

**Denmark: Financial Sector Assessment Program—Detailed Assessment of the  
Core Principles for Systemically Important Payment Systems**

This Detailed Assessment of the Core Principles for Systemically Important Payment Systems for Denmark was prepared by a staff team of the International Monetary Fund as background documentation to the Financial Sector Assessment Program with the member country. It is based on the information available at the time it was completed in September 2006. The views expressed in this document are those of the staff team and do not necessarily reflect the views of the government of Denmark or the Executive Board of the IMF.

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FINANCIAL SECTOR ASSESSMENT PROGRAM

DENMARK

DETAILED ASSESSMENT OF  
THE CORE PRINCIPLES FOR  
SYSTEMICALLY IMPORTANT  
PAYMENT SYSTEMS

SEPTEMBER 2006

INTERNATIONAL MONETARY FUND  
MONETARY AND FINANCIAL SYSTEMS DEPARTMENT

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## GLOSSARY

ATM	Automated teller machine
BEC	<i>Bankernes EDB-Central</i> , the computer center used by Danmarks Nationalbank to operate KRONOS, the Danish real-time gross-settlement system for large-value payments
BIS	Bank for International Settlements
CLS	Continuous Linked Settlement Bank, an international clearing and settlement system for foreign exchange transactions based in New York
CDs	Certificates of deposits
CP	Core principles
CPSS	Committee on Payment and Settlement Systems
CPSIPS	Core Principles for Systemically Important Payment systems
CPU	Computer processing unit
CSD	Central Securities Depository
CSE	Copenhagen Stock Exchange
DBA	Danish Bankers Association
DFSA	<i>Finanstilsynet</i> , the Danish Financial Supervisory Authority
DVP	Delivery-versus-payment
EC	European Commission
ECB	European Central Bank
ESCB	European System of Central Banks
EEA	European Economic Area
EFTPOS	Electronic Funds Transfer at the Point of Sale, terminal for accepting card payments that is able to transmit the information
EMU	Economic and Monetary Union
EU	European Union
FIFO	First in first out
FUTOP	The Danish clearing center for futures and options, owned by the Swedish company OMX Group AB
K-RIX	The Swedish RTGS-system
KRONOS	The real-time gross-settlement system for interbank large value payments operated by Danmarks Nationalbank
IMF	International Monetary Fund
ISO	International Organization for Standardization
IT	Information technology
MFD	Monetary and Financial Systems Department
MOU	Memorandum of understanding
OMX	The Nordic stock exchange, a merger of the exchanges of Denmark, Estonia, Finland, Latvia, Lithuania, and Sweden
PBS	<i>Pengeinstitutternes Betalings Systemer A/S</i> (Payment Business Services A/S), owner and operator of the PBS clearing and operator of Sumclearing, the Danish clearing and settlement system for retail payments
PVP	Payment-versus-payment

RTGS	Real-time gross-settlement
SCP	Scandinavian Cash Pool
SLA	Service Level Agreement
SSS	Securities Settlement System
STA	Securities Trading Act
Sumclearing	The multilateral netting system for retail payments in Denmark
TARGET	Trans-European Automated Real Time Gross Settlement Express Transfer System, the large value system in Europe
VP	<i>Værdipapircentralen A/S</i> , the Danish Central Securities Depository

## I. INTRODUCTION

### A. General

1. The assessment of the observance of the Core Principles (CP) for Systemically Important Payment Systems (CPSIPS) developed by the Committee for Payments and Settlement Systems (CPSS) dated January 2001 was carried out as part of the first Financial Sector Assessment Program mission to Denmark, November 7–18, 2005.<sup>1</sup>
2. The main counterparties for the assessment were Danmarks Nationalbank and Finanstilsynet, the Danish Financial Supervisory Authority (DFSA), whose staff were very open and informative and whose full cooperation and diligence are greatly appreciated.

### B. Scope of the Assessment

3. Two payment systems are declared systemically important by the Danish authorities: (i) KRONOS, the real-time gross-settlement (RTGS) system for large-value payments; and (ii) Sumclearing, a multilateral netting system for the clearing and settlement of retail payments. Sumclearing is defined as systemically important primarily because it is the only retail payment system in Denmark and it also handles relatively large payments. The infrastructure for retail payments has a “pyramid shaped structure” in the sense that it consists of two sub-clearings and their results (sum totals) are netted in the Sumclearing. In this assessment, the infrastructure for retail payment is seen as a complex and interdependent set of procedures, encompassing the whole common infrastructure that is used for initiating and processing to the final settlement and reporting. This infrastructure is described in the *Aftalebog* and the *Håndbog for Betalingsformidling* (payment system manual) of the Danish Bankers Association (DBA), the owner of Sumclearing.

### C. Information and Methodology Used for Assessment

4. The assessment was performed using the assessment methodology as described in the *Guidance Note for Assessing Observance of Core Principles for Systemically Important Payment Systems* of the IMF/World Bank.
5. The assessment relied on the thorough and comprehensive self-assessments of the two systems performed by the overseers and on in-depth interviews with the staff of the Payment System Department of Danmarks Nationalbank and of the DFSA staff in charge of overseeing the systems. Very informative meetings were also held with the Accounting Department of Danmarks Nationalbank, which operates KRONOS, the DBA, the owner of Sumclearing, and with different users of the two systems. Furthermore, the assessor met with staff from different departments of Danmarks Nationalbank discussing the relations between

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<sup>1</sup> The assessment was performed by Jan Woltjer, Monetary and Financial Systems Department (MFD), International Monetary Fund (IMF).

payment system, monetary, and information technology (IT) security policies, and crisis management.

6. Prior to the mission, Danmarks Nationalbank provided all the necessary documentation in the form of relevant laws, articles, brochures, and guidelines and the completed questionnaire on payment systems. In addition, two books published by the Nationalbank were made available: *Monetary Policy in Denmark*, June 2003, and *Payment Systems in Denmark*, 2005.<sup>2</sup> The latter provides a thorough description of the infrastructure for the settlement of payments and securities and the risks therein.

7. During the mission, the assessor also carried out an assessment of the observance of the CPSS/IOSCO Recommendations for Securities Settlement system of Værdipapircentralen (VP), the Danish Central Securities Depository (CSD).

8. The assessor did not face any problem potentially limiting the assessment process.

#### **D. Institutional and Market Structure—Overview**

9. The payment system infrastructure in Denmark is highly developed and technologically well advanced. A broad variety of payment instruments are processed varying from checks and paper-based credit transfers to card transactions. In 2005, around 1.1 billion payments with a value of DKr 5,027 billion were processed in the Sumclearing infrastructure. With around 670 million payments by cards in 2005, Denmark had the highest number of card transactions per capita in Europe. Especially the use of Dankort, a common debit card product of the Danish banks, is very popular and widely accepted by Danish retailers. Credit cards have only a minor market share due to the differences in price policy. A large amount of recurrent bills for telephone, utilities, and other services (168 million in 2005) are paid via direct debits, with 9 out of 10 households using the services of Payment Business Services (PBS). A similar service is developed for private and public business enterprises for paying for good and services bought from other firms.

10. E-banking is intensively used in Denmark, while the use of checks is declining. About 2.7 million Danish citizens have opened an e-banking account and send in their payment orders via the internet. Checks are especially used for fulfillment of larger payment obligations (average value per transaction cleared through the Sumclearing in 2005 was DKr 22.850). The number and value of payments by checks have been halved since the introduction of more modern payment instruments as the direct debit and Dankort in the beginning of the 1980s. It is likely to decline further. Recent initiatives have made it possible for government agencies to increase their use of electronic credit transfers at the expense of checks, when making payments to citizens, since all citizens are obliged to have a bank account.

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<sup>2</sup> The two books are available on the website of Danmarks Nationalbank: <http://www.nationalbanken.dk/dnuk/specialdocuments.nsf>.



11. Despite the increasing use of electronic payment instruments, banknotes and coins issued by Danmarks Nationalbank remain an important means of payments. Banknotes and coins are put into circulation via a number of decentralized banknotes holdings placed with banks in various parts of Denmark. These holdings are owned and operated by the banks that supply local banks with cash. Danmarks Nationalbank grants the banks in question an interest free loan corresponding to the banknotes held. The loan is fully collateralized.

12. A Danish characteristic is the high degree of cooperation within the financial sector in relation to the technical infrastructure. The main parts of the infrastructure for the clearing of retail payments and securities are owned by the banks collectively. This cooperation has resulted in unified systems handling all types of retail payments. All banks have access to the common infrastructure. Accordingly, smaller banks can offer their clients a full range of payment services. All banks can influence the decision taking process on development, pricing and other relevant issues.

### **E. Payment Systems Infrastructure**

13. The infrastructure for retail payments comprise three parts: two sub-clearings (the electronic clearing and truncation system and the PBS clearing); and the Sumclearing. The results of the sub-clearings are combined and cleared in the Sumclearing and the final result is settled via the accounts participants have opened at Danmarks Nationalbank.

14. In both subsystems, payments are submitted continuously 24 hours a day. The electronic clearing and truncation system processes checks, credit transfers, and cash withdrawals by clients of other banks. Banks transmit the checks and the other categories of payments they receive in paper form or electronically to their data processing center. These data processing centers are interbank service providers that normally provide services to different banks. Only the larger banks have their own processing center. The datacenters exchange bilaterally information and prepare a list of debit and credit balances for each of their participants vis-à-vis every other participant in the subsystem. In the evening these balances are sent into the Sumclearing. The PBS clearing processes direct debits and EFTPOS transactions with a debit or credit card and cross-border card transactions.

15. The PBS clearing is a common infrastructure, owned by the banking industry and provides services to all Danish and foreign banks active in the Danish market. It calculates bilateral positions for all its participants and sends this into the Sumclearing, which settles the positions together with the position of a participant in the electronic clearing and truncation system. The Sumclearing settles payments in both kroner and euro.

16. Transactions in the financial markets are cleared via VP, the Danish CSD, and the Futures and Options Clearing House (FUTOP), the clearinghouse for derivatives.<sup>3</sup> Denmark's capital market is dominated by bonds with active trading in mortgage bonds and government securities. Although, most of the bonds are listed on the Copenhagen Stock Exchange (CSE), most of the trading is carried out over-the-counter in the informal interbank telephone market.

17. The KRONOS, Sumclearing, and VP settle via clearing accounts their participants have opened with Danmarks Nationalbank. In addition to the settlement for the aforementioned ancillary systems and FUTOP, KRONOS also settles the kroner leg of foreign exchange transactions that are cleared via the Continuous Linked Settlement (CLS) system. It is also the channel for the execution of monetary policy transactions and interbank large value transactions. KRONOS is a multicurrency system that settles transactions in Danish kroner and euro. For the settlement of euros, KRONOS is linked to TARGET, the large-value system of the European System of Central Banks (ESCB). In addition, the system settles transactions in Swedish kroner and Icelandic kroner, however only in connection with the settlement in VP of securities denominated in these currencies.

18. Denmark has a sound legal infrastructure for payments and securities settlement transactions. It covers issues as finality, netting, and delivery-versus-payment (DVP). The enforceability of collateral arrangements is well regulated. The electronic signature and use of electronic data is recognized in court and all contractual relationships are enforceable. A zero hour rule does not exist and finality of payments is ensured in case of bankruptcy. The separate laws for certain payment instruments also regulate consumer protection with respect to electronic and card payments.

19. Payment systems are overseen by the DFSA and Danmarks Nationalbank, which cooperate closely. The oversight powers of the two institutions are regulated in the Securities Trading Act (STA). The cooperation and consultative arrangements between the two overseers are laid down in a memorandum of understanding (MOU) that is publicly available. The STA was amended effective March 1, 2006, which further clarifies the oversight authority. There is a narrow cooperation between central banks and banking supervisory authorities with respect to crisis management in the Scandinavian countries and in the European Union (EU).

20. The developments in the payment infrastructure and payment instruments are mainly market driven. A major payment system reform has not taken place since the introduction of KRONOS in November 2001, and no major changes are planned for the near future.

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<sup>3</sup> FUTOP was taken over by OMX Group AB in Sweden in 2005. It does no longer operate under the umbrella of a Danish license and regulations. However, derivative contracts in Danish kroner are still settled on the accounts in Danmarks Nationalbank.

## II. ASSESSMENT OF THE CORE PRINCIPLES AND CENTRAL BANK RESPONSIBILITIES

**Table 1. Detailed Assessment of Observance of KRONOS of the CPSS Core Principles for Systemically Important Payment Systems**

<i>CP I - The system should have a well-founded legal basis under all relevant jurisdictions.</i>	
<i>Description</i>	<p><b>General</b><sup>4</sup></p> <p>The legal basis for KRONOS can be divided into five categories:</p> <ol style="list-style-type: none"> <li>I. Danmarks Nationalbank Act;</li> <li>II. General Danish law of contracts and property;</li> <li>III. Regulations governing payment systems and collateral arrangements;</li> <li>IV. The contractual basis for KRONOS; and</li> <li>V. The conditions of the ESCB for the participation of non-euro area national central banks in TARGET.</li> </ol> <p><i>a. Completeness and reliability of framework legislation</i> The legal basis for KRONOS comprises a consistent, complete, and reliable set of laws, regulations, and contractual arrangements.</p> <p><i>b. Publicly available</i> With the exception of the outsourcing agreement between Danmarks Nationalbank, the system owner, and Bankernes' EDB Central (BEC), the system operator, all relevant laws, regulations, and agreements are publicly available. In Denmark all laws, rules, and regulations passed by the parliament and all statutory orders and circulars issued by the administration are published on "Retsinformation," an on-line legal information system of the Danish Government in Danish. The most important legislation for the financial sector is available in English on the website of the Finanstilsynet, the DFSA.</p> <p><i>c. Upholding of the legal basis in court</i> The legal certainty of the rules, regulations, contracts, or any other aspect of the legal basis for payment, clearing, and settlement systems has never been challenged in court.</p> <p><i>d. Legal support of electronic processing</i> Payments via electronic transfers are recognized as valid legal acts, and book-entry of electronic payments and claims as deposits to accounts (e.g., cash and securities) are accepted as evidence before Danish courts.</p> <p><b>I. Danmarks Nationalbank Act</b></p> <p>Pursuant to Danmarks Nationalbank Act, the Nationalbank is to maintain a safe and secure currency system and to facilitate and regulate the traffic in money. The Nationalbank considers this the legal basis for its operational role (providing settlement facilities for large value payments in Denmark) and for its catalyst and oversight role, for which the key</p>

<sup>4</sup> For an extensive overview of the legal basis for Danish payment systems, see *Clearing and Settlement in Legal Perspective* by Niels. C. Andersen, Danmarks Nationalbank Working Papers 2004–20, July 2004. (Available on: <http://www.nationalbanken.dk/dnuk/specialdocuments.nsf>.)

objective is to contribute to the efficiency and stability of payment and securities settlement systems. Effective March 1, 2006, the oversight role of Danmarks Nationalbank with respect to payment systems was explicitly recognized by the Danish Parliament and laid down in the STA.<sup>5</sup>

## **II. Law of contracts and property**

### *e. Enforceability of laws and contracts*

Danish law of contracts and property recognizes and, to a very broad extent, protects agreements and other legal acts between parties (freedom of contract, simple contracts, and freedom of evidence).

All relevant laws as well as contractual arrangements within the framework of KRONOS between the different parties involved are fully enforceable.

### *f. Zero hour rules or any similar rule*

Danish law does not contain a zero hour or any similar rule stipulating that bankruptcy or insolvency proceedings can be applied retroactively.

## **III. Regulations governing payment systems and collateral arrangements**

The specific regulations on finality, recognition of netting, and the legal underpinning of collateral arrangements in payment and securities settlement systems in Denmark, as well as the enforceability of these legal issues under all circumstances—even in the case of bankruptcy—can be found in part 18 of the STA (STA; March 17, 2005). The relevant sections are applicable to KRONOS.

### *g. Protection of finality in a payment system in Denmark*

The EU Settlement Finality Directive (directive 98/26 EC) is implemented in Danish law in Section 57 et seq. of the STA. The primary objectives of the Directive are: (i) to protect the finality of transactions settled in payment systems and in securities settlement systems (SSS), whether settled on a gross basis or on a multilateral netting basis; and (ii) to protect possible collateral arrangements within the framework of a payment and settlement system to secure intraday credit and/or to guarantee the timely settlement in case of a bankruptcy event. The DFSA has notified the European Commission (EC) that KRONOS is a designated system under this Directive.

