluate under what circumstances new risks could arise. The way in which they might perform this task can be various. The text provides a framework to help overseers to dynamically assess the availability and appropriateness of risk control measures and to evaluate how market practice currently respects the objectives set by regulators in terms of systems' safety and efficiency.

This framework includes *two major issues*.

The first issue refers to the *development of different types of tools* which overseers could equally implement in the context of payment or of securities settlement systems, and which might enable them to assess how risk-takers mitigate exposures. The tools have been divided into research, assessment and intervention tools according to their scope. The instruments are of both qualitative and quantitative nature, and their use permits, inter alia, the evaluation of current market practices and eventually the need to influence them when they consistently differ from the objectives overseers have. For this reason, overseers might be interested in maintaining a constant dialogue with risk-takers and in assessing whenever the feedback provided by the market might have an impact on their oversight framework.

The second issue refers to the *development of crisis procedures* to enable overseers to intervene in case a risk materialises in a systemically important failure. The procedure for crisis management has been shaped in such a way that it can be implemented in different

contingency situations and which foresees eventually the possibility to organise a joint response to the crisis between the authorities involved in the oversight of those systems hit by the same contingency.

Both issues can be regrouped into a *risk management action plan* with the aim of defining, in written procedures:

(i) which risks currently arise in overseen systems and the way they are mitigated;
(ii) which risks overseers consider not to be adequately mitigated by operators and technical agents;
(iii) in which way they want to follow-up on still open questions; and
(iv) the level of transparency they want to adopt as concerns their oversight results.

Hence, the aim of assessing risks and risk mitigation techniques in the context of central bank oversight of payment and securities settlement systems can be defined as an ongoing process which finds its major root in the developments overseen systems are or can be subject to, and finds one of its major reasons in the developments overseers might achieve in terms of safety and efficiency within the systems they oversee.

5 Glossary

TERM	EXPLANATION
Back-to-back transaction	A pair of transactions that requires a counterpart to receive and redeliver the same securities on the same day. In providing liquidity to the market often dealers buy and sell the same security for the same settlement date.
Bridge transaction	Transaction between two counterpart members in different ICSDs
Cash management services	Cash management services include fund transfers, overdraft facilities, etc..
CSD	The Central Securities Depository is the depository for national assets.
Custody	Safekeeping and administration of securities and financial instruments on behalf of participants of an SSS.
Default	Inability of an entity to meet its obligations.
Direct access	Direct membership of a participant in a CSD.
Eurobonds	Bonds issued by a borrower outside the domestic market, denominated in a Eurocurrency, underwritten and sold by an international syndicate of financial institutions. The securities are generally listed but not traded. They are not subject to tax and other registration requirements of any national market.
External transaction	Transaction with a counterpart in a foreign market.
Failure	Non-settlement of a transaction.
Finality	Finality is achieved when the transaction cannot be reversed in accordance with the rules and procedures of the settlement system. When finality is reached the acquirer of the securities achieves an enforceable interest in the securities object of the transaction.
Global custodian	The global custodian uses a local agent as sub-custodian which is member of the CSD in the country of issue of the security.
Gridlock	Gridlock occurs when two or more payment queues are blocked due to shortage of funds.
Haircut	The amount by which the value of the collateral provided to back a transaction is reduced to cover fluctuations in the market price of the securities concerned.
ICSD	The International Central Securities Depository is a depository for international assets.
Internal transaction	Transaction between two accounts hold at the same CSD/SSS.
Local agent	Local bank which is member of the CSD in the country of issue of the security.
Operator	The central system organisation providing products and services.
Oversight	A public policy activity principally intended to promote the safety and efficiency of payment and securities settlement capabilities and in particular to reduce systemic risk.
Settlement of the payment leg of operations	The SSS provides for the effective cash transfer (payment) of a settled operation. The payment can be processed on a gross or a net basis either directly through central bank accounts or through one or more private settlement banks.
SSS acting as depository	Where the SSS acts as depository, it enables participants to deposit with it the securities for which the SSS has a direct and unique relationship with the issuer. The SSS records the relationship of the securities on behalf of its participants and manages the relationship with the issuer.
Sub-account	Account opened subsequently to the opening of the customer's main account. Each CBL account includes both a cash and securities sub-component.
Systemic risk	Systemic risk 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. The possibility that the liquidity and credit problems precipitated by these failures to perform will disrupt financial markets and impair the functioning of payment and securities settlement is of particular concern.
Technical agent	A supplier of service where an operator has located a significant portion of its operational or IT infrastructure or where several payment- or securities settlement-related operational or IT infrastructures are centralised.