### *h. Irrevocability and finality*

Section 57c of the STA prescribes that the rules and regulations and participation agreements for a registered payment system has to set out: (i) when a payment is to be considered as entered into the system, and (ii) the point(s) in time after which a registered transfer order can no longer be revoked by a participant or a third party. In KRONOS, irrevocability and finality are clearly defined in the rules of the system and are assured even in case an insolvency procedure is opened against a participant.

<sup>5</sup> For a description of the legal basis for Danmarks Nationalbank's role as an overseer, see *Detailed Assessment of the Securities Clearance and Settlement Systems—Denmark*, IMF, July 2006, pp. 41–43.

<sup>6</sup> For an extensive overview, see *The Provision of Collateral to Danmarks Nationalbank in a Legal Perspective* by Niels C. Andersen and Kirsten Gürtler, Danmarks Nationalbank Monetary Review, 3rd quarter 2003, pp. 49–64. (Available on: <http://www.nationalbanken.dk/dnuk/specialdocuments.nsf>.)

Payments sent into the KRONOS system and placed in the queue, can be revoked by the participant itself till the moment settlement takes place. From that moment on, the payment is irrevocable and neither the participant itself, nor any third party can reverse the payment.

Finality occurs at the moment the account of the bank involved is debited. According to the functioning of the system, the account of the receiving bank will simultaneously be credited. Final payments cannot be challenged by a liquidator or a third party and no retroactive action is possible.

*i. Netting arrangements*

Bilateral and multilateral netting are recognized under Danish law (Section 50 and 57 STA). After the implementation of the European Finality Directive, a netting arrangement is protected even in case of a participant's insolvency. Although KRONOS is a RTGS system, the recognition of netting and the finality of payments in a netting scheme are important for the functioning of this system, since it settles the multilateral netting results of several ancillary systems like: (i) CLS, the international clearing and settlement system for foreign exchange transaction; (ii) VP, the Danish CSD, and Clearing and Settlement System for Securities; (iii) FUTOP, the clearing system for derivatives; and (iv) Sumclearing. After the clearing results of the different ancillary systems are settled in KRONOS, participants can use the amounts received in these systems immediately for other payment obligations in KRONOS or lend the money out in the interbank money market.

*j. Applicable law and conflict of law*

Via the participation agreements, all participants in KRONOS have accepted that the system is governed by Danish law and that the legal venue is Denmark. Foreign participants from outside the European Economic Area (EEA) must document their legal capacity, as well as their home country's legal recognition of the finality and irrevocability of payments transacted via KRONOS, the Danish netting arrangements, and the enforceability of collateral arrangements, even in the event that insolvency proceedings have opened against the participant under the insolvency law of its home country.

*k. Enforceability of collateral arrangements<sup>6</sup>*

Collateral arrangements in payment and securities settlement systems are fully enforceable under the STA. This applies to any type of collateral instrument, whether pledge or repo. Collateral that has been provided to Danmarks Nationalbank for present or future debts in the form of securities or a deposit may be realized immediately in case of a default, without advance approval by public authorities or the pledgor, if the parties concerned have in place a written agreement to this effect (Section 57b (2) STA). The written agreement on immediate liquidations of collateral overrules the usual eight days respite before liquidation granted under Section 538a (2) of the Administration of Justice Act.

Within KRONOS, five categories of collateral can be distinguished on which a specific legal regime is applicable: (i) deposits held by counterparties for monetary policy transactions on accounts with Danmarks Nationalbank, called certificates of deposits (CDs); (ii) "traditional" pledged Danish securities, declared eligible by Danmarks Nationalbank and held in a safekeeping account in VP; (iii) eligible Danish securities pledged under the automatic collateralization system; (iv) eligible foreign securities; and (v) cash pledged under the Scandinavian Cash Pool arrangement.

- CDs. CDs are sold regularly within the monetary policy framework to reduce the overall liquidity of the banking sector by bringing it back within the target set, are automatically used as collateral for monetary loans or overdrafts in the current account. In case of liquidation or an outright sale by the participant, there is an

automatic agreement between the participant and Danmarks Nationalbank that guarantees that the proceeds of a sell-off in the interbank market or redemption by Danmarks Nationalbank will be used automatically to redeem any overdraft in the current account of the participant in kroner. CDs can only be used to collateralize obligations to Danmarks Nationalbank and may not be used to collateralize obligations between banks or third parties. CDs can only be traded between banks that are counterparty in monetary policy transactions or between banks and the central bank.

- “Traditional” pledged Danish securities. Participants in KRONOS that have signed a deed of pledge with Danmarks Nationalbank can pledge securities that are classified as eligible by Danmarks Nationalbank, such as government bonds and mortgage bonds. They have to transfer the collateral to a safekeeping account in VP registered in their own name. This account is, in accordance with Section 66 of the STA, pledged to Danmarks Nationalbank. Under the aforementioned deeds of pledge for credit facilities, Danmarks Nationalbank is entitled to seek immediate fulfillment in the securities that have been deposited in the safekeeping account, without the obligation to give advance notice to the debtor. On the basis of these deeds of pledge, Danmarks Nationalbank is also entitled to take over ownership of the securities in the pledge account in case of a default. The interest payments and redemptions related to the pledged securities will be paid to a specific yield account in KRONOS that is automatically pledged to Danmarks Nationalbank and are fully available for the redemption of outstanding debts to it. Under Danmarks Nationalbank’s terms and conditions for provision of collateral, a margin, and in specific cases additional haircuts, are applicable to ensure that the value of all outstanding loans will not exceed the value of the pledged securities, should the market price of these securities drop. In case the drop in market value exceeds the margin, the pledgor is, unprompted, obliged to re-establish the margin by providing further collateral. Pursuant to Section 57b of the STA, such provision of collateral cannot be revoked pursuant to the Insolvency Act Section 70 (1) that requires that collateral should be provided when the debt is incurred, or to Section 72C of the same Act that opens the possibility for retroactive action with respect to certain dispositions that take place after the filing of a request for bankruptcy.
- Securities made available under the automatic collateralization system. Automatic collateralization enables Danmarks Nationalbank to make liquidity available to a borrower for the settlement of the clearing results in Danish kroner in: (i) the Sumclearing; (ii) VP; and (iii) CLS. The liquidity borrowed under this scheme cannot be used for other purposes, for instance, for normal payments in KRONOS or for monetary policy operations. A special procedure based on Section 55 STA is applicable to this scheme. This procedure differs from the traditional pledging of securities, since a borrower having signed the automatic collateralization agreement and having the agreement registered in VP in accordance with Section 55(4) STA, can use its portfolio of dematerialized securities in one or more designated VP securities accounts as collateral. Typically the borrower designates his normal trading account or accounts for these purposes. Within this scheme also (eligible) securities to be received in a VP settlement cycle can be used as collateral for the payment obligations related to this cycle (self-collateralization). Within the automatic collateralization framework it is not necessary to transfer the securities to a dedicated pledge safekeeping account and it is not necessary to specify which (eligible) securities in the account are pledged. The borrower is free to sell the securities in the account, or use them as collateral in a repo or otherwise with a third party, as long as there remains sufficient cover for his outstanding loans under this arrangement.

Within the framework of the agreement, the borrower has to open an “automatic collateralization account” at Danmarks Nationalbank on which the loans granted under this scheme are booked and from which the money raised by loans can be transferred by the participant to the three settlement accounts of the aforementioned netting schemes.

VP notifies Danmarks Nationalbank of the value of the collateral (mark to market and minus the relevant margin/haircuts) in the securities accounts the participants have designated for this purpose and the changes therein, for instance, due to received or delivered securities. The value of the securities in the account(s) forms the debit cap for the automatic collateralization account (the amount that can be borrowed under this scheme).

Since VP guarantees Danmarks Nationalbank that there will always be sufficient collateral in the designated account(s) to cover all the outstanding loans an individual participant has borrowed to fulfill its payments obligations under the three netting schemes, VP receives from Danmarks Nationalbank information on the amounts transferred by the participant to the settlement accounts for VP (for the settlement of periodic interest and redemption payments), and the settlement accounts for Sumclearing and CLS. On the other hand, VP is allowed to debit the automatic collateralization account for loans taken out under this arrangement for the funding of positions in the clearing of VP netting cycles as long as the total of all loans granted will not exceed the debit cap set for this account, and sends a notification thereof to Danmarks Nationalbank. Thus, the information in the automatic collateralization account is fully mirrored between the systems of Danmarks Nationalbank and of VP.

If the borrower does not repay a loan under the automatic collateralization system before 1:30 p.m. the same day, Danmarks Nationalbank is entitled to assert the right of collateral and in this connection, in compliance with Section 55(6) STA, will request VP to transfer a relevant portfolio of the pledged securities to a VP securities account in Danmarks Nationalbank’s name that corresponds to the value of the loans not paid back in time. Assertion of the right of collateral must take place before 3:00 p.m., otherwise the right of collateral will automatically lapse. After the transfer is accomplished, Danmarks Nationalbank is entitled to release the collateral after 3:00 p.m. without giving advance notice or observing the eight days respite normally granted under the Administration of Justice Act.

- Eligible foreign securities. Danmarks Nationalbank has entered into correspondent agreements with Sveriges Riksbank and Norges Bank, which stipulate that branches of Swedish or Norwegian banks can obtain intraday credit in Danish kroner from Danmarks Nationalbank on the basis of their respective government securities pledges to Danmarks Nationalbank. Sveriges Riksbank and Norges Bank act as correspondent bank/custodian and handle the practical issues related to the pledging of securities in accordance with Swedish and Norwegian law respectively. The agreements are reciprocal. Accordingly, branches of Danish banks in Norway and Sweden are able to pledge Danish government securities to borrow intraday funds from the central banks in those countries. In principle, Danish banks can also use securities declared eligible by the ESCB and issued in member states of the Economic Monetary Union (EMU) as collateral for intraday credit in euros in KRONOS, using the Correspondent Central Banking Model for delivering and safekeeping the collateral. In practice, however, this channel is not used.

- The Scandinavian Cash Pool (SCP). Against the background of the Scandinavian currencies joining CLS on September 2003, it was sought to simplify the functioning of credit granted to branches of banks located in one of the other Scandinavian countries, to speed up the procedure and to automate the process in order to ensure that banks will for instance always be able to meet the deadlines for pay-in obligations to CLS. For these reasons it has been decided that the three central banks will also grant intraday credit based on pledged account balances in the RTGS systems of the other two central banks involved. If, for instance, a branch of a Swedish bank in Denmark wants to make use of the facility to borrow intraday funds from Danmarks Nationalbank, the mother company of the borrowing bank transfers the amount of cash from its current account in K-RIX, the Swedish RTGS-system to a special SCP pledged account that is pledged to Danmarks Nationalbank. To execute the transfer in K-RIX, the mother company may have to raise an intraday loan based on securities pledged to the Riksbank. The Riksbank shall immediately notify Danmarks Nationalbank of the pledged amount and, after having converted the amount into kroner and deducted a suitable exchange rate haircut, the Danish central bank shall immediately make available the loan in KRONOS to the branch. The loan will be registered in a SCP loan account that the debtor has to open in KRONOS. Also a branch or a subsidiary can pledge liquidity for a loan to the mother company or any other member of the financial group.

The borrower that wants to use the SCP to raise an intraday credit in kroner has to sign a deed of pledge with Danmarks Nationalbank that is normally governed by the law of the country where the lender, namely Danmarks Nationalbank, is located, i.e., Danish Law, whereas under the Swedish or Norwegian conflict of law rules, the act of completion of the pledge is governed by the law in the debtor's country of domicile, i.e., Swedish or Norwegian law, which by and large corresponds to the Danish provisions. Credit under the SCP has to be repaid by 2:00 p.m. on the same day. If the loan is not repaid by 3:30 p.m. Danmarks Nationalbank has the right to enforce the pledged amount of Swedish kroner, for instance by selling it or by a currency swap.

*j. Challenge of the collateral arrangements under other jurisdictions*

The implementation of the finality directive in the individual EEA countries ensures that Danmarks Nationalbank's right to realize collateral pledged by a branch of a bank located outside Denmark, but within the EEA, cannot be challenged under the bankruptcy rules of the country where the headquarters of the bank is located.

#### **IV. The general contractual basis for KRONOS**

The contractual basis for KRONOS comprises:

- The general terms and conditions for the settlement of monetary policy instruments and settlement payments in Danish kroner, euro, Swedish kroner, and Icelandic kroner, and the bilateral participation agreement (request for connection).
- The terms and conditions for a current account and for the specific VP, Sumclearing, and CLS settlement accounts at Danmarks Nationalbank in the different currencies. However, no CLS settlement accounts can be opened in euros, Swedish kroner, and Icelandic kroner, and no retail payments can be settled in the two latter currencies.
- The terms and conditions for pledging of collateral and Danmarks Nationalbank deeds of pledge for credit facilities to be signed by the participants, and the collateral



	<p>rights agreements between participants and Danmarks Nationalbank with respect to the automatic collateralization facility and the SCP loan agreement. Within the latter context, a specific deed of pledge has to be signed by the participant opting for this facility. For the settlement of euros, specific credit facilities and collateral arrangements are in place.</p> <ul style="list-style-type: none"> <li>▪ The settlement agreements are between Danmarks Nationalbank, VP, and the Sumclearing respectively. Within this framework, Danmarks Nationalbank acts as guarantor to the two clearing systems that the amount equivalent to the balances in the respective settlement accounts is available for settlement—even if the participant has gone into administration—between the moment the reservations for VP (so-called credit lines) and Sumclearing are made under the scheme and the moment the clearing cycle is executed.</li> <li>▪ The outsourcing agreement with Bankernes EDB Central (BEC), an external data processing center, on the supply of IT services.</li> </ul> <p><b>V. ECB’s conditions for the participation of “non-euro area” national central banks in Target</b></p> <p>As part of the European RTGS system, TARGET KRONOS is subject to the provisions of the TARGET Agreement. This agreement sets out the detailed conditions for the participation of non-euro area national central banks in TARGET. In 2001, after a comprehensive verification of the Danish RTGS rules, the ECB found that the terms of the TARGET Agreement had been correctly incorporated into the Danish RTGS rules.</p>
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	<p>The operations of KRONOS are embedded into a solid legal framework of laws and contractual arrangements that is complete, reliable, and enforceable in all relevant circumstances. Funds received in the system can without any legal risk be used immediately by the beneficiary for the fulfilling of its own obligations and no retroactive actions are possible in case of a bankruptcy of a participant.</p>
<b><i>CP II – The system’s rules and procedures should enable participants to have a clear understanding of the system’s impact on each of the financial risks they incur through participation in it.</i></b>	
<i>Description</i>	<p><b>General description of the documentation</b></p> <p>The rules and procedures can be found in: Danmarks Nationalbank, “Documentation for Monetary-policy instruments and settlement of payments in DKK, EUR, SEK and ISK.” The document comprises:</p> <ul style="list-style-type: none"> <li>▪ The general terms and conditions laying out: <ul style="list-style-type: none"> <li>- an explanation on the terminology used;</li> <li>- regulation on representation of the participating institute and relevant signatures;</li> <li>- indirect participation;</li> <li>- execution of transaction;</li> <li>- emergency procedure;</li> <li>- obligations of participants to participate in tests;</li> <li>- liabilities of the central bank;</li> <li>- statements of accounts; and</li> <li>- governing law and some other issues, including details of the banking days when the system is open for business concerning Danish kroner and euros, and the general structure of fees and prices.</li> </ul> </li> </ul>

- Four specific sections for the settlement of each currency settled. Each section gives the terms and conditions for various account types that can be opened for the settlement of the relevant currency, the relevant credit and collateral arrangements applicable for a specific currency, and the documents to be signed within this context.
- A section on the fax formats to be used in emergency procedures.

This document is completed with:

- a more detailed list of prices in KRONOS;
- the list of eligible securities (including the principles for valuations and the applicable haircuts). The list is in Danish only;
- a short memo with general information on KRONOS;
- system specifications for KRONOS (November 2001);
- a document called Getting started with KRONOS (October 2001);
- KRONOS sign-on Manual (in Danish only); and
- authorization codes for the KRONOS terminal (in Danish only).

The aforementioned material provides a basic description of the tools available to the participant in relation to:

- technical requirements for connecting to KRONOS;
- monitoring of the participant's payments (status);
- liquidity-management facilities (queuing);
- use of standing orders;
- execution of payments;
- log-on and authorization codes; and
- managing accounts via powers of attorney.

*Additional material on the functioning of the system and the risks in the system*

In addition, Danmarks Nationalbank has published several articles on: (i) risks in payment systems in general and in some systems in particular; and (ii) the legal basis for clearing and settlement in payment and securities settlement systems and the provision of collateral within KRONOS from a legal perspective. Furthermore, Danmarks Nationalbank has written a clear and well organized book on Payment Systems in Denmark and made it available in hardcopies and published it on the web-site of Danmarks Nationalbank.<sup>7</sup> The aforementioned publications give insight into the role of Danmarks Nationalbank in payment systems, the functioning of different payment and securities settlement systems in general, the risks in payments and securities settlement and a thorough description of the infrastructure for payments in Denmark.

**Assessment of the documentation**

*a. Clearness, comprehensiveness, and up-to-date*

The rules and regulations are clear, comprehensive, and up-to-date. Changes in the terms and conditions are highlighted and explained in articles in the Monetary Review. The updated documents are published on the internet replacing the old ones.

<sup>7</sup> See *Payment Systems in Denmark*, Danmarks Nationalbank, Copenhagen, June 2005 which is available on the website of Danmarks Nationalbank: <http://www.nationalbanken.dk/dnuk/specialdocuments.nsf>.

*b. System design and risk management*

The basic system design and communication infrastructure is described in the KRONOS System specification, in which also a payment's route through the queue functions is outlined. It is made clear that no credit risks can arise in the system since the system always checks for adequate cover before the payment is executed. If no cover is available, the payment is stored in a queue.

Although the rules and regulations do not explain in detail the risks and risk management in the system, this is clearly explained in several articles that were published in various bulletins and reviews when the system was launched and are available on the website. Also the aforementioned book on the payment system in Denmark gives a clear and comprehensive description of risks and risk management in KRONOS and the way risks are reduced by the system design. The documents that were submitted to the participant when KRONOS was launched in November 2001 include a comprehensive description of how to deal with insufficient liquidity, including the requirements for pledging collateral for credit from Danmarks Nationalbank.

*c. Legal basis and roles of the parties*

Although the legal basis is sound, it is not explained in detail in the rules and regulations, but a description and explanation can be found in several articles published by Danmarks Nationalbank that are available on the website and are outlined in the book on payment systems in Denmark. The roles of the parties are clearly stated in the various rules and regulations.

*d. Availability of the rules and regulation*

The rules and regulations and other relevant material were submitted to participants in paper form and are publicly available on the website of Danmarks Nationalbank.

*e. Discretion for the system owner*

The rules and regulations entitle Danmarks Nationalbank, as owner of the system, to waive the rules as stated in the General Terms and Conditions due to monetary and foreign-exchange-policy considerations, without prior notice and without liability (Article 11 General Terms and Conditions). Also, in the terms and conditions for the various accounts, Danmarks Nationalbank has discretionary powers for instance with respect to:

- granting access to KRONOS to entities which in the assessment of Danmarks Nationalbank are of significance for the settlement of payments in Denmark;
- terminating the current account of a participant regardless of whether a breach of the rules and regulations has taken place;
- timing of the realization of collateral in case loans are not redeemed in time;
- rejecting certain assets that are not deemed to be suitable, although they fulfill the general requirements; and
- accepting other collateral than specified in the list of eligible assets, for instance in case a foreign participant has insufficient Danish securities in VP.

*f. Decision and notification procedures in abnormal situations*

Emergency procedures for participants are described under the fifth section in the general section of the documentation. These emergency procedures cover system downtime, interruption of communications between the system and the participants, and failure of the participants' IT systems. Fax forms have been prepared for completion in the event that emergency procedures must be used.

	<p><i>g. Training</i></p> <p>Before new participants are admitted, they must pass a number of tests to ensure that they meet the technical requirements and have the necessary operational capacity and insight. Internally at Danmarks Nationalbank, employees in the Accounting Department have been trained on the basis of a specific training plan for the individual user. The level of training is assessed to be satisfactory among KRONOS users.</p> <p>However, a few small participants may experience problems in providing the required number of employees with sufficient experience in the use of the system. Such problems primarily relate to nonobservance of deadlines in relation to cover of current-account overdrafts, and transfer of funds to settlement accounts for example.</p>
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	The available documentation and the publications of Danmarks Nationalbank enable participants to understand the system's impact on each of the financial risks they bear through their participation in KRONOS.
<p><b><i>CP III - The system should have clearly defined procedures for the management of credit risks and liquidity risks, which specify the respective responsibilities of the system operator and the participants and which provide appropriate incentives to manage and contain those risks.</i></b></p>	
<i>Description</i>	<p><b>General description</b></p> <p>KRONOS is designed as a RTGS for interbank large value payments and time-critical payments in Danish kroner and euro. The normal RTGS facilities, such as queuing mechanisms and intraday liquidity facilities, are in place. For the settlement of euros KRONOS is linked to TARGET, the large value system of the ESCB. Payments in Danish kroner can be sent in and settled from 7:00 a.m. to 3:30 p.m. Euros can be settled between 7:00 a.m. and 6:00 p.m. Payment orders can be submitted via the KRONOS terminal, a dedicated client server network or via SWIFT. Use of the SWIFT network is mandatory for the settlement of euro transactions. The system can also settle payments in Swedish kroner and Icelandic kroner in relation to securities transactions in these currencies but is hardly used for that purpose.</p> <p>During 2005, 664,000 transactions were executed with a total value of DKr 60,633 billion (US\$10,100 billion), whereas the value of the transactions settled in euros amounted to €3,774 billion (US\$4,685 billion).</p> <p>Payments in KRONOS are rather concentrated with a market share of the largest two participants of nearly 65 percent, whereas the largest 10 participants account for 92 percent of the turnover in the system.</p> <p><b>Links with and special facilities for the settlement of payments in ancillary systems</b></p> <p>KRONOS has links with several ancillary systems such as the Sumclearing, CLS, VP, and FUTOP.</p> <p><i>Settlement of Sumclearing transactions</i></p> <p>Sumclearing is Denmark's infrastructure for the clearing of retail payments that clears payments in kroner and euros on a multilateral basis and settles the results in KRONOS (there are four cycles for kroner and three for euros). The net payments related to the Sumclearing amounted to DKr 1,113 billion in 2005. The netting ratio in the Sumclearing was 22.1 percent in 2005, implicating that the multilateral netting resulted in a liquidity saving of 78 percent.</p>

*Settlement of CLS transactions*

CLS, the international clearing house for foreign exchange transactions located in New York, United States, has opened an account in KRONOS and has, since September 2003, been settling the positions of its participants in Danish kroner in the system. Participants' payment obligations are broken down into five pay-ins that have to be paid in the morning before specified deadlines. In 2005, DKr 1,596 billion was paid to and received from CLS in KRONOS. Participants in CLS have reached substantial liquidity savings via CLS. In April 2006, an average of 596 transactions in Danish kroner was settled per day in CLS with a gross value of DKr 154 billion. The average daily pay-ins to CLS in this period amounted to DKr 7,3 billion, equivalent to a liquidity saving of 95 percent.

*Settlement of securities transactions in VP*

VP, Denmark's CSD, settles securities transactions on a DVP basis via KRONOS, as well as on a multilateral netting basis (BIS model 3), and on a RTGS basis (BIS model 1). Per business day, there are six clearing cycles for transactions in kroner and one for the clearing of euro transactions. VP also settles interest, dividend payments, and redemptions in KRONOS (so-called periodic runs). In 2005, the total value of the net payments related to the VP settlement cycles added up to DKr 2,873 billion.

*Settlement of derivatives*

Finally, the Futures and Options Clearing House (FUTOP), owned by the OMX Group AB in Sweden, settles the results of the clearing of derivatives transactions in DKr through KRONOS (turnover in 2004: DKr 0.4 billion).

*Separate VP, CLS, and Sumclearing settlement accounts*

Participants have to open separate settlement accounts in KRONOS for the multilateral clearing of securities transactions, periodic payments related to securities, and the settlement of retail payments. A participant will also have to open a separate CLS settlement account if it wants to be able to borrow under the automatic collateralization scheme in relation to the CLS settlement. (For a participant without a CLS settlement account pay-ins and pay-outs are done directly between CLS Bank's current account and the participant's current account). They have to transfer funds from their current account to their settlement accounts at specified moments in the day. They can also obtain intraday loans under the automatic collateralization arrangement (see CP I) for the settlement of their payment obligations in these ancillary systems. For the settlement of Sumclearing, CLS, and of VP's periodic run (settlement of interest and redemptions), loans have to be reserved in advance and transferred from the participant's so-called automatic collateral account to their Sumclearing, CLS, and VP settlement account. The settlement accounts are emptied automatically after the last settlement obligation is fulfilled.<sup>8</sup>

*Special openings times for the settlement of VP and Sumclearing night cycles*

After closing at 3:30 p.m., KRONOS re-opens immediately at 4:00 p.m. for the settlement of the Sumclearing and the settlement cycles in VP with value date the next business day. Between 4:00 p.m. and 4:30 p.m., participants can transfer liquidity from their current account to their settlement accounts for the Sumclearing and/or VP clearing. Participants in Sumclearing can also make reservations under the automatic collateralization arrangement and transfer the funds to their Sumclearing settlement account. Participants are not allowed to

<sup>8</sup> The balances in the Sumclearing and CLS settlement accounts are first used to redeem the loans obtained under the automatic collateral agreement. The remaining balances are transferred to the current account of the participant involved.

use the system during the aforementioned period for other transactions. During the night, participants have no access to the system and the system is only open for the settlement of the clearing cycles in VP and the Sumclearing. Almost all obligations in kroner (98 percent or more) in these systems are settled during the night runs, when the system is not used for other payment obligations.

### **Management of credit risks**

#### *System design*

As an RTGS-system with queuing facilities, which settles in central bank money, KRONOS offers protection against credit risk and settlement bank risk. Payments settled in KRONOS are final (irrevocable and unconditional) and no retroactive action is possible in the event of a bankruptcy of a participant.

#### *DVP links and PVP*

Furthermore, credit or principal risk is reduced by the establishment of adequate delivery-versus-payment facilities for securities transactions and PVP facilities for foreign exchange transactions via CLS or for the conversion of kroner into euro.

#### *Other risk managements tools*

No specific risk management measures in the form of access criteria based on creditworthiness, credit limits, or loss-sharing arrangements are taken or deemed necessary in the RTGS framework. All banks, mortgage banks, investment firms, and foreign credit institutions conducting cross-border activities in Denmark can become participants in the system.

### **Management of liquidity risk**

#### *Queuing mechanism*

To reduce liquidity needs, enhance efficiency, and minimize the risk of gridlock in the system, payments that cannot be settled immediately due to the lack of funds in the account are placed in a centralized queue. Participants can monitor the payments in their queue online and can set priorities.

Payments in a queue are settled on a first in, first out (FIFO) basis. However, participants have the possibility to remove payments out of the queue or to change the order in which payments will be settled (by pass FIFO).

If a payment in the queue is not settled at the end of the day, it is automatically rejected by the system. Payment transactions relating to gross settlement of securities are not processed by the KRONOS system but are sent directly to the systems that debit and credit the purchaser's and seller's current accounts in Danmarks Nationalbank. Therefore, even if KRONOS is not functioning, these payments transactions can still in principle be settled.

#### *Gridlock resolution*

KRONOS has an optimization routine to speed up the settlement of queued payments (gridlock mechanism). It has never been necessary to apply the gridlock resolution.

#### *Throughput guidelines and other incentives*

No throughput guidelines or price incentives for early settlement are in place in KRONOS.

*Behavioral incentives*

A gentlemen's agreement among participants help to ensure the timely settlement of most payments. Normally more than 95 percent of the payments are settled before noon and the rest soon thereafter. In 2004, on three days more than 5 percent of the interbank transactions were settled in the final hour before the system close at 3:30 p.m. The early settlement gives participants ample time to lend and borrow funds in the interbank market.

*Sources of liquidity*

Participants have only limited amounts on their current accounts that can be used during the day for settlement purposes. In the framework of Danmarks Nationalbank monetary policy, the key objective is to keep the overall amount of funds in the current accounts of all banks together below a certain pre-specified level to avoid banks having too much funds that might be used to speculate against the exchange rate of the Danish krone that is pegged to the euro in a very narrow band. If the sum of the balances of all participants together exceeds this level, Danmarks Nationalbank will take funds out of the market via the selling of CDs. Monetary policy loans are granted when the market is short of liquidity.

However, liquidity in the infrastructure for payments and securities settlement is relatively abundant due to the access to unlimited collateralized intraday credit. Participants can use: (i) government bonds; (ii) bonds guaranteed by the government; and (iii) mortgage bonds and bonds issued by KommuneKredit and Danish Ship Finance as collateral. Eligible bonds are all listed on the CSE and dematerialized.

Under the "traditional collateral scheme," collateral has to be transferred to a special safekeeping account in VP that is pledged to Danmarks Nationalbank. The value of the collateral in this account is calculated as the official price of the securities on CSE on the preceding day, less securities specific valuation haircuts (the size of the haircut varies according to the category to which it belongs and the maturity.) Certificates of deposit, issued in the framework of monetary policy are automatically included in the calculation of the collateral value. The value of the collateral thus calculated forms the maximum overdraft debit position on the current account. Any credit obtained under the traditional collateral scheme has to be paid back at the end of the monetary policy day at 3:30 p.m. Participants are not allowed to have an overdraft in their current account at the closing of the system. Danmarks Nationalbank does not grant overnight credit for the roll over of an intraday overdraft and participants are forced to go into the money market to fund their liquidity needs. If intraday credit is not covered at the end of the monetary day, a fine is levied and action is taken to cover the position in the market on behalf of the participant.

Accountholders can also pledge collateral for intraday credit via the SCP, an arrangement between the central banks of Denmark, Norway, and Sweden. Liquidity raised in one of the payment systems of the central banks concerned can be used as collateral under this scheme. In that case, the central bank in question will block the liquidity in a special account and notify the other central bank of the amount pledged. A haircut of 5 percent is applicable to cover the exchange risk. Within KRONOS, the SCP loan is debited on an SCP loan account. This facility is especially used by branches or subsidiaries of banks active in the three Scandinavian countries. Credit under the SCP must be repaid at 2:00 p.m. Danish banks especially use the SCP to pledge balances in kroner for loans granted to their Norwegian and Swedish subsidiaries by the central banks in these countries. In 2005, Norwegian and Swedish banks did not use the SCP.

Furthermore, a special facility, the automatic collateralization system, is in place to obtain intraday credit for the settlement of the CLS in-payments and the payment obligations in the various Sumclearing and VP settlement blocks (See CP I above for a more detailed description). The list of eligible securities is applicable under this scheme.