6 Glossary of abbreviations

ABREVATION	DEFINITION
ASL	Automated Securities Lending
BCL	Banque centrale du Luxembourg
BIC	Bank Identifier Code
CAS	Central Accounting System
CBF	Clearstream Banking Frankfurt
CBL	Clearstream Banking Luxembourg
CCB	Cash Correspondent Bank
CCP	Central Counterparty
CET	Central European Time
Cetrel	Centre de transferts électroniques
CI	Clearstream International
CSD	Central Securities Depository
DASL	Disclosed Automated Securities Lending
DvC	Delivery-versus-credit
DvP	Delivery-versus-payment
ECP	Euro Commercial Programme
EOC	Euroclear Bank
ESCB	European System of Central Banks
FIFO	First-in-first-out
FOP	Free of payment
IBCA	Interest Bancshares Corporation Class A
ICG	Internal Credit Group
ICSD	International Central Securities Depository
IT	Information Technology
LIPS-	Luxembourg Interbank Payment System
NCB	National Central Bank
PKI	Public Key Infrastructure
PRIMA	Place of the Relevant Intermediary Approach
RTGS	Real-time Gross Settlement System
S&P	Standard and Poor's
SLBGS	Securities Lending and Borrowing Syndicate
SSL	Strategic Securities Lending
SSS	Securities Settlement System
SWIFT	Society for the Worldwide Interbank Financial Telecommunication
SYPAL-Gie	Groupement pour la promotion et la gestion des systèmes de paiement au Luxembourg
TARGET	Trans-European Automated Real-time Gross Settlement Express Transfer System
TFA	Tripartite Financing Facility
TOF	Technical Overdraft Limit

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8 First annex: Payment and securities settlement

8.1 Securities settlement

Trade confirmation

The first step in settling a securities trade is to ensure that the two counterparts in the transaction, the buyer and the seller of the security, agree on the terms of the transaction, which is defined as trade confirmation. Depending on the trading mechanisms adopted, the trade confirmation will be done in different ways. Within an electronic trading system for example, the system itself produces the confirmation of the terms of the trade between the two counterparts, otherwise the terms are generally confirmed by the stock exchanges based on the data that the counterparts submit.

In case a broker-dealer or a member of the stock exchange[69] takes the roles of intermediary in a transaction on behalf of the original counterparts[70], the trade confirmation might occur in two separate stages. The first part occurs between the two direct market participants, while the second part occurs between each direct market participant and the respective original counterpart on which behalf it is acting. Counterpart risk is reduced the earlier the trade confirmation is achieved and the earlier discrepancies will be detected. Once this task has been performed, the intermediaries have to create instructions for the positioning of funds and securities, which will be matched within the SSS prior to the settlement date. Credit risk is reduced the shorter the settlement cycles will be.

Clearing and settlement

After the confirmation of the terms of the trade has occurred, clearing and settlement takes place.

Clearing involves the calculation of the obligation of the counterparts. This process can be done on a gross basis, which implies that the calculation is done trade by trade, or on a net basis, which implies that the calculation of the position will be done in terms of the net outstanding credit or debit position towards the counterpart in the trade (bilateral netting) or towards all the counterparts in all the trades (multilateral netting). The netting is mostly common on securities markets where the volumes of trades are high with the goal to manage liquidity better and to reduce gross exposures.

[69] Either the broker-dealer or the member of the stock exchange or in this case direct market participants.
[70] The buyer and the seller of the security will be in this case indirect market participants.