	<p><i>Intraday facilities in euro</i>  Since Denmark Nationalbank is not a member of the EMU, it cannot create euros. It has a special arrangement by which it deposits on a daily basis €585 million with a euro area central bank. This amount is available for intraday credit extended to participants. The amount is broken down according to individual limits for account holders in euros at Danmarks Nationalbank. Participants have to collateralize their intraday credit for which they can use the eligible collateral in Danish kroner or eligible securities on the collateral list of the ESCB. All intraday credit has to be paid back before the closing time of TARGET. No overnights loans in euros can be obtained from the Danish central bank.</p> <p><b>General tools in KRONOS</b></p> <p><i>Information systems</i>  The participants have access to real-time information on payments in the queue, settled incoming and outgoing payments, their current and settlement accounts balances, as well as available central bank credit.</p> <p><i>Timely monitoring by the system provider</i>  The functioning of the system is monitored continuously by staff in the Accounting Department of Danmarks Nationalbank and appropriate actions are taken when necessary.</p> <p><i>Crisis management</i>  Within the framework of the Coordination Committee on Financial Stability, which coordinates the handling of financial crises, a MOU is agreed between Danmarks Nationalbank, the Ministry of Finance, the Ministry of Economic and Business Affairs, and DFSA. Against this background, Danmarks Nationalbank has established an internal crisis management procedure. The purpose is to utilize the opportunities to spot signs of crisis at an early stage, using all available knowledge on financial markets, the functioning of payment and clearing and settlement infrastructure, and analysis of the macro economy and financial stability. The structure of Denmark’s crisis management is based on the “morning meeting group” that meets every business day from 9:45 to 10:00 a.m. The morning meeting is attended by the entire Board of Governors.</p> <p>If deemed necessary, Danmarks Nationalbank can act as a lender-of-last-resort and may grant credit on special terms and conditions. Clear procedures are in place in KRONOS, in case a bank is placed under public administration.</p>
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	<p>The design of the KRONOS system and the liquidity facilities provided by Danmarks Nationalbank enable participants to manage and contain their credit and liquidity risk appropriately. The system is very fluent and the time between acceptance and final payment is normally very short. However, due to: (i) the way the settlement of ancillary systems is structured; (ii) the design of liquidity management in which funds have to be reserved for specific purposes and some of the liquidity is available for special purposes only; and (iii) the organization of the communication infrastructure, the system is highly sophisticated but also complex. This could make it vulnerable to operational problems and may hamper the optimal use of the available liquidity.</p>



<b><i>CP IV - The system should provide prompt final settlement on the day of value, preferably during the day and at a minimum at the end of the day.</i></b>	
<i>Description</i>	<p><i>Irrevocability</i> The sending bank can cancel a transaction that is submitted and placed in the queue until the time of final settlement. The beneficiary or receiving bank is not permitted to stop payments.</p> <p><i>Clearly defined and legally effective moment of final settlement</i> When sufficient funds are available or can be borrowed from Danmarks Nationalbank, transactions are settled throughout the day on a gross basis. After the settlement has taken place the transfer is final, irrevocable, and unconditional, and cannot be reversed by the sender or a third party. The finality of payments in KRONOS is effectively protected under the STA and no retroactive action is possible in case the sending bank might be declared bankrupt or placed under public administration later in the day or at any time thereafter.</p> <p><i>Interval between acceptance and final settlement</i> Due to its RTGS design, the functioning of the gridlock mechanism and the relatively abundant liquidity in the system, most payments are processed immediately after being accepted by the system.</p> <p><i>Rejection of payments</i> Danmarks Nationalbank can reject a payment if it has not been registered correctly due to syntax errors or technical problems. Transactions that lack cover will be queued and, if not settled, will be cancelled (returned) at the end-of-day. No payments have ever been rejected after settlement has been completed. If a bank is placed under public administration, the account will be frozen, and it will not be possible for this bank to settle outgoing payments or receive payments from other banks in the system.</p> <p><i>Enforcement of settlement processes and opening times</i> Opening times and cut-off times are clearly stated, made public, and strictly followed. The closing of the system can only be postponed due to operational problems. During the lifetime of KRONOS it was never necessary to extend them.</p>
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	KRONOS provides prompt final settlement during the day. Opening times and deadlines for sending transactions are clearly stated and monitored. Effective incentives are in place to ensure that hours of operation and the settlement process timetable are strictly respected under normal circumstances.
<b><i>CP V - A system in which multilateral netting takes place should, at a minimum, be capable of ensuring the timely completion of daily settlements in the event of an inability to settle by the participant with the largest single settlement obligation.</i></b>	
<i>Description</i>	KRONOS is a RTGS system that settles on a continuous basis during the day with intraday finality. Receiving banks can immediately use the incoming funds for the fulfillment of their own obligations.
<i>Assessment</i>	<b>Not applicable</b>
<i>Comments</i>	
<b><i>CP VI – Assets used for settlement should preferably be a claim on the central bank; where other assets are used, they should carry little or no credit risk and little or no liquidity risk.</i></b>	
<i>Description</i>	The system settles funds transfers between accounts that participants have opened with Danmarks Nationalbank. The funds received are a claim on Danmarks Nationalbank itself (payments in kroner) or on the ESCB with respect to euros.

	With 126 participants at the end of 2005, the participation in KRONOS is relatively high. However, some smaller financial institutions have voluntarily chosen either not to open an account in KRONOS or to close their account and use the settlement services of a direct participant.
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	The settlement takes place in central bank money and no settlement bank or deposit risk occurs in KRONOS.
<b><i>CP VII – The system should ensure a high degree of security and operational reliability and should have contingency arrangements for timely completion of daily processing.</i></b>	
<i>Description</i>	<p><i>Security policy and objectives</i></p> <p>Danmarks Nationalbank has established an adequate security policy for IT. The objective of the IT security policy is to prevent interruption to the bank's activities. The aim is also to reduce the risk that confidence in the Nationalbank's credibility is undermined and to reduce the risk of financial loss to known and accepted values. The requirements of the ESCB shall be incorporated into the Nationalbank's IT security management. The IT securities management is based on the standard BS7799. On the basis of the securities policy, specific IT securities guidelines have been developed in relation to:</p> <ul style="list-style-type: none"> <li>- organization of IT security;</li> <li>- outsourcing;</li> <li>- IT security for individual employees;</li> <li>- classification of systems;</li> <li>- user access, access controls, etc.;</li> <li>- testing, change management;</li> <li>- operations and data exchange;</li> <li>- business continuity;</li> <li>- physical security; and</li> <li>- external requirements, legislation.</li> </ul> <p>Individual departments responsible for the IT system have to implement the guidelines.</p> <p><i>Risk analysis and monitoring</i></p> <p>In 2003, a comprehensive risk assessment was performed on the basis of a methodology developed by the European Central Bank (ECB). All risks in the system and its organization were identified, the probabilities that loss events would occur were estimated, as well as the possible impact of such events. The adequacy of measures taken were described and assessed. The security analysis identified five threats for which the residual level of risk was unacceptable. Measures were proposed and implemented.</p> <p><i>Documentation on the systems</i></p> <p>KRONOS and the related systems are comprehensively documented by the BEC. The information is updated on a regular basis in connection with system changes.</p> <p><i>Back up facilities</i></p> <p>Adequate back-up systems in a hot stand-by mode are available to ensure business continuity. The two BEC sites are linked via optical fiber cables enabling real-time data mirroring. The second site is located several kilometers away. The commitment between BEC and Danmarks Nationalbank is to restart operations on the second site within four hours. Various tests of the restart procedures, however, demonstrated that operations could be continued within one and a half hours.</p>

*Contingency and emergency procedures*

Emergency procedures and contingency plans have been developed and are regularly tested with the relevant parties (biannually with current account holders and quarterly with CLS participants). Emergency procedures also comprise switching between the two BEC centers, and situations where central bank staff must be sent outside the Bank in order to operate KRONOS. These procedures at Danmarks Nationalbank include rules on crisis management/dissemination of information, including contacts within the various organizations should the problems continue (escalation procedures). In addition, BEC, VP, PBS (the operator of Sumclearing), and Danmarks Nationalbank have held meetings to ensure that they are familiar with each other's emergency procedures. Experience from two incidents within the past year has shown that in practice the emergency procedures do not always function optimally, particularly in relation to communication between the parties concerning problems arising from settlement in Sumclearing or VP settlement.

In the contingency plans, "traditional" threats such as various types of crime, IT system failure, fire, and flooding are deemed to be the most urgent and are dealt with. Threats such as large epidemics and terrorist attacks are not covered by the plans to the same extent. The contingency plans thus do not take account of situations leading to large scale absenteeism due to strikes, pandemics, or other reasons. Nor are massive wide-area disasters covered by contingency plans. Both of these are deemed very extreme cases by Danmarks Nationalbank and so unlikely that the risk must be deemed to be very limited (acceptable).

*Protection of data communication*

Adequate measures are taken to ensure confidentiality, protection against the failure of rejection, and authentication of data communication. Firewalls are in place to protect the systems from intrusion attempts by outsiders. The protection measures are tested regularly by an independent party. Encryption in order to ensure confidentiality is optional in the proprietary network.

*Audit trails*

All transactions in KRONOS can be traced back from the recipient to the sender (end-to-end). The traceability and the correct registration in the general ledger are reviewed by the Audit Department of Danmarks Nationalbank.

*Development and procurement*

Adequate measures are in place to ensure the quality of the development of new software and testing of new updates and releases. Dedicated IT environments are used for development and for testing that are strictly separated from the operational environment. Well established procedures are in place for change management.

*Availability and scalability*

Both Danmarks Nationalbank and BEC have sufficient and well-qualified staff at their disposal.

Danmarks Nationalbank's agreement with BEC includes minimum availability requirements formulated as the tolerance limits for the number of system failures. Although these requirements are observed, the number of incidents in KRONOS is relatively high compared with other ESCB countries. The availability of the systems in 2003, 2004, and 2005 was, respectively, 99.68 percent, 99.85 percent, and 99.84 percent .

The system has sufficient capacity to handle high volumes during peak times.

	<p><i>Audits</i> The system is audited by the internal audit department of Danmarks Nationalbank, the system auditor of BEC, and by the external auditor of Danmarks Nationalbank. All elements of the KRONOS system, including the security policy, are subject to audits.</p>
<p><i>Assessment</i> <i>Comments</i></p>	<p><b>Broadly observed</b> Danmarks Nationalbank has established an effective security policy and has defined clear objectives to ensure a high degree of operational reliability. Risks are assessed proactively and adequate contingency arrangements are in place.</p> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>- coordinate the contingency plans of Danmarks Nationalbank, BEC, VP, and PBS and develop the infrastructure for testing of the emergency procedures (a working group has been established to organize this);</li> <li>- re-negotiate with BEC the maximum restart time and agree to comply with the international best practice of two hours;</li> <li>- develop further and adapt the securities analysis methodology developed by the ECB according to new insights with respect to IT security;</li> <li>- although not currently an issue, continuously ensure that communication via the proprietary network observes international standards with respect to integrity;</li> <li>- continue stress testing all parts of the system adequately and ensure sufficient peak capacity; and</li> <li>- analyze how operational reliability can be enhanced so that the number of incidences can be reduced. This should be seen in context of the highly sophisticated but also complex design of KRONOS (see CP III) and the fact that the KRONOS system and systems of BEC are run on the same platform. There might be cost-effective measures to enhance operational reliability and to reduce the amount of incidents.</li> </ul>
<p><b><i>CP VIII - The system should provide a means of making payments, which is practical for its users and efficient for the economy.</i></b></p>	
<p><i>Description</i></p>	<p><i>Crucial functions of the system</i> KRONOS is the channel through which monetary policy operations are implemented, enabling Danmarks Nationalbank to fulfill its main tasks. It also provides the settlement channel for ancillary systems that clear on a multilateral basis, thus enabling the payments in these systems to acquire finality. KRONOS is also widely used for commercial and interbank payments, on a cross-border as well as on a domestic level.</p> <p><i>Available functionalities in the system</i> All the usual facilities in an RTGS-system for sending, queuing, and inquiry are in place.</p> <p><i>Liquidity management and availability of intraday credit</i> Due to the flexible and comprehensive collateralization facilities, the system is very fluent. These facilities enable participants to reserve sufficient liquidity for the settlement of their obligation in the net settlement of securities and retail payments and have a liquidity buffer available for emergency situations, such as the default of a large participant.</p>

	<p><i>Opening times and practicality of the settlement cycle</i> The system has relatively long opening times and accommodates the needs of ancillary systems to settle in the early evening and during the night. This enables participants to settle cross border trades timely and without loss of value dates with participants in Euroclear and Clearstream. Danmarks Nationalbank regularly monitors whether the system is found to be efficient and cost-effective for participants.</p> <p><i>Cost recovery and pricing</i> The fees in KRONOS do not cover the salaries of the staff at Danmarks Nationalbank involved in the ongoing development and operation of KRONOS. In a non-published analysis carried out in 2002 using the TARGET methodology, the cost recovery of KRONOS was 54 percent, but excluding local and global shared costs (primarily staff costs and depreciation of buildings), the cost recovery was around 70 percent. The costs of change requests should be borne by the participants. A discount has been introduced for larger users to make the system more attractive and avoid bilateral settlement via loro and nostro accounts the larger banks keep with each other.</p>
<p><i>Assessment</i> <i>Comments</i></p>	<p><b>Broadly observed</b> KRONOS provides a reliable service to its participants that appear to fit the needs of its users and fulfils the public interests by reducing systemic risks and offering an efficient channel for the execution of monetary policy. It does not, however, achieve full cost recovery.</p> <p><b>Recommendation:</b> Although a payment system entails a service to the public, it could be beneficial to again analyze the exact costs of KRONOS. Comparisons with fees charged by systems in comparable countries would also be useful. This would provide a basis for in-depth discussions on what part of the costs should be borne by Danmarks Nationalbank and ideally make the pricing policy of Danmarks Nationalbank more transparent and it would give more insight into the cost-effectiveness of the payment system's operations.</p>
<p><b><i>CP IX - The system should have objective and publicly disclosed criteria for participation, which permit fair and open access.</i></b></p>	
<p><i>Description</i></p>	<p><i>Access criteria</i> Danmarks Nationalbank has a very open access policy and the system is open for all banks and investment firms in Denmark without any restriction on size, function, or capital. Branches of foreign financial institution that are allowed to be active in Denmark have the right to become a participant. Foreign banks located in another EU country, or in a country which with the EU has concluded an agreement on home supervision, can also become remote members. However, the technical infrastructure and especially the use of the KRONOS terminal might form a barrier to remote access, since the terminal has to be connected to the system via a data processing center in Denmark, which incurs a language problem (manuals, screen images, and authorization codes in Danish only). Also the notification of changes in the rules and in prices is communicated via a letter in Danish, while information on eligible collateral and the calculation of the value of collateral is also published only in Danish.</p> <p>The access criteria are listed in the "Terms and Conditions for Current Accounts," which are published on the web-site of Danmarks Nationalbank.</p> <p><i>Discretionary powers of Danmarks Nationalbank</i> The rules and procedures give Danmarks Nationalbank the power to also grant access to other entities which it deems to be of significance to the settlement of large-value payments. Furthermore, Danmarks Nationalbank is entitled to close the current account of a participant regardless of whether the participant has breached the rules.</p>

	<p><i>Exit procedures</i></p> <p>Although banks are totally free not to open an account or to close an account, and procedures are in place to close in an orderly manner the account of a bank that has gone into administration, there are no explicit exit regulations in the rules and regulations other than that the central bank can close the account.</p>
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	<p>The access rules for KRONOS are in general clear, publicly disclosed, fair and objective, and do not have a restrictive impact on competition. However, the discretionary powers could within this framework be questioned, although they have not been applied in practice.</p> <p><b>Recommendation:</b></p> <ul style="list-style-type: none"> <li>- reconsider the discretionary powers with respect to access and exit;</li> <li>- analyze the effects of the language barrier for remote members and whether they are in line with the very open access policy and the promotion of Denmark's financial markets; and</li> <li>- formulate explicit exit procedures in the rules and regulations.</li> </ul>
<b><i>CP X – The system's governance arrangements should be effective, accountable and transparent.</i></b>	
<i>Description</i>	<p><i>Ownership structure and accountability of the management</i></p> <p>KRONOS is owned by Danmarks Nationalbank. Danmarks Nationalbank has entered into an agreement with BEC on the outsourcing of IT operations and the management of KRONOS. The outsourcing is regulated via service level agreements (SLA). Notwithstanding the outsourcing, Danmarks Nationalbank is fully responsible for the functioning of the system and its governance.</p> <p>Information on the Board of Danmarks Nationalbank, the way they are appointed, the management structure, and the decision making processes that are used to make policy and other decisions on the system are publicly available. The Board of Danmarks Nationalbank is fully accountable for the performance of the system and provides a write-up in the annual report. The system is thoroughly audited.</p> <p><i>Objectives</i></p> <p>The main objectives are to reduce systemic risk, promote efficiency in the payments infrastructure for domestic and cross-border payments, and create an effective channel for monetary policy operations. These objectives reflect the needs of the users as well as owners and take public interest into account.</p> <p><i>Availability of information on the system</i></p> <p>Relevant information on the system and its operations is readily available, complete, and up to date. Through various publications, Danmarks Nationalbank has provided information about its role in connection with the development and operation of KRONOS. As regards the terms and conditions for appointment to Danmarks Nationalbank's governing bodies, this information is also publicly available.</p> <p><i>Consultation with all relevant users on major decisions</i></p> <p>"Danmarks Nationalbank's IT project model prescribes that key stakeholders must be involved in the development of the system. This is anchored in KRONOS via reference groups, whose participants are briefed on Danmarks Nationalbank's work on the system. Furthermore, participants can forward their requirements regarding the further development of the system."</p>

	<i>Fulfillment of the CP</i> The system fulfills seven out of ten CP in full. Two others are broadly observed and one is not applicable.
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	KRONOS governance arrangements are effective, accountable, and transparent. Adequate consulting procedures with the banking industry are in place for major decision making..