The settlement involves the final transfer of securities and funds respectively to the buyer and to the seller. The dematerialisation of securities permits that settlement is performed without physical movement of the holding through a book-entry mechanism. Once the payment and the delivery have been made, the settlement process will be completed. Nevertheless legally, an additional step has to be fulfilled before finality can be achieved. Settlement systems generally keep registries in which the ownership of securities is listed in the records of the issuer. Securities may be registered in the name of a broker-dealer or custodian (indirect holding system) or in the name of the ultimate owner (direct holding system). The change in ownership recorded in the register permits finality to be legally achieved.

Settlement of cross-border trades

The settlement of cross-border trades takes place outside of the country in which one or both of the counterparts involved in the transaction are located. A common example is the processing of Eurobonds which is usually performed through ICSDs such as EOC and CBL. The channels to settle cross-border may vary depending on the type of security to be processed.

A first option requires that a non-resident counterpart achieves *membership* in the settlement system within the country where the security has been issued. This channel might nevertheless not be available for all non-resident institutions. If direct membership is not allowed, *local agents* can usually gain access to the country of issue of the security. The agent will be a direct member in the local CSD and will offer settlement and related services to the non-resident counterpart. Settlement services in different markets can be furthermore provided by *global custodians*, which have an own network of sub-custodians. *ICSDs* on the other hand, offer settlement for a wide range of securities and currencies and have developed links to a number of local CSDs.

8.2 Payment settlement

The submission, the validation by the system, the acceptance for settlement of the instruction and the settlement with finality represent the statuses of a payment instruction.

The submission involves that the details of the payment (details on the beneficiary and the sender, amount to be transferred, etc.) are transmitted to the payment system on or before the value date. The payment system subsequently validates the instruction. In an RTGS system the settlement is achieved immediately, while for net systems, the positions are first netted and settled during the defined settlement cycle(s). Once the settlement account of the beneficiary of the transaction within the payment system is credited, the settlement is unconditional and irrevocable.

Routing of domestic payments within LIPS-Gross

After a payment has been inputted in the system and validated, the payment is intercepted by SWIFT FIN-Copy which sends a settlement request to the BCL. The latter in turn debits the account of the sender subject to sufficient credit available and credits the account of the receiver of the payment. If sufficient credit is not available, the BCL informs the participant of the lack of funds.

Routing of cross-border payments within LIPS-Gross

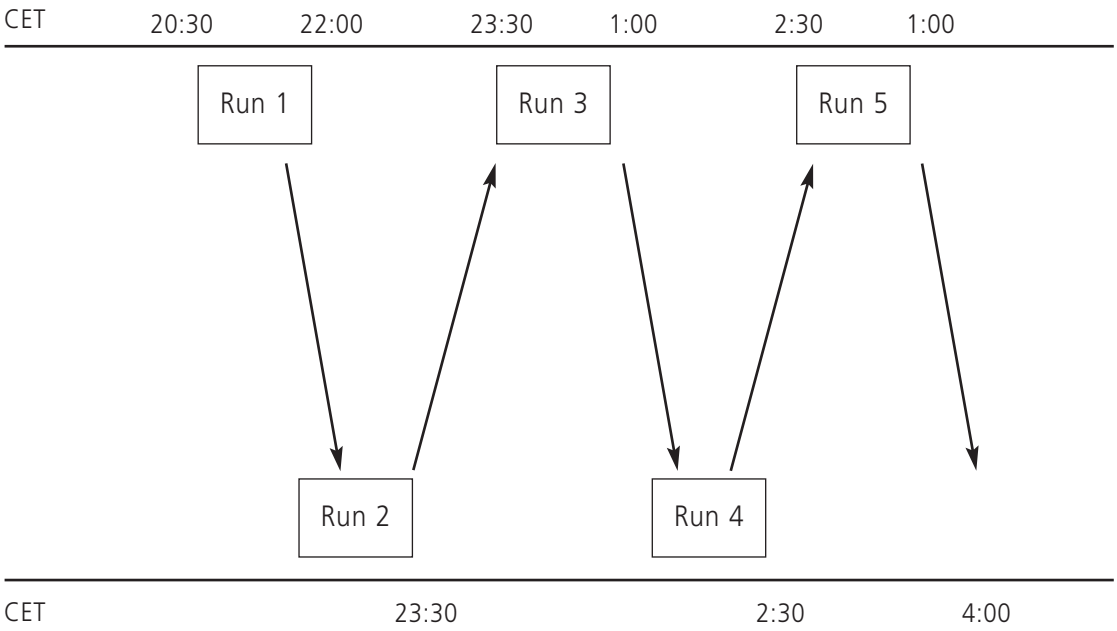
Outgoing TARGET cross-border payments are settled like domestic payments within LIPS-Gross. The payment message has to be addressed to the BIC address of the BCL which will in turn forward the instruction to the receiving NCB. In case no sufficient credit is available, the participant is informed. On the other hand incoming cross-border payments are forwarded by the BCL to the receiving LIPS-Gross participant after settlement.

9 Second annex: EOC-CBL bridge agreement

The new bridge agreement between EOC and CBL was signed in March 1992 and launched in September 1993. Since the implementation of the electronic bridge the securities transactions have been effectuated by means of book-entry transfers. Both EOC and CBL systems maintain a securities and a cash account with the other. The following figure shows the mechanics of the settlement process.

FIGURE 1: MULTIPLE OVERNIGHT PROCESSING EOC-CBL

Source: BIS, Committee on Payment and Settlement Systems of the central banks of the Group of Ten countries, Cross-border securities settlement, March 1995



A: The processing starts with a first delivery done by CBL (at 20:30 CET at the latest). CBL maximises internal and bridge deliveries given CBL participants' securities, cash holdings and/or available cash and securities borrowing facilities. Once the system has checked that the participant has liquidity available for delivery to EOC, his securities account will be provisionally debited and his cash account provisionally credited. Those funds are marked as "unconfirmed funds" and can be used within the limits of the unconfirmed funds facility, which implies that CBL permits customers to use incoming cash prior to confirmation that CBL has received the funds. The securities on the other hand, even if provisionally credited, can be used as collateral. EOC's transit securities account at CBL is provisionally credited and EOC's transit cash account at CBL is provisionally debited. The proposed delivery instructions are then sent to EOC after the first settlement batch is completed at CBL (at 22:00 CET at the latest).

B: EOC tries also to maximise deliveries given availability of liquidity. If an EOC's participant has enough cash at disposal to accept a proposed delivery from CBL's participant, his cash and his securities account will be debited/credited provisionally. On the other hand, CBL's transit cash account at EOC is provisionally credited and CBL's transit securities account at EOC is

provisionally debited. During the same settlement cycle, a proposal for deliveries to CBL is prepared. At the end of the cycle, EOC sends the feedback on the proposed deliveries by CBL in the first run and its own proposed deliveries (at 23:30 CET at the latest).

C: As soon as CBL receives the feedback on accepted bridge deliveries, they become final and the provisionality is removed from CBL participant's accounts, from CBL's and EOC's transit securities and cash accounts. Book-entries were already final when done during the first run. From this moment the letter of credit covers the resulting inter-system exposure. On the basis of the new securities and cash positions of its participants, CBL tries to maximise again the settlement of remaining unsettled internal and bridge transactions and provides for a feedback on EOC's delivery proposal. According to the same principles the next cycle (**D**) is performed. Failed instructions are re-entered in the following run.

E: During the last run CBL tries to settle proposed bridge deliveries from EOC depending on the liquidity availability of CBL's participants. Due to the fact that no other run can be finalised during the same night, any new provisional book-entries relating to CBL deliveries to EOC for the same value date remain outstanding until the next night-time cycle, when the instructions will be inputted in the first run by CBL. Those unsettled instructions are called backlog. Since the provisional book-entries are irrevocable, CBL's participants cannot cancel backlogs. Backlogs do not arise in the case of EOC.