**Table 2. Summary Observance of KRONOS with the CPSS Core Principles**

<i>Assessment Grade</i>	<i>Principles Grouped by Assessment Grade</i>	
	<i>Count</i>	<i>List</i>
Observed	7	I, II, III, IV, VI, IX and X;
Broadly observed	2	VII, VIII,
Partly observed		None
Nonobserved		None
Not applicable	1	CP V

**Table 3. Recommended Actions to Improve Observance of KRONOS with the CPSS Core Principles**

<i>Reference Principle</i>	<i>Recommended Action</i>
<b>Legal foundation (CP I)</b>	None
<b>Understanding and management of risks (CP II - III)</b>	None
<b>Settlement (CP IV-VI)</b>	None
<b>Security and operational reliability, and contingency arrangements (CP VII)</b>	<ul style="list-style-type: none"> <li>- coordinate the contingency plans of Danmarks Nationalbank, BEC, VP, and PBS and develop an infrastructure for broad testing of emergency procedures;</li> <li>- renegotiate with BEC the maximum restart time and agree to comply with the international best practice of two hours;</li> <li>- develop the securities analysis methodology developed by the ECB further and adapt it according to new insights with respect to IT security;</li> <li>- ensure that communication via the proprietary network observes international standards with respect to integrity;</li> </ul>

<i>Reference Principle</i>	<i>Recommended Action</i>
	<ul style="list-style-type: none"> <li>- stress test all parts of the system adequately and ensure sufficient peak capacity; and</li> <li>- analyze the complexity of the system design and its interaction with other systems of Danmarks Nationalbank or of BEC and study how this complexity could be reduced.</li> </ul>
<b>Efficiency and practicality of the system (CP VIII)</b>	<ul style="list-style-type: none"> <li>- analyze in depth the costs of the system;</li> <li>- define the part of the cost to be borne by Danmarks Nationalbank; and</li> <li>- develop a price strategy that takes into account the fees charged in comparable countries.</li> </ul>
<b>Criteria for participation (CP IX)</b>	<ul style="list-style-type: none"> <li>- reconsider the discretionary powers with respect to access and exit;</li> <li>- analyze the effects of the language barrier for remote members and whether they are in line with the very open access policy and the promotion of Denmark's financial markets; and</li> <li>- formulate explicit exit procedures in the rules and regulations</li> </ul>
<b>Governance of the payment system (CP X)</b>	None



**Table 4. Detailed Assessment of Observance of Sumclearing of the CPSS Core Principles for Systemically Important Payment Systems**

<i>CP I - The system should have a well-founded legal basis under all relevant jurisdictions.</i>	
<i>Description</i>	<p><b>General Description</b><sup>9</sup></p> <p>The legal basis for the Sumclearing and the retail payment instruments that are cleared and settled in this system can be divided into four categories:</p> <ol style="list-style-type: none"> <li>I. General Danish law of contracts and property;</li> <li>II. Specific Danish rules of law directed at payment systems and collateral arrangements;</li> <li>III. Regulations with respect to payment instruments such as the laws on checks and bills of exchange and the act on certain means of payments; and</li> <li>IV. The contractual basis for Sumclearing, including its rules and regulations.</li> </ol> <p><i>a. Completeness and reliability of legal framework</i></p> <p>The legal basis for the Sumclearing comprises a consistent, complete, and reliable set of laws, rules and regulations, and agreements.</p> <p><i>b. Publicly available</i></p> <p>With the exception of: (i) the rules and regulations (Håndbog); (ii) the settlement agreement between the DBA and Danmarks Nationalbank; and (iii) the outsourcing agreement between the DBA as system provider and PBS as operator of the system, all relevant laws, regulations, and agreements are publicly available.</p> <p><i>c. Upholding of the legal basis in court</i></p> <p>There are no court cases related to legal certainty in the area of payments, clearing, and settlement systems.</p> <p><b>I. General Danish law on contracts and property</b></p> <p><i>d. Enforceability of laws and contracts</i></p> <p>Danish law on contracts and property recognizes and, to a very large extent, protects agreements and other legal acts between parties (freedom of contract, simple contracts, and freedom of evidence).</p> <p>All relevant laws as well as contractual arrangements within the framework of Sumclearing between the different parties involved are fully enforceable.</p> <p><i>e. Zero hour rules or any similar rule</i></p> <p>Danish law does not contain a zero hour or any similar rule stipulating that bankruptcy or insolvency proceedings can be applied retroactively.</p>

<sup>9</sup> For an extensive overview of the legal basis for Danish payment systems, see *Clearing and Settlement in Legal Perspective* by Niels. C. Andersen, Danmarks Nationalbank Working Papers 2004–20, July 2004. (Available on: <http://www.nationalbanken.dk/dnuk/specialdocuments.nsf> .)

*f. Legal support of electronic processing*

Payments via electronic transfers are recognized as valid legal acts, and book-entry of electronic payments and claims as deposits to accounts (e.g., cash and securities) is accepted as evidence by Danish courts.

**II. Specific Danish rules of law directed at payment systems and collateral arrangements**

The specific regulations of registered payment systems in Denmark, including the Sumclearing is found in part 18, Section 57 and 57 a-e. of the STA (STA; 17 March 2005).

*g. Protection of finality in a payment system in Denmark*

The EU Settlement Finality Directive (Directive 98/26 EC) is implemented in Danish law in Section 57 et seq of the STA. The primary objective of the Directive is to protect the finality of the settlement in payment and securities settlement systems, including settlement by netting and to protect possible collateral arrangements within the framework of a settlement system in order to secure intraday credit or to ensure timely settlement in case of a bankruptcy event. The DFSA has notified the EC that Sumclearing is a designated system under this Directive.

*h. Irrevocability and finality*

According to Section 57c of the STA, the regulations and participation agreements for a registered payment system should set out when a payment is to be considered entered in the system and the point(s) in time after which a registered transfer order can no longer be revoked by a participant or a third party. In Sumclearing, transfer orders cannot be revoked after the deadlines for deliveries for the different settlement cycles.

Finality in the Sumclearing occurs at the moment the Sumclearing settlement accounts that participants have opened in KRONOS—the RTGS large-value payment system of Danmarks Nationalbank—are credited or debited according to their position in the multilateral netting. The positions of the participants in the netting are sent to Danmarks Nationalbank by PBS, the system-operator of Sumclearing, and immediately processed. Final payments cannot be challenged inside the system and no retroactive action is possible.

*i. Legal recognition of netting arrangements*

The netting arrangement for clearing and settlement in the Sumclearing are recognized under Danish law (Section 50 and 57 STA). Payment orders that have been sent into the system and validated before the opening of an insolvency procedure against a participant but have not yet been cleared and settled, can be effected or reversed in full. Whether the aforementioned payments will be effected or unwind will depend on the objective conditions that the netting agreements shall contain according to Section 57 (5), which stipulates when netting in such an event is to be carried out and when claims are to be reversed in full. The aforementioned wording of the law leaves open whether a system will opt to ensure settlement under all circumstances or to choose for a partial or total unwinding of the outgoing and incoming payment orders of the bankrupt participant. However, in case of an unwind the process should be executed according to objective conditions to be approved by the overseer.

In case of insufficient liquidity, the rules and regulations of the Sumclearing state that all transactions in which the failed participant is involved as sender or receiver will be removed from the clearing. The system will try to settle them in one of the following settlement cycles during the same day (postponement).

If a participant is declared bankrupt before the deadlines for delivery of sum data, the incoming and outgoing payments of this participant are not included in the Sumclearing. If the participant is declared bankrupt afterwards and has still sufficient liquidity in his Sumclearing settlement account, the payments are settled with finality. In case of insufficient liquidity, the payments in which the bankrupt participant is involved will be removed from the clearing. However, the administrator of the bankruptcy estate has the right, according to Section 3.2.1. of the rules and regulations of the Sumclearing, to enter into an agreement with the DBA as the owner of the system, for an extraordinary payment settlement cycle, in which the estate participates and provides sufficient liquidity.

*j. Enforceability of collateral arrangements for intraday and overnight credit*  
Collateral arrangements in payment and securities settlement systems are fully enforceable under the STA. This applies to any type of collateral instrument, whether pledge or repo agreements (for details, see the assessment of KRONOS).

*k. Applicable law and conflict of law rule*

Via the participation agreements, all participants in Sumclearing have accepted that the system is governed by Danish law and that the legal venue is Denmark. Foreign participants must document their legal capacity, as well as their home country's legal recognition of the finality and irrevocability of payments transacted via Sumclearing, even in the event of insolvency proceedings against the participant under the insolvency law of the home country.

### **III. Regulations with respect to payment instruments**

There are separate acts for classical payment instruments such as checks and bills of exchange. New payment instruments like payment cards and electronic money are regulated in the act on certain payment means. In order to increase consumer protection, the act on certain payment means includes provisions to ensure that users are provided with the necessary information material, and provisions relating to divisions of responsibility and liability in order to provide protection against extensive losses as a result of, e.g., misuse and fraud. This act also includes rules on the payment service providers' possibilities of covering their operating costs (setting maximum fees that banks can charge to retailers and cardholders). Furthermore, for card payments an extensive set of agreements exists between the issuing bank and the acquiring bank, between the issuing bank and the cardholder, and between the acquiring bank and the recipient/retailer.

### **IV. The contractual basis of Sumclearing**

The contractual basis for participation in and operating of the Sumclearing comprises:

(i) The participation agreement for the two clearing subsystems underlying the Sumclearing, namely: (i) the electronic clearing and truncation system in which checks, credit transfers, and ATM cash withdrawals by clients of other banks are processed; and (ii) the PBS clearing, in which direct debits and EFTPOS transactions with a Dankort and other (national and international) debit or credit cards are processed.

(ii) The participation agreement in the Sumclearing, which is a bilateral agreement between the system owner (the DBA) and the participant. The participation agreement includes provisions concerning access requirements, responsibilities, a netting agreement, participation fees, legal venue, and governing law. One of the requirements for access is the fact that participants must participate in the electronic clearing and truncation system, in PBS clearing, or in both. For certain issues the participation agreement refers to the

	<p><i>Håndbog for Betalingsformidling</i>, which, among other things, includes the rules, regulations, and procedures. The <i>Håndbog</i> is available in Danish only.</p> <p>(iii) The settlement agreement between the DBA, the owner of Sumclearing, and Danmarks Nationalbank. It also includes the terms and conditions for opening an account with Danmarks Nationalbank, in which the positions in the Sumclearing are settled.</p> <p>(iv) The agreements between banks in relation to the clearing and settlement of retail payments.</p> <p>(v) An administration agreement between the DBA, the system owner, and PBS, the operator of the system, for the delivery of IT and other services (outsourcing).</p>
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	Although not all documents were available in English, the operations of Sumclearing are deemed by the assessor to be embedded into a solid legal framework of laws and contractual arrangements that is complete, reliable, and enforceable in all relevant circumstances. Funds settled in the system can without any legal risk be used immediately by the beneficiary for the fulfilling of his own obligations and no retroactive action is possible in case of the bankruptcy of a participant.
<b><i>CP II – The system’s rules and procedures should enable participants to have a clear understanding of the system’s impact on each of the financial risks they incur through participation in it.</i></b>	
<i>Description</i>	<p>The rules and procedures for the Sumclearing are given in the DBA’s <i>Aftalebog</i> (Book of Agreements) and <i>Håndbog for Betalingsformidling</i> (Payment System Manual). The <i>Aftalebog</i> is the common contractual basis and comprises the participation agreement between the participant and the DBA, the owner of the system, as well as the most important agreements between the banks in relation to the clearing and settlement of retail payments. The <i>Håndbog for Betalingsformidling</i> provides:</p> <ul style="list-style-type: none"> <li>- a simple and comprehensive description of the basic structure of Sumclearing and a payment’s route through the system;</li> <li>- a description of the legal basis;</li> <li>- detailed descriptions of procedures;</li> <li>- formats for data exchange in the Sumclearing and the two underlying sub-clearings; and</li> <li>- the settlement procedures in the Sumclearing.</li> </ul> <p><i>a) Clearness, comprehensiveness and up to date</i> The rules and regulations are clear, comprehensive, and up to date.</p> <p><i>b) System design and risk management</i> The <i>Håndbog</i> describes the system’s basic design, including the way retail payments are cleared in the two underlying sub-clearings and the timetables for delivery (cut-off times) of the so called “sum totals” (debit and credit balances per participant) by the two sub-clearings in Sumclearing. In the Sumclearing, the sum of the positive positions (transfers to receive) and negative positions (transfers sent) per participant in all sub-systems is calculated and settled via the Sumclearing settlement accounts at Danmarks Nationalbank. However, the system’s rules do not explicitly explain the risks in the system and risk management procedures.</p> <p><i>c) Legal basis and roles of the parties</i> The rules describe the legal basis of the Sumclearing. In combination with the participation and settlement agreements, the <i>Håndbog</i> provides also a clear description of the responsibilities and obligations of the participants and other parties.</p>

	<p><i>d) Availability of the rules and regulation</i> The Aftalebog and Håndbog for Betalingsformidling exist in hard copies only (loose-leaf system). The two books are only available in Danish. The system owner is responsible for updating the books and sends out new pages to participants. The Håndbog is not publicly available, whereas anyone can order a copy of the Aftalebog from the Danish Competition Council. In order to ease access for participants and facilitate the updating procedures, the DBA plans to issue electronic versions of the two books and publish them on its website (restricted area).</p> <p><i>e) Discretion for the system owner</i> Under the participation agreement, the DBA is entitled to amend the system rules and procedures unilaterally and without notification. In addition, the participation agreement entitles the DBA to agree on amendments to the settlement agreement with Danmarks Nationalbank.</p> <p><i>f) Decision and notification procedures in abnormal situations</i> During abnormal situations, e.g., if there is a need for extraordinary settlement cycles, the system owner will inform the participants of procedures and timetables through the online information system, CG-online. In addition, the Håndbog describes in detail the procedures to follow in case of certain operational failures, for instance, broken communication lines or mistakes in data records.</p> <p><i>g) Training</i> Seminars are organized at which participants are trained in the use of the system. The seminars are not held at fixed intervals, but as required. The most recent seminar was in 2002, but the DBA plans to arrange new seminars in the near future.</p>
<i>Assessment</i>	<b>Broadly observed</b>
Comments	<p>The clearing and settlement of retail payments in Denmark is complex and (at least for outsiders) difficult to understand due to:</p> <ul style="list-style-type: none"> <li>- the amount of different parties involved and their (different) roles, such as: (1) the DBA; (2) Danmarks Nationalbank; (3) PBS; (4) Data processing centers (except the larger banks, all other banks have outsourced the processing and clearing of retail payments to data processing centers); and, (5) clearing participants and nonclearing participants;</li> <li>- the functioning of the two clearing subsystems and the different way of processing specific categories of payment instruments;</li> <li>- the interrelationships between the two clearing subsystems and the Sumclearing;</li> <li>- the clearing of kroner payments and payments in euros;</li> <li>- the role of the different settlement cycles;</li> <li>- the different facilities for intraday credit from Danmarks Nationalbank (see rec. 3); and</li> <li>- the handling of a default and the consequences thereof.</li> </ul> <p>Although Danmarks Nationalbank has done an excellent job to describe the clearing and settlement of retail payments in its publication <i>Payment Systems in Denmark</i>,<sup>10</sup> it is important that the DBA, as the owner of the system, provides the participants with a memorandum in which:</p> <ul style="list-style-type: none"> <li>(i) a clear description is given of the system and of the roles of the parties therein;</li> <li>(ii) the risks in the systems are outlined;</li> </ul>

<sup>10</sup> See *Payment Systems in Denmark*, Danmarks Nationalbank, Copenhagen, June 2005. (Available on: <http://www.nationalbanken.dk/dnuk/specialdocuments.nsf>.)

	<p>(iii) the most important rules and procedures are set out, especially with respect to the handling of extraordinary situations; and</p> <p>(iv) the consequences of a default are described, such as the possible effects of a removal of a participant, if the notification of a bankruptcy is received before the deadline for delivery, or of an unwind, if it is received afterwards but no liquidity is available. In order to enlarge transparency, it is advisable to clarify:</p> <p style="padding-left: 40px;">(a) what will happen with the payments in the pipeline in the two clearing subsystems;</p> <p style="padding-left: 40px;">(b) the consequences thereof for the counterparties of the defaulter in the clearing, as well as for the accountholders/retailers involved;</p> <p style="padding-left: 40px;">(c) how they can recover their claims or fulfill their obligations; and,</p> <p style="padding-left: 40px;">(d) the risks in the clearing for nonclearing members in case of the default of the clearing participant they use as settlement agent.</p> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>- The DBA should as soon as possible publish a memorandum as described above in English and in Danish and make it available to the participants and the public on its website.</li> </ul>
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***CP III - The system should have clearly defined procedures for the management of credit risks and liquidity risks, which specify the respective responsibilities of the system operator and the participants and which provide appropriate incentives to manage and contain those risks.***

<p><i>Description</i></p>	<p><i>General description of the system</i></p> <p>The Sumclearing is a multilateral deferred net settlement system. Payments are settled in a number of fixed payment cycles during the settlement day. There are four separate settlement cycles for payments in Danish kroner and three for payments in euro. The settlement cycles in Danish kroner are primarily run at night, while the settlement cycles in euros are run in the morning. The clearing of participants' net positions in the Sumclearing are compiled on the basis of the data submitted by the two clearing subsystems: the electronic clearing and truncation system, and the PBS clearing system.</p> <p>In both clearing subsystems, payments are submitted continuously. In the electronic clearing and truncation system, banks transmit the checks and other payment orders they receive on paper or electronically from their clients to their data processing center, which on this basis generates a list of the participant's retail payments. Every night the data processing centers bilaterally exchange total lists of retail payments for their participants. This enables the data center to prepare a list of debit and credit balances for each of their clearing participants vis-à-vis every participant in the subsystem. These balances are known as sum totals and sent into the Sumclearing.</p> <p>In the PBS clearing system, PBS compiles the payments it receives during the day on a centralized basis and calculates the bilateral net positions of each participant. In the PBS clearing system, there is a distinction between the clearing of direct debits on one hand (the ordinary clearing procedure) and the clearing of card transaction in EFTPOS terminals on the other hand (the so-called fast clearing procedure). In the latter clearing retailers submit and report on-line to PBS or via their acquiring bank (data files). Transfer orders related to direct debits are known in advance and processed in the morning the day before settlement. Immediately afterwards the results of the ordinary clearing are transmitted to the Sumclearing for settlement at midnight and stored in this subsystem, while the list of related retail payments are submitted at the same moment by PBS to the data processing centers. The data centers normally process them the same morning and report the payments to the clients of</p>
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banks. These categories of payments are thus made available before they are settled with finality.<sup>11</sup> The list of individual card transactions are sent to the data processing centers in the evening, prior to the submission of the clearing results to the Sumclearing, but these payments are processed after they are settled.

To be incorporated in the first settlement cycle that settles at 1:30 a.m. in the morning of the next day, the sum totals and the results of the PBS clearings have to be received by the Sumclearing at 1:00 a.m. at the latest (deadline). If there is a delay, the payments will be settled in one of the following cycles. However, for the fourth and final cycle at 8:55 a.m. no new payments can be submitted. This cycle is only used to settle the payments of participants that have insufficient liquidity and for that reason could not be settled in the earlier cycles.

Settlement takes place via the Sumclearing settlement accounts that the participants have opened in the books of Danmarks Nationalbank. A clearing participant can reserve liquidity in advance in its Sumclearing settlement account by transferring liquidity from its current account at Danmarks Nationalbank and/or via its automatic collateralization account (see the assessment of KRONOS). Danmarks Nationalbank reports the balances in the Sumclearing settlement accounts to PBS (the so-called lines) prior to every settlement cycle and PBS compares the net positions in the clearing with the available liquidity of the participants in question and, if sufficient liquidity is available for all participants with a debit position, the clearing results are sent to the processing center of Danmarks Nationalbank that executes the transfers immediately by debiting and crediting the Sumclearing settlement accounts of the participants according to their position in the Sumclearing. The new balances are reported for the following settlement cycles to PBS.

Since no overdrafts are allowed in the Sumclearing settlement accounts, PBS will, in case of insufficient liquidity, remove all the debit (to be paid to all other participants) and credit positions (to be received from all other participants) of the failed participant from the clearing and new positions are calculated for the other participants. The positions of the participant that lacks sufficient liquidity are postponed to the next cycle and settled with delayed sum totals or clearing results from PBS. After each settlement cycle, PBS sends a Standard Status Record to the data processing centers that enables them to finalize the payment cycle of the retail payments involved.

In 2005, 96.7 percent of the value of all transactions was settled in the first normal settlement cycle at 1:30 a.m. in the morning. This enables banks to book the incoming payments into the accounts of the beneficiaries, so that the funds are available for their customers in the morning. In the second, third and fourth cycle only minor amounts are typically settled, respectively, 1.0 percent, 1.0 percent, and 1.2 percent.

*Financial risk in the Sumclearing*

Due to its deferred multilateral netting structure, potentially, there are three standard types of financial risks in the system: (i) credit risk, (ii) liquidity risk, and (iii) systemic risk. In addition, due to the tiered structure, in which the non-clearing members have opened an account with a clearing member and settle their payments via this participant's Sumclearing account at Danmarks Nationalbank, there are also deposit or settlement bank risks (see CP VI.)

<sup>11</sup> Banks have concluded agreements with their customers to the effect that payments that have booked prior to final settlement can be reversed in case of a default by the payer or payer's bank.

According to the CP Report, the credit risk depends on the lapse of time between when a payment is accepted by the system and its final settlement. If the moment the payment is accepted is defined as the moment the payment has become irrevocable, the exposure time is around one hour. Even if there is no delay, as in an RTGS system, or the delay between the acceptance and the settlement might be very short in a netting system, the participant can still be exposed to credit risk, if it credits its customers in anticipation of a receipt (see page 25 in the CP Report).

Systemic risk will appear if the failure of one participant to meet its required obligations will cause other financial institutions to be unable to meet their obligations when due. Due to its character as infrastructure for retail payments, it is in particular the liquidity risk that might lead to systemic risk in case of a bankruptcy. This is analyzed in more depth under CP V.

*Managing credit risk*

In Sumclearing, which is a deferred net settlement system, no specific tools for the managing of credit risk are in place. Such tools may include limits on credit exposures (debit or credit caps), a loss sharing agreement, or liquidity arrangements (see also CP V). If a participant has not enough liquidity, the payments to and from this participant will be removed from the netting and postponed to latter settlement cycles and cancelled at the end of the day, if the participant is declared bankrupt or is not able to settle.

Participants set maximum limits to the size of an individual debit transaction in the electronic clearing and truncation system. Similar limits are set by the clearing participants for each of their respective non-clearing members for which they settle the payment flows. According to the rules and regulations this reduces the risk to which a clearing participant will be exposed in the event of unexpectedly large withdrawals in the Sumclearing, primarily as a result of errors made by another clearing participant. Payments above these limits have to be settled in KRONOS, the RTGS-system of Danmarks Nationalbank. Most of the smaller participants (including non-clearing members) have chosen, or their clearing member has set for them, a transaction limit equal to or below DKr 25 million (around US\$4 million). All the larger banks have limits of DKr 100 million (US\$15.8 million). For Dankort transaction, a limit of DKr 1 million (around US\$160,000) is applicable. In the clearing for euro payments the maximum limit is €15 million. Individual participants can set a lower limit. These limits help cap the total value of individual participants' outgoing payment flows in the Sumclearing. However, they are relatively high compared to similar limits in retail clearing systems in other countries or with respect to debit cards.

*Managing liquidity risk*

Participants do not know their position in the Sumclearing, the moment they have to reserve liquidity in their Sumclearing account in KRONOS, i.e., between 4:00 p.m. and 4:30 p.m. when KRONOS has been reopened for the settlement with value day the next day. After 4:30 p.m. and until 7:00 a.m. the following morning, participants have no access to their accounts in KRONOS, and only the settlement cycles of the Sumclearing and VP are executed in this system. The banking sector as a whole normally reserved around six to eight times the amount needed to settle their positions during 2005. The background for the reservation of such large amounts of excess liquidity is a combination of uncertainty with respect to the outcome of the clearing, the fines levied by the Bankers Association,

<sup>12</sup> See also *Systemic Risk in the Danish Interbank Netting Systems* by Morten Linnemann Bech, Bo Madsen and Lone Natorp, Danmarks Nationalbank Working Papers 2002–8, Copenhagen, November 2002, page 13. (Available on: <http://www.nationalbanken.dk/dnuk/specialdocuments.nsf> .)



	<p>reputational risk, and the abundant available intraday liquidity granted by Danmarks Nationalbank that can be mobilized at virtually zero cost under the classical pledge arrangement and the automatic collateralization scheme.<sup>12</sup></p> <p>If liquidity at some point in time becomes scarce, participants will presumably reduce their excess cover, which could lead to an increase in the number of postponements. In the first five months of 2005, there were 51 cases when the excess cover of a participant was less than 50 percent in the Sumclearing. Five participants actually had insufficient liquidity and had their payments removed and an extra settlement cycle was necessary. In one case the amount of payments that had been removed was quite substantial. The liquidity situation could also change in a crisis situation, when the liquidity positions of all banks or of some banks deteriorate rapidly, leading to more postponements, unless measures are introduced.</p> <p>In the fourth settlement cycle at 8:55 a.m., participants with insufficient liquidity in their Sumclearing settlement account have the possibility to transfer the lacking funds from their current account to their Sumclearing account in KRONOS. If necessary, they can pledge additional collateral or try to borrow funds in the interbank market (KRONOS opens again at 7:00 a.m. and banks are obliged to have staff available from 8:00 a.m. onwards). If necessary, additional settlement cycles can be arranged in the period till 3:00 p.m.</p> <p><i>Incentives to reserve sufficient liquidity</i></p> <p>In case insufficient liquidity is reserved by the participant and the settlement has to be postponed, the system owner levies a fine of DKr 5,000. The fine increases to DKr 25,000 if the payments of a participant have to be postponed for a third time and for every omission thereafter within a 12-month period.</p>
<p><i>Assessment</i></p>	<p><b>Partly observed</b></p>
<p>Comments</p>	<p>The main method for addressing the shortfall of funds in the Sumclearing as a deferred net settlement system is to remove all payments involving the failed participant. This is normally deemed to be an unacceptable means of allocating the funding shortfall in a systemically important payment system, primarily because of its random impact on the surviving participants (see the CP-report Box 6 on page 26). However, for this CP, a classification of “nonobserved” has not been assigned due to the following considerations:</p> <ul style="list-style-type: none"> <li>• the system is used for customer to customer payments only;</li> <li>• although the relative size of the amounts cleared may be substantial from an international point of view for a retail payment system and as a percentage of BNP (300 percent), it is still relatively small compared with a large value payment in a developed country;</li> <li>• the abundant availability of intraday liquidity and the excess liquidity reserved in the Sumclearing accounts under normal circumstances; and</li> <li>• the fact that settlement takes place in the night and early morning giving the participants time to cover their positions via bringing additional collateral or by borrowing funds in the interbank money market.</li> </ul> <p>This might have lead to a rating of “broadly observed” were there no risks due to the fact that the funds in some situations are made available to customers the day before the settlement is final. This can lead to credit risk and operational risk and make this system vulnerable in a crisis situation. The problem was already identified some time ago, but appropriate measures have not yet been taken.</p>

	<p>It is recommended:</p> <ul style="list-style-type: none"> <li>- to reduce possible systemic risks in the system further (see also CP V) by either:             <ol style="list-style-type: none"> <li>a) maintaining the present settlement procedures, but implementing adequate loss-sharing and liquidity arrangements, or;</li> <li>b) taking measures to lower the net positions to be cleared by: (i) lowering the maximum size of an individual payment in the electronic and truncation system by settling larger customer payments and urgent payments in KRONOS on an online, real time basis; and, (ii) considering whether the payment flows can be more effectively divided over several batches during the day and night, instead of concentrating them for clearing and settlement into the first normal Sumclearing settlement cycle at 1:30 a.m. The proposed method would mean that the operating day (24 hours) is broken into several periods and at the end of each period the payments in that period would be settled as a batch or lot. To ensure that the payment can be settled, a maximum amount can be set for each lot for which a certain amount of liquidity could be set aside.<sup>13</sup> This would lead to smaller net positions and thus less risk. The disadvantage is that it might reduce the netting effect (lower netting ratio), but this disadvantage is limited where intraday liquidity is abundant, and can be obtained at no, or a very low cost. Under the current method some of the banks reserve several times the amount needed.</li> </ol> </li> <li>- to take measures to prevent the booking of retail payments in the accounts of the customers before the settlement of the payments is final, as long as there is no guarantee that the payments will be settled with finality under all circumstances. This is especially a problem in the PBS ordinary clearing subsystem, where the information on individual payments is already distributed to the participants in the morning, the day before the settlement takes place. This problem can be solved, for instance, either by making the information available after the settlement has taken place, or, by settling the results of this ordinary clearing via the Sumclearing immediately after the processing is finished (see measure (ii) above).</li> <li>- to take measures to implement procedures that reduce the time it takes for reversing defective payment instructions that due to operational malfunctioning was settled, e.g. payment instructions settled twice in a settlement block. A few incidents have shown that such measures will not only reduce the operational risk but also the credit risk for banks (customers might have already used the incoming payments to fulfill their own obligations) since the reversal of payment instructions can be a very cumbersome process that may take quite a long time. (In the present situation it is estimated that it may take up to a week to reverse all payments safely and securely). Especially on certain days, e.g., on days with mortgage payments, the potential volume to be reversed is very large. It should be taken into account that problems of this type can occur in situations with general uncertainty concerning the financial system, which may amplify the problems and erode further the trust in the banking sector.</li> </ul>
<p><b><i>CP IV – The system should provide prompt final settlement on the day of value, preferably during the day and at a minimum at the end of the day.</i></b></p>	

<sup>13</sup> The lot settlement method is used by Interpay, the Dutch clearinghouse for retail payments. For a description, see for instance, Quarterly Bulletin, De Nederlandsche Bank, December 2001, page 24-26 (available on the website of the Dutch Central Bank: <http://www.dnb.nl/dnb/pagina.jsp?pid=tcm:13-35755-64>). Lots can be calculated and settled for each bank individually or by first calculating a multilateral netting and then settling in the RTGS-system.

<p><i>Description</i></p>	<p><i>Acceptance and irrevocability</i>  Payments in the Sumclearing are irrevocable at the deadline for submission of the sum totals. These deadlines are set in the rules and regulations at 1:00 a.m. and 2:30 a.m., respectively, for the two normal settlement cycles and 5:30 a.m. for the first and second extra settlement cycles. Netting takes place afterwards.</p> <p><i>Clearly defined and legally effective moment of final settlement</i>  The final settlement of the payments is clearly indicated for the different settlement cycles and takes place at the moment the clearing results are debited and credited in the Sumclearing settlement accounts of the participants.</p> <p><i>Interval between acceptance and final settlement</i>  The interval between acceptance and final settlement is typically very short (i.e., around one hour).</p> <p><i>Enforcement of settlement processes and openings times</i>  The operating hours of the infrastructure for retail payments are 24 hours a day. The deadlines for delivery to the Sumclearing are strictly enforced. If the deadlines are missed, due to a delay, the payments are settled in the following settlement cycle.</p> <p><i>Reversal of payments in case of mistakes and errors</i>  Payments are settled with finality within each settlement cycle during the day. Any mistakes, which are discovered after the sum totals become irrevocable, must be corrected by a reversal of the original payment and a submission of the correct payment. Both payments are handled as new payments in the system.</p>
<p><i>Assessment</i></p>	<p><b>Observed</b></p>
<p><i>Comments</i></p>	<p>The system has several settlement cycles during the day, although the bulk of the payments is settled in the first cycle during midnight/early morning of the settlement day. The time interval between the moment the sum totals become irrevocable or are netted, and the final settlement is very short and both are on the same settlement day.</p> <p>However, this does not imply that retail payments are settled with same day finality. The time between the moment payment orders of their clients are received by the banks and are submitted for processing or are submitted directly by retailers, and the moment they are finally settled is normally one day due to the overnight settlement.</p>
<p><b><i>CP V - A system in which multilateral netting takes place should, at a minimum, be capable of ensuring the timely completion of daily settlements in the event of an inability to settle by the participant with the largest single settlement obligation.</i></b></p>	
<p><i>Description</i></p>	<p><i>Risk management measures to protect the clearing against a default</i>  As described under CP III, risk management measures to protect the clearing against the inability of the participant with the largest single settlement obligation in the form of a liquidity, and loss sharing arrangement or a settlement guarantee by Danmarks Nationalbank have not been introduced. Nor are there debit or credit caps to protect the netting from excessive exposures. The only risk management measure that could influence the net positions in the clearing, is the limit the participants can set for the size of an individual payment. However, the effectiveness of this measure is rather modest since the limits, especially those set by larger banks, are unusually high for a retail payment system.</p>

	<p><i>Unwinding</i></p> <p>In case of inability to settle, all the payments to and from the participant are removed from the clearing and new net positions are calculated for each participant vis-à-vis all other surviving participants. The payments removed are postponed and the system will try to settle them in the next cycle. If at the end of the day no solution can be found, they are canceled.</p> <p><i>Possible systemic risk</i></p> <p>Danmarks Nationalbank is of the opinion that under the present circumstances, the probability that problems in the Sumclearing will trigger a systemic crisis is very minute. Due to the abundant liquidity in the system that enables banks to reserve large amounts of liquidity in their Sumclearing accounts well in excess of their settlement obligations, the inability to pay off the largest Sumclearing participant will most probably not cause a widespread domino effect and thus will not have a disruptive effect on the financial system. Also, the relative size of the system, the low average value of retail payments, as well as the fact that government payments (around 38 percent of the net payments in 2005) are settled via the Sumclearing account of Danmarks Nationalbank itself, ensuring that these payments will always be settled, reduces the risk of contagion in the opinion of Danmarks Nationalbank.<sup>14</sup> This conclusion was confirmed by a stress-test conducted in the period December 21, 2001 and January 25, 2002. Taking into account the actual liquidity lines of the other participants, only on one day the inability to pay off the largest participant would have caused one other participant to be unable to meet its obligations. Even if the reserved liquidity lines would have been substantially lower, but still in excess of the settlement obligation, the contagious effects would have been limited during this period.</p> <p>However, various stress tests have not taken into account other bank exposures. If this had been done, it would have provided a more complete picture.<sup>15</sup> The study also assumes that the financial losses for banks are minimal, if the payments are removed from the clearing. According to this study, the potential danger is foremost in the liquidity area, since the payments are customer to customer payments and not interbank payments. However, there might be losses for some financial institutions in case of a default, since some payments are related to payments for interest or redemption of loans or for other services of the financial sector to the public.</p>
<p><i>Assessment</i></p>	<p><b>Broadly observed</b></p>
<p><i>Comments</i></p>	<p>Although, the systemic risk could be deemed low during normal situations due to the abundant liquidity reserved by the participants, there is still room for doubt under more stressed conditions, when liquidity becomes scarce for some banks (see also CP III) and/or spill-over from other systems may occur. In the opinion of the assessor, the Sumclearing could therefore not be deemed to be in full compliance with CP V. All the more, since credit risk and operational risk exist due to the crediting of customers accounts well in advance of the final settlement. (Something that could also be cured with a guaranteed settlement via classical protection measures.) Also, the lack of limits for the positions in the netting can lead to positions becoming excessive and difficult to handle. As recommended in CP III, classical protection measures in the form of loss sharing and liquidity arrangements should be implemented for this deferred netting scheme, <i>or</i> the individual positions in the netting</p>

<sup>14</sup> The processing of the retail government payments are outsourced to a commercial bank but not the settlement.