10 Third annex: An example of the assessment of principal risk in a generic securities settlement system

10.1 Basic assumptions

This example gives an appreciation of how a risk borne by a generic securities settlement system can be assessed using the framework which has been developed in Chapter II. The basic assumption made in this context is that the SSS used in the example settles high transaction volumes through a DvP model 1 batch procedure. The SSS provides for safekeeping, custody and settlement services to its customer-base and serves several local markets around the world. In order to enhance the settlement of participants' transactions, the SSS, which is embedded with a payment system, furthermore supplies credit and securities lending and borrowing facilities which are backed by a syndicate of guarantors. The syndicate manages the valuation of securities' haircuts, bears principal risk and manages new collateral admissions. SSS's transactions are, as a general rule, fully collateralised but exceptions can be made for highly creditworthy customers to which uncollateralised credit lines might be granted on a short-term basis. Access criteria to the SSS are also based on the creditworthiness of participants. The system's operator furthermore has in place loss-sharing arrangements in case a participant defaults on its obligations and in case transactions are erroneously booked.

10.2 Definition of the exposure: principal risk (credit risk)

Credit risk represents the possibility that a counterpart does not fulfil its obligations for the full value, either at the due time or at any time thereafter. It can be subdivided into replacement cost risk and principal risk. Principal risk relates to the possibility that the counterpart defaults on its obligations once the transfer of funds or securities has begun but has not yet been completed.

10.3 Research tools

10.3.1 Identification of principal risk

The analysis of the life-cycle of a securities transaction highlights:

- *the moment in time at which principal risk arises*;
  Principal risk arises when one party in the transaction has fulfilled its obligations and lasts until the counterpart has fulfilled its respective obligations.

- *the nature of the obligations of counterparts;*
  The two counterparts in the transaction have the obligation to respectively sell/pay for the security object of the trade for the amount and the price defined and deliver/pay at the settlement date defined. The operator of the system is responsible for the calculation of the bilateral obligations of the counterparts, for the settlement of the instruction and for the settlement of the cash and securities leg of the transaction.

10.3.2 Analysis of principal risk

Principal risk can be analysed according to three criteria; its scale, its duration and its frequency.

- *Scale of principal risk*
  The scale of exposures gives an understanding of the severity of risks and therefore also of the potential impact on the system's functioning, if such risks materialise.

  When a counterpart defaults, all transactions to or from that customer are blocked; nevertheless other customers waiting for payments coming from the defaulting party might incur in liquidity or credit risk. The defaulting counterpart can incur credibility losses and financial losses due to the non-fulfilment of its obligations. The non-defaulting counterpart on the other hand can incur losses depending on the possibilities it has to access credit facilities or securities lending programmes and the costs related to those facilities. The losses incurred by the both counterparts are usually proportionate to the value of the original contract. Hence the scale of principal risk seems to be *high*.

- *Duration of settlement risk*
  The duration of exposures identifies the moment in time at which the exposures materialise and the point in time at which they extinguishes.

  Principal risk arises when one party in the transaction has fulfilled its obligations and lasts until the counterpart has fulfilled its respective obligations. The moment in time at which one counterpart can default on its obligations can be defined by the moment in time at which its transfer of cash or securities has achieved finality. In the same way, when the corresponding payment has achieved finality, the counterpart does not incur further principal risk. For both transaction legs, the delivery and the payment leg, the moment in time at which finality is achieved is followed by an identification period during which the counterparts' obligations are already final but both customers have still to identify whether or not they have received the transfer or the payment. Every change in the timing at which each counterpart is expected to fulfil its obligations can have an impact on the exposure's duration. Hence the duration of principal risk seems to be *medium*.

- *Frequency of principal risk*
  The frequency of exposures relates to the frequency at which the exposures arise and at which they materialise.

  Each time one party in a transaction has discharged its obligations before the counterpart has discharged its respective obligations, principal risk arises. Due to the fact that the SSS implements DvP model 1 procedure, which implies that the transfer of funds and securities is carried out simultaneously, the frequency at which the exposure arises seems to be *low*.