<sup>15</sup> See also *Systemic Risk in the Danish Interbank Netting Systems* by Morten Linnemann Bech, Bo Madsen and Lone Natorp, Danmarks Nationalbank Working Papers 2002–8, Copenhagen, November 2002, pp. 16–17 (Available on: <http://www.nationalbanken.dk/dnuk/specialdocuments.nsf> .)

	<p>should be reduced (making the amounts to be cleared less systemically important) by lowering the maximum size for individual transactions and spreading out more effectively the clearing results over different cycles during the day. In Denmark, resistance to the introduction of loss-sharing arrangements seems to exist among bankers, whether for payments or for securities settlement systems, because these arrangements are identified with survivor pay schemes that could result in moral hazard and hence distort competition.</p>
<p><b><i>CP VI – Assets used for settlement should preferably be a claim on the central bank; where other assets are used, they should carry little or no credit risk and little or no liquidity risk.</i></b></p>	
<i>Description</i>	<p>The system settles fund transfers over accounts participants have opened with Danmarks Nationalbank. The funds received are a claim on Danmarks Nationalbank itself. Although there are no restrictions on access for banks, in the Sumclearing, nor in KRONOS and the participation rate is relatively high (62 banks participate directly in the Sumclearing in kroner and 26 in the retail clearing in euro), 104 smaller banks have chosen voluntarily to settle their retail payments in kroner via a clearing participant, while 142 banks use a settlement agent for the clearing and settlement of their euro payments. These banks are exposed to settlement bank risk should their settlement agent default. No specific requirements are set by the system owner or by the overseers and no figures were available about concentration risks, the amounts cleared, and settled via the larger settlement banks and possible deposit risks.</p> <p>PBS and Danmarks Nationalbank have made it possible for nonclearing participants to quickly change clearing participant or become a direct clearing participant.</p>
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	<p>The settlement takes place in central bank money, albeit that smaller banks have voluntarily chosen to use another bank to clear and settle their retail payment flows and thus expose themselves to settlement bank or deposit risks.</p> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>- The overseers should gather figures about possible concentration and deposit risk due to the use of settlement banks and analyze what will happen to the smaller banks and the trust in the system as a whole, if, one of the larger settlement banks were to go bankrupt. Within this context, it should be taken into account that the same settlement bank might also be used for other services, such as cash provider in VP.</li> </ul>
<p><b><i>CP VII – The system should ensure a high degree of security and operational reliability and should have contingency arrangements for timely completion of daily processing.</i></b></p>	
<i>Description</i>	<p><i>IT-security policy</i></p> <p>PBS has a general IT security policy that has been prepared in accordance with international standards (ISO17799). Among other things, it comprises descriptions of responsibilities and organization in relation to IT security, classification of data and documents by degree of confidentiality, requirements for data during transmission (e.g., encryption), and guidelines for data access and physical security. The security policy has been approved by the Board of PBS and its observance is assessed on an annual basis.</p> <p>PBS has set up a special IT-security group that meets frequently. The group includes several PBS executives and holds overall responsibility for IT security at PBS (i.e., for implementation of the IT-security policy). In addition to issues of principle relating to IT-security at PBS, the group discusses various operational incidents.</p> <p><i>Risk management and monitoring</i></p>

Among others, PBS has consulted with the Danish Security Intelligence Service to gain an appreciation of the potential threats to PBS. IT crime is deemed to be the greatest threat, while extreme operational events such as terrorist attacks, and flooding are assessed to be very unlikely (e.g., in view of PBS' geographical location outside Copenhagen).

Every year, a comprehensive security analysis of all PBS systems is conducted, and security analysis are also performed in connection with major system changes. In addition, there are approved security descriptions for all PBS systems, including the Sumclearing in both kroner and euro and its underlying systems.

*Documentation of the system*

User manuals exist for all essential IT systems relating to the Sumclearing. All manuals are up-to-date. There are security descriptions for all relevant systems, including the Sumclearing in both kroner and euro and its underlying systems. The security descriptions have been approved by the Board of PBS.

*Back-up facilities*

PBS has established back-up facilities (a second site) at a relatively short distance from the primary facility, which may make it vulnerable for a wide area disaster. The detailed procedures on a switch to the second site are described in PBS' contingency plans. The back-up facility can handle all key functions in relation to the Sumclearing and the underlying systems. PBS' second site is an integral part of its operating environment, and direct data mirroring takes place between the two facilities. After measures implemented in 2003/04, the Sumclearing can be restarted at the second site within 4 hours, compared to 24 hours previously. PBS' tests of the business continuity plans have confirmed that the Sumclearing can be restarted within the targeted four hours, and for EFPOS transactions PBS has set a target of two hours.

*Contingency and emergency procedures*

PBS has prepared contingency plans for the Sumclearing and the key underlying systems. The plans describe the practical handling of disaster situations (e.g., who makes which decisions and when). The contingency plans are documented and tested on a regular basis, and the experience gained is included in the ongoing evaluation of the plans. Plans concerning critical IT systems at PBS are tested once every three years. The results of the tests are reported to PBS' IT security group. Business continuity plans for management and information dissemination, for example, are tested once a year. The contingency plans are based on the plans prepared for the handling of industrial disputes. PBS' work on its contingency plans has focused primarily on its own circumstances. PBS has not participated in joint measures to develop contingency plans in cooperation with participants, data processing centers, or Danmarks Nationalbank. PBS' contingency plans have not been coordinated with those of the major utility companies, e.g., electricity and telephone companies. However, PBS does have an uninterruptible power supply and was thus able to continue operations without problems in connection with the power outage in 2003.

In addition, BEC (system operator of KRONOS), VP, PBS (the operator of Sumclearing), and Danmarks Nationalbank have held meetings to ensure that they are familiar with each other's emergency procedures. Experience from two incidents within the past year has shown that in practice the emergency procedures do not always function optimally, particularly in relation to communication between the parties concerning problems arising from settlement in Sumclearing or VP settlement.

*Protection of data communication*

Exchange of data between PBS and the participants' data processing centers take place in an agreed data standard. The actual exchange of data between PBS and the data processing centers usually takes place via the PI-net, a proprietary network that connects the data processing centers with each other and with VP and PBS. The network is used by the data processing centers for exchange of retail payments data. All messages in the system are encrypted and all communication lines are duplicated.

The system provider (PBS) has taken adequate measures to ensure integrity, authentication, and non-reputability in the network. These issues are addressed in the PBS security policy that conforms to legal requirement and generally accepted business standards. Adequate firewalls are in place to protect the systems against intruders and the safety measures are tested annually by independent experts. The results of these tests and a yearly risk assessment are used for evaluating the need for enhancements.

#### *Audit trails*

In principle, the Sumclearing does not process individual payments, but only total balances, known as sum totals, cf. the draft report, Section 2.3.2. PBS can trace an individual payment in the PBS clearing that is made on the basis of PBS' own products, but has no information on individual payments in the electronic clearing and truncation system. PBS' logging and investigation of individual payments in the PBS clearing are mainly intended to discover and prosecute those responsible for fraud and abuse.

#### *Development and procurement*

Changes to PBS' systems are subject to changes in management procedures to ensure that only approved system changes are implemented in the operating environment. The procedures involve testing of planned system changes in special testing environments. A manual procedure has been agreed for testing whether system changes affect the interfaces to VP Securities Services and BEC (Danmarks Nationalbank's data processing center).

#### *Availability and scalability*

The capacity of the Sumclearing is monitored and assessed on an ongoing basis. In recent years no significant capacity problems have been observed. The CPUs used are owned by PBS, which has imposed a contractual obligation on the provider to be able to expand the capacity at very short notice. If there are indications of potential capacity problems, these can be prevented by suspending development and testing activities.

Earlier, there was no regular reporting of operational patterns or incidents in the Sumclearing to the Board of PBS or the DBA. However, beginning 2006, PBS has introduced a quarterly reporting to the DBA of incidents, transaction volumes, etc. The quarterly reporting will probably be complemented by an annual report.

PBS has sufficient skilled staff available, even in cases where large numbers of staff are absent due to a severe epidemic.

#### *Audits*

In its capacity as joint data processing center, PBS is subject to the DFSA's Executive Order no. 254 of April 10, 2005 on system audits in joint data processing centers. Among other things, the internal and external system auditors conduct ongoing inspection of the Sumclearing's procedures, user manuals, Håndbog for Betalingsformidling, and audit the security analysis. Minutes of meetings and other materials from the Board of PBS show that extensive reporting by the system auditors takes place. In addition, the system auditors do not refrain from criticism where this is justified. The issues pointed out appear to be followed up closely by both the system operator and the auditors.

On several occasions, the Sumclearing has been reviewed by PBS' internal auditors in

	cooperation with the internal auditors of one of the large clearing participants. All issues identified in these audits have been addressed.
<i>Assessment</i>	<b>Broadly observed</b>
<i>Comments</i>	<p>PBS as system operator has established an effective security policy to ensure the security and operational reliability of the system, and has adequate contingency arrangements for timely completion of daily processing.</p> <p>However, a full assessment of the operational reliability was not possible due to the lack of data on availability and incidents at the time of the assessments. The functioning of the system should be formally monitored and availability of the system and incidents should be given the appropriate attention by management.</p> <p>With respect to contingency measures, PBS seems to be concentrating a little too much on internal problems. The focus can be broadened. For instance, the contingency measures can be improved by testing them with participants or their data processing centers. Coordination of the emergency procedures of the Sumclearing, KRONOS, and VP, and improvement of the communication procedures for a crisis situation should also be given adequate attention. In many countries, the central bank and/or the financial regulator act as catalysts in this process.</p> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>- The targets set for availability should be formally monitored and statistics on availability (uptime) and major incidents and their consequences should be made available to the system owner, the participants, and the overseers. As indicated, to alleviate this, quarterly reporting began in 2006.</li> <li>- The contingency measures should be tested with participants and the emergency measures should be coordinated with other system providers. Danish authorities have started work on the latter issue (see the assessments of KRONOS and VP).</li> <li>- As indicated in the introduction of this assessment, it is the opinion of the assessor that Sumclearing has to be seen in a broader context. Sumclearing is only the top of the pyramid of the infrastructure for retail payments. The operational reliability of the whole infrastructure for the settlement of retail payments is as strong as the weakest link in this chain. It is recommended that the overseers assess the operational reliability of the clearing sub-systems and the links between the different parts of the infrastructure (see also the assessment of the responsibilities of the central bank in applying the core principles).</li> </ul>
<b><i>CP VIII - The system should provide a means of making payments, which is practical for its users and efficient for the economy.</i></b>	
<i>Description</i>	<p><i>Crucial functions of the system</i></p> <p>The overseers have declared the system for clearing and settlement of retail payments systemically important, since it is important to the functioning of the economy, widely used, and there are no alternatives.</p> <p>A broad variety of payment instruments are processed, varying from checks and paper based credit transfers to card transactions and direct debits. In 2005, around 1.1 billion payments with a value of DKr 5,027 billion were cleared and settled in the system.</p> <p>The number of checks has declined since the introduction of direct debits and the Dankort.</p>



Recently, electronic banking and other new products also have contributed to the rapid decline since 1998, when the annual value of checks cleared peaked at DKr 1,237 billion, to DKr 522 billion in 2004.

Direct debit is well developed and 9 out of 10 households use the Direct Debit Services for paying regular bills.

Denmark has the highest number of debit card transactions per capita in Europe. Use of credit cards is limited due to the strong position of Dankort and the fee structure for retailers (no transaction fee for retailers per debit card transaction against an average transaction fee of 3.25 percent for credit card transactions: retailers pay an annual fee for Dankort that is related to the size of their transactions and varies between DKr 500 and DKr 10,000 (US\$80 and US\$1,600 respectively).

Electronic banking is very popular; 2.7 million Danish citizens (of a total population of 5.4 million) have an e-banking account. Home banking is fully supported by the infrastructure. All Danish banks operate on one network standard called PI-net and use Edifact standards to communicate with customers.

*Open infrastructure and high degree of automation*

The Sumclearing is part of the Danish banks' joint payments infrastructure, in which all banks in Denmark participate. An advantage of having a joint payment infrastructure is the fact that fixed operating costs can be distributed among all participants. This also provides for uniform processing of retail payments, irrespective of the remitter and recipient's choice of bank.

Denmark's technological infrastructure is relatively advanced. The retail infrastructure is characterized by a high degree of automation and the use of data standards that promotes straight-through-processing and helps to reduce costs. The joint payments infrastructure may also facilitate a change of bank since agreements such as BetalingsService (the Danish direct debit service) can be transferred to the new bank.

*Decision taking structure*

The main parts of the infrastructure for clearing and settlement are owned by the banks collectively. The Sumclearing is owned by the DBA and PBS shares are held by the banks including Danmarks Nationalbank. This helps to ensure that the system reflects user requirements with regard to functionality, etc., and that settlement takes place in a manner that is efficient for the participants. The participants are also able to influence the development of the system via their participation in task forces and committees under the DBA, in which also the smallest participants are represented (usually via the Association of Local Banks in Denmark).

*Opening time and practicality of the settlement cycle*

The overnight settlement in the Sumclearing enables processing to take place when liquidity withdrawal and use of IT capacity are at their lowest. It also means that mortgage payments to mortgage-credit institutions via the Sumclearing are usually settled before the disbursement of interest and redemptions in the VP settlement, which occurs in the morning.

On the other hand, in view of the overnight settlement of retail payment from one customer account to another in the Sumclearing cannot be carried out on the same day. Some countries' retail payment systems take longer to settle payments, while other countries' systems allow for intraday settlement.