  Regarding the frequency at which principal risk materialises, the analysis of customers' creditworthiness might show that the less creditworthy counterparts are usually the ones which default on their obligations (i.e. in general they have a higher probability of going

bankrupt). Nevertheless other reasons are usually more significant in explaining why customers default on their obligations, which implies that their transaction might settle late or not settle at all. These reasons refer usually to operational mistakes made by customers when formatting the transaction orders on one hand, while on the other hand they refer to mistakes customers make when planning their liquidity needs. Counterparts might, for example, forget to pre-advise an incoming payment on their account or forget to check their credit line limit and input transaction orders which are in value higher than the credit line at their disposal, etc.. Furthermore, for SSSs with high turnover numbers, the rate at which transactions fail to settle is usually quite low compared to the total number of transactions settled by the system during the day.

The rate of counterparts' default seems to be limited and not necessarily linked to the creditworthiness of the counterparts. Hence the frequency at which settlement risk materialises seems to be *low*.

10.3.3 Mapping of principal risk

(The mapping of a risk achieves importance when done in conjunction with other exposures.)

10.3.4 Prioritisation of principal risk

Principal risk can be prioritised according to the relative importance overseers give to this exposure. The *"full" risk weight* of principal risk defines the significance of the exposure's scale, duration and frequency, while its *"derived" risk weight* defines the capability of the existing mitigation techniques the SSS implements to reduce principal risk.

- *Full risk weight*
  The characteristics of principal risk can be defined as: high scale, medium duration and low frequency. Hence its full risk weight could be defined as *medium*.

- *Derived risk weight*
  Principal risk can arise either in securities transactions (if one of the counterparts does not fulfil its obligations) or when the SSS provides for credit facilities to its participants. As concerns securities transactions, principal risk is mitigated by the fact that the SSS implements model 1 DvP. As concerns credit facilities, principal risk remains partly uncovered in the following situations:

  - The SSS offers credit facilities to enable a smooth settlement. The mitigation techniques used in this context are based on the creditworthiness of counterparts rather than on the amount of collateral provided to cover each single transaction. Certain facilities, such as credit lines, can also be granted on an unsecured basis.
  - The SSS might supply unsecured credit lines. This discretionary credit facility is provided to participants on the basis of their level of collateralisation and on their financial standing. Due to the fact that the decision to grant unconfirmed funds can be exercised discretionarily, a lack of experience in the staff of the SSS might give raise to liquidity constraints if the transaction is not settled in due time. (This in turn might give raise to a participant's claim against the SSS itself.)

Hence the derived risk weight of principal risk seems to be *low-medium*.

The mapping and prioritisation of principal risk might need to be reconsidered in the light of the analysis of the other risks which arise within the same system.

SUMMARY TABLE

TYPE OF RISK	FULL RISK WEIGHT - FREQUENCY - DURATION - SCALE	DERIVED RISK WEIGHT	PRIORITISATION (in terms of oversight)
Principal risk	Full risk weight: *medium* - low frequency - medium duration - high scale	*low-medium*	*medium* except for specific issues on which an intervention might be needed (e.g. in the context of the use of unsecured credit lines)

10.3.5. Market expectations as concerns principal risk

Participants are usually those who are exposed to principal risk. The SSS itself does usually not act as principal in securities transactions. As concerns principal risk, the following expectation seems to prevail on the market:

- *Regulators seem to point towards a reduction of the settlement cycle*;
  Concerning the shortening of settlement cycles, the SSS implements a batch procedure which allows the system to receive and process trade information from different markets several times during the day. Every additional delay depends on the settlement procedures implemented on the local markets. As concerns internal transactions, a reduction in the settlement cycle might not create additional constraints, because the system provides for same-day settlement. Concerning external transactions, in which an SSS participant settles with a foreign counterpart, the capability of the SSS to reduce the settlement cycle depends on the settlement efficiency achieved on the local market[71].

Hence, a reduction of the settlement cycle does not seem to entail particular constraints for internal transactions. This result might be different for external transactions.

[71] As a general rule, stock exchange trades have a relative short settlement cycle (money market instruments have the shortest cycle, followed by bonds and then equities), over-the-counter traded instruments might have longer settlement cycles.

10.4 Assessment tools

10.4.1 Effectiveness and nature of mitigation techniques used to cover principal risk

Several mitigation techniques are used in the SSS to cover principal risk. As general rule, most of the mitigation mechanisms:

- are multifunctional and therefore cost-effective;
- their nature is usually preventive, which implies that the mitigation mechanism focuses on the reduction of the frequency at which the exposure might materialise;
- their capability to reduce exposures is quite high.

10.4.1.1Multi-functional mitigation mechanisms

a. Collateralisation of credit exposures

Collateral is used for settlement purposes to cover participants' transactions, securities and lending facilities and repurchase arrangements.

- nature of the mitigation technique: *preventive measure*;
- adequacy of the mitigation technique: *high*.

b. The Syndicate of Guarantors

The syndicate manages the valuation of securities' haircuts and bears principal risk in the context of securities lending and borrowing programmes. It furthermore manages new collateral admissions.

- nature of the mitigation technique: *preventive measure*;
- adequacy of the mitigation technique: *high*.

c. Selection of customers based on their creditworthiness

Access criteria to participate in the SSS are based on the creditworthiness of participants. Creditworthiness is furthermore used as criteria to grant unsecured credit lines and to enable the exceptional settlement of transactions even when no sufficient funds are available on the participant's account.

- nature of the mitigation technique: *preventive measure*;
- adequacy of the mitigation technique: *medium (even a creditworthy participant might bear a certain risk of default)*.

d. Collateral valuation

Criteria to evaluate collateral are, as a general rule, the same for the collateral used to cover ordinary transactions and for the collateral used to cover credit or securities lending and borrowing facilities.

- nature of the mitigation technique: *preventive measure*;
- adequacy of the mitigation technique: *high (it reduces the exposure but does not eliminate it in case of highly volatile financial markets)*.

10.4.1.2 Mono-functional mitigation techniques

The use of DvP 1 reduces principal risk (in the settlement process)
- nature of the mitigation technique: *preventive measure*;
- adequacy of the mitigation technique: *full*.

10.4.2 Availability of contingency mechanisms for principal risk

All types of systems might be faced with contingency situations; hence overseers might need to assess to which extent a system and its availability mechanisms can cope with distress. For this reason contingency mechanisms should be tested regularly by operators or technical agents. The concerned SSS has in place contingency mechanisms to intervene in case principal risk materialises.

The first mechanism enables the operator of the system, in case of default of a participant on its obligations, to block all the accounts of the concerned participant, so that no further settlement will be possible. Supposed that this contingency mechanism is performed manually and the decision to implement it is taken internally by the operator's management, it does *not* seem necessary for the operator to test the mechanism regularly.

The second mechanism enables the operator, in the event that the customer has a debit balance in a security and does not credit the account within a fixed time-delay, to purchase collateral on the market at the expense of the defaulting customer. Nevertheless, if the purchase cannot be made, a pro-rata reduction of the holdings of those customers, which hold the same security in the system at the time the loss occurred, can be initiated. Furthermore, the system might reserve the right to reverse any erroneous debit or credit entries to any account at any time. Such errors shall include a debit or credit made in connection with a transaction which becomes subject to a reversal order. Losses in a collective holding of a particular class of securities are to be borne jointly and pro-rata by the co-owners of the collective holding on the basis of the credit balance existing at the time where the loss occurred. Supposed that the participation in loss-sharing contingency mechanisms represents a participant's obligation as usually stated in the system's internal rules, it does not seem necessary for the operator to test the mechanism regularly.

10.5 Intervention tools

The intervention tools, which overseers could use to contribute to the reduction of principal risk, are generally *preventive actions*. The major one can be the use of *moral suasion* as that enables overseers to improve the risk-consciousness of risk-takers without being prescriptive. Its goal could be to contribute to the:

- reduction of the use of unsecured credit lines;
- increase of the use of collateralisation;
- maintenance of records on the volume and values of participants' defaults and their reason of default.