*Cost recovery and pricing*

	<p>Exact costs for Sumclearing itself were not available. However, PBS the system-operator and operator of PBS clearing and common supplier of several payment products for banks is fully cost recovering (profit in 2005 after taxes DKr 192 million).</p> <p>For the Sumclearing, all participants pay an annual fee of DKr25, 000 (around US\$4,000) for the clearing of kroner payments and DKr 50,000 for the clearing of euro payments. The annual fee is fixed by the DBA and covers all costs. The difference reflects the fact that the Sumclearing in Euro has approximately half as many clearing participants as the Sumclearing in kroner.</p> <p>In addition to the Sumclearing fee, participants also pay to participate in the rest of the joint payments infrastructure. These payments include inter-alia a connection fee and an annual fee for participation in the electronic clearing and truncation. Furthermore, participants pay a connection fee and a number of annual fees and transaction fees to PBS depending on how much of the common infrastructure they wish to subscribe to. The annual fee for institutions that issue a Dankort is based on the participants' working capital as defined by the DFSA, adjusted to make the fee an increasing but regressive function of participant's size. The transaction fee for a Dankort transaction is a fixed amount per transaction of DKr 0.05 to be paid by the issuer bank. Customers and retailers organizations have no influence on the fee structure. However, the contributions to the costs of debit card transactions by the retailers are from an international point of view very low, and customers do not yet pay a fee at all for the use of their debit card. No figures are available about the total costs of running the Danish retail payments at the moment, or on the division of the costs over banks, business firms/retailers, and consumers/clients.</p> <p>In June 2000, the Danish competition authorities reviewed the overall terms and conditions for access to the DBA's payment systems agreements. Against this background, the Danish Competition Council approved these terms and conditions.</p> <p><i>Use of liquidity and liquidity costs</i></p> <p>The extensive liquidity reserved by clearing participants for settlement (see CP V) can be seen as a—currently cost-free—inefficiency in the system. When reserving liquidity, the participants pledge collateral in the form of securities that could alternatively have been used for other purposes. The present substantial excess cover reflects that there are no costs connected with pledging securities as collateral for the settlement.</p>
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	The Danish banking sector and its interbanking service provider, PBS, offer a broad and modern package of retail payment services. The infrastructure is open and technologically relatively advanced. The development of new products is very innovative. The settlement cycle is not exceptionally long. Customer satisfaction with some of the services is very high.
<b><i>CP IX – The system should have objective and publicly disclosed criteria for participation, which permit fair and open access.</i></b>	
<i>Description</i>	<p><i>Access criteria</i></p> <p>The requirements for participation are clearly defined in the Sumclearing participation agreement (see CP 2). Access is open to all banks, saving banks, and cooperative banks. Access is also open to foreign banks that are active in Denmark, provided that they are well supervised. Participants must be able to settle their payments as direct members via one or both of the clearing sub-systems and have opened a current and a settlement account with Danmarks Nationalbank.</p> <p>Foreign banks have to provide a satisfactory legal opinion with respect to the recognition of</p>

	<p>the finality rules and the netting agreement under their bankruptcy laws. Sumclearing does not have remote access capabilities and foreign banks have to access the Sumclearing infrastructure remotely through an agreement with a direct participant.</p> <p><i>Limitation of access</i> There are no minimum requirements with respect to credit rating or capital ratios, other than the normal requirements by the banking supervisory authority (fulfillment of the capital adequacy rules). Neither does the fee structure or the technical requirements form a barrier to access.</p> <p><i>Non-clearing members</i> Although access is open for all banks, smaller banks can choose for economical and efficiency reasons to settle their payment flows via a clearing participant, while still having access to the payment infrastructure for retail payments in order to offer their clients a full package of payment services including access to automated teller machines (ATMs) and the use of debit and credit cards. In this case they are called nonclearing members and have no direct relationship with Sumclearing.</p> <p><i>Assessment of the access criteria by the Danish Competition Authority</i> In June 2000, the Danish competition authorities reviewed the overall terms and conditions for access to the DBA's payment systems agreements. Against this background, the Danish Competition Council approved these terms and conditions. Among other things, it was noted that the terms and conditions are publicly accessible, written, and non-discriminatory. It was also pointed out that there are easy access rules for small banks, e.g., because they can participate via other banks.</p> <p><i>Exit rules</i> Participants that no longer fulfill the requirements for access will be removed. Such a decision has to be made by the board of the DBA as the owner of the system. However, no formal arrangements exist to facilitate a participant's exit from Sumclearing.</p>
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	<p>The Sumclearing has objective criteria for participation, which permit fair and open access and do not restrict competition in the banking sector. In the retail area banks do not compete on infrastructure but on fees and services. Also smaller banks can provide their clients with a full package of payment services.</p> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>- Although the public can obtain a copy of the Aftalebog in which the participation agreement is published, the DBA should facilitate public disclosure by stating the access criteria in the memorandum mentioned under CP II.</li> <li>- The DBA should make the exit rules more formal by drafting exit criteria in the rules and regulations and work out decision procedures and procedures to facilitate the exit of a participant as well as publish them in the aforementioned memorandum.</li> </ul>
<b><i>CP X - The system's governance arrangements should be effective, accountable and transparent.</i></b>	
<i>Description</i>	<p><i>Ownership structure</i> As previously mentioned, the largest parts of the infrastructure for retail payments are commonly owned by the banking industry. The Sumclearing itself is owned by the DBA and PBS is owned by the banks and Danmarks Nationalbank.</p> <p><i>Objectives and participants' influence on decision taking</i></p>

	<p>The DBA is the trade organization for the Danish banking sector and its members include Danish commercial banks, savings banks, cooperative banks, and subsidiaries and branches of foreign banks. The DBA co-ordinates any work on the further development of the infrastructure for retail payments and the wide range of mutual agreements behind the infrastructure. The interests of all participants are taken into account in decisions concerning the infrastructure. In the DBA's task forces and committees, small banks are usually represented by the Association of Local Banks. Aspects relating to the common infrastructure are discussed in task forces and committees under the DBA, and consensus is normally reached.</p> <p>The objectives of PBS are to develop, sell, and operate systems and services in the market for payment cards and payment services, as well as to provide services as subcontractor to the common infrastructure for the banks. Its mission is to make payments simple and secure.</p> <p><i>Transparency</i> DBA's ownership of the Sumclearing is publicly known, whereas the organization's board and management structure can be found on its website. The appointment process of a board member is described in the organization's articles, which are also publicly available.</p> <p>PBS is a public limited company that is obliged to publish an annual report. The annual report is available on its website. It gives information on its activities, structure of the Board, and income statement. The Board is fully liable to the annual shareholders meeting, i.e., the banking sector.</p>
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	<p>The governance structure is effective, accountable, and transparent</p> <p>Recommendation:</p> <ul style="list-style-type: none"> <li>- The DBA could enhance the transparency of the infrastructure for clearing and settlement of retail payments by making the memorandum as indicated under CP II available to the public.</li> <li>- It should take action to comply in full with all CP.</li> </ul>

**Table 5. Summary Observance of the Sumclearing of the CPSS Core Principles**

<i>Assessment Grade</i>	<i>Principles Grouped by Assessment Grade</i>	
	<i>Count</i>	<i>List</i>
Observed	6	1, 4, 6, 8, 9, 10
Broadly observed	3	2, 5, 7
Partly observed	1	3
Non-observed		None
Not applicable		None

**Table 6. Recommended Actions to Improve Observance of the Sumclearing of the CPSS Core Principles**

Reference Principle	Recommended Action
Legal foundation (CP I)	None
Understanding and management of risks (CP II - III)	<p>The DBA should as soon as possible:</p> <ul style="list-style-type: none"> <li>- Draw a memorandum that provides a comprehensive description of the functioning of the system; the risks involved; the risk and liquidity management measures, and tools for participants; the consequence of an unwinding; and the main rules and regulations and procedures, especially in abnormal situations. The memorandum should be published on its open website in English and in Danish.</li> <li>- Lower the risks in the system by either implementing a loss-sharing and liquidity arrangement or lowering the positions in the netting by setting lower maximum limits for individual transactions and dividing the payment flows effectively in batches during the settlement day instead of concentrating them in the first normal settlement cycle at 1.30 a.m.</li> <li>- Take measures to prevent the booking of the retail payments in the account of customers before the settlement is final, as long as the settlement is not guaranteed by adequate risk management measures. Alternatively, the results of the ordinary clearing could be settled immediately after the processing is finished, whereupon the data on the underlying retail payments could be distributed (see above).</li> </ul>
Settlement (CP IV-VI)	<p>The overseers of the system should:</p> <ul style="list-style-type: none"> <li>- Gather information on possible concentration risk, the amounts settled and the deposit risk for the smaller banks that use a specific settlement bank, and analyze the consequences for smaller banks and the trust in the system in case of a default of one of the larger settlement banks.</li> </ul>
Security and operational reliability, and contingency arrangements (CP VII)	<p>The contingency measures should be tested with participants and the emergency measures should be coordinated with other system providers.</p>
Efficiency and practicality of the system (CP VIII)	None

Criteria for participation (CP IX)	<p>The DBA should:</p> <ul style="list-style-type: none"> <li>- Facilitate the public disclosure of the access criteria by stating the rules in the memorandum mentioned under CP II.</li> <li>- Make the exit rules more formal by drafting exit criteria and work out decision procedures and procedures to facilitate the exit of a participant and publish them in the aforementioned memorandum.</li> </ul>
Governance of the payment system (CP X)	<p>The DBA:</p> <ul style="list-style-type: none"> <li>- May want to enhance the transparency of the infrastructure for clearing and settlement of retail payments by making the memorandum, as indicated under CP II, available to the public by publishing it on its open website.</li> <li>- Should take action to comply in full with all Core Principles.</li> </ul>

Table 7. Assessment of Observance of Danmarks Nationalbank of the Responsibilities of the Central Bank in Applying the Core Principles

<b>Central Bank Responsibilities in Applying the CPSIPS</b>	
<b>Responsibility A – The central bank should define clearly its payment system objectives and should disclose publicly its role and major policies with respect to systemically important payment systems.</b>	
<i>Description</i>	<p><i>Legal and institutional framework</i></p> <p>The main objective of Danmarks Nationalbank is to ensure the efficiency and stability of the Danish payment and settlement systems so that they do not pose a threat to financial stability. This is laid down in Section 1 of the Danmarks Nationalbank Act, in which it is stated that: Danmarks Nationalbanks shall “maintain a safe and secure currency system in this country and [...] facilitate and regulate the traffic in money and the extension of credit.” The Nationalbank considers this to entail contributing to the efficiency and stability of payment systems.</p> <p>Recently, an amendment of the STA has been approved by the parliament, spelling out that Danmarks Nationalbank will be the sole authority responsible for overseeing systemically important payment systems.</p> <p><i>Different roles</i></p> <p>Danmarks Nationalbank main roles in the area of payments are:</p> <ul style="list-style-type: none"> <li>- to issue banknotes and coins;</li> <li>- to act as banker to the government and fiscal agent for the issue of public debts;</li> <li>- to act as settlement bank and provider of KRONOS, the large-value payment system in Denmark;</li> <li>- to act as catalyst to promote the efficiency and security of the payments and settlement infrastructure via regular meetings with other parties with an interest in payment, participation in various working groups and committees, and by organizing ad hoc meetings when issues of mutual interest have to be discussed with other stakeholders. It uses also its position as shareholder of VP and PBS within this context; and</li> <li>- to act as overseer of payments and securities settlement systems.</li> </ul> <p><i>Disclosure of objectives and roles</i></p> <p>In 2001, Danmarks Nationalbank formerly defined and disclosed its role and policies with regard to systemically important payments and settlement systems the Financial Stability Report (pp. 89–90). The objectives and tasks are also outlined on the Bank’s website. The objectives of contributing to the efficiency and stability of the Danish payment and settlement systems are listed under the Bank’s core objectives. Recently, Danmarks Nationalbank published a book on payment and securities settlement systems in Denmark that also comprises a paragraph on the role of Danmarks Nationalbank and its major policies with respect to these systems.</p>
<i>Assessment</i>	<b>Observed</b>
<i>Comments</i>	Danmarks Nationalbank has clearly defined its objectives with respect to Systemically Important Payment Systems and clearing and settlement systems for securities within the responsibilities it has been charged with in the Nationalbank Act and has disclosed its role, and major policies.
<b>Responsibility B – The central bank should ensure that the systems it operates comply with the core principles.</b>	
<i>Description</i>	<p><i>Division of work and responsibilities with respect to KRONOS</i></p> <p>Responsibility for operational and security issues relating to KRONOS is distributed among several departments at Danmarks Nationalbank:</p>

	<ul style="list-style-type: none"> <li>- <u>Payment Systems Department</u> is the system owner responsible for design and development of the system, including that it has the functionality expected of a modern RTGS system. This Department is also charged with the oversight of payment and securities settlement systems.</li> <li>- <u>Accounting Department</u> undertakes the day-to-day operation of the system, including entry of payments to the participants' accounts and monitoring of the functioning of the system. In connection with operational problems, liquidity problems of participants and so on, the Accounting Department is responsible for contact with participants and the operator of the IT systems, i.e., Bankernes EDB Central (BEC).</li> <li>- <u>Information Technology Department</u> is responsible for IT strategy and use at Danmarks Nationalbank and handles relations with BEC, including maintenance of the agreements with BEC (assisted by the Payment Systems Department and others).</li> <li>- <u>Organization Department</u> is responsible for Danmarks Nationalbank's business procedure framework and the model for risk assessment of systems and procedures. In addition, it is responsible for Danmarks Nationalbank's IT security policy, physical security, and business continuity (contingency plans).</li> <li>- <u>Internal Audit Department</u> audits Danmarks Nationalbank's accounts, bookkeeping, underlying procedures, use of IT, and internal controls, including whether statutory requirements and other external requirements are observed.</li> </ul> <p><i>Responsibilities for the oversight of KRONOS and compliance with the Core Principles</i> The Payment System Department is responsible for the oversight of KRONOS and its compliance with CPSS Core Principles for systemically important payment systems. A separated section of the Payment System Department is charged with the oversight section to ensure Chinese Walls between the decision making by overseers and system owners/project managers for development, while ensuring synergy by combining policy tasks and oversight tasks in the same department. The oversight section has performed three self-assessments of KRONOS. It is planned that the oversight from 2006 onwards to a greater extent shall be performed on a "continuous basis."</p>
<i>Assessment</i>	<b>Broadly observed</b>
<i>Comments</i>	<p>There is a sound framework in place to ensure that KRONOS complies with the CP. The section charged with this task is clearly separated from the department charged with the operation of the system and within the Payment System Department, the oversight function is treated as an autonomous function. However, the Bank's oversight of KRONOS has not yet been formalized in written procedures and manuals describing the sources and methodologies used. Also, the information gathering could be improved.</p> <p><i>Recommendation:</i></p> <p>Within the assignment of the oversight task it is recommended:</p> <ul style="list-style-type: none"> <li>- to draft a mission statement and to work out an oversight methodology and implementation plan.</li> <li>- to ensure that the oversight of KRONOS is performed on a continuous basis by organizing regular meetings with the system providers, establish crisis management, define the information needs, organize the gathering of data, and to set up a database;</li> <li>- to ensure that sufficient resources and expertise are available to reach the set goals and targets either within the oversight section or borrowing expertise from other departments within Danmarks Nationalbank; and</li> <li>- to establish internal and external relationships within the context of the oversight policy.</li> </ul>



	<p>In the work plan for 2006, the Payment System Department has given high priorities to work out procedures and manuals for oversight and to strengthen the oversight task of all systemically important payment systems, including KRONOS.</p> <p>The objectives of Danmarks Nationalbank with respect to payment systems, namely efficiency and stability of payment and securities settlement systems could also be promoted via other roles Danmarks Nationalbank has in the payments and securities area, such as the catalyst role and the operational role. Within this framework it is recommended:</p> <ul style="list-style-type: none"> <li>- to analyze in more depth the pros and cons of the different roles and their usefulness to tackle specific issues in the Danish institutional context;</li> <li>- how the different roles could be optimally used to achieve the set goals and objectives with respect to the payment policy;</li> <li>- to coordinate the use of the different roles.</li> </ul>
<p><b>Responsibility C – The central bank should oversee observance with the core principles by systems it does not operate and it should have the ability to carry out this oversight.</b></p>	
<p><i>Description</i></p>	<p><i>Legal basis for the oversight role</i>  The legal basis for the oversight is found in Section 1 of Danmarks Nationalbank Act, which makes the bank responsible for maintaining a safe and secure currency system in Denmark and to facilitate and regulate the traffic in money. Recently an amendment of the STA had been approved by parliament, spelling out that Danmarks Nationalbank will be the sole authority responsible for overseeing systemically important payment systems. Yet Danmarks Nationalbank has used moral suasion and its role as settlement bank to enforce compliance with international standards and recommendations. The new statutory power will include the option of applying sanctions and performing on-site inspections.</p> <p><i>Elaboration of the oversight of Systemically Important Systems outside the central bank</i>  In cooperation with the DFSA, Danmarks Nationalbank has worked an oversight framework in which systemically important payment systems outside the central bank are defined and in which the two institutions together verify that the systems observe the CPSS Core Principles or the CPSS/IOSCO Recommendations for Securities Settlement Systems. Danmarks Nationalbank and the DFSA have agreed that the Sumclearing, the system used for settlement of retail payments, and VP, the CSD that clears and settles securities, are both systemically important and fall within the scope of the oversight. However, the self-assessment of the Sumclearing had a rather narrow scope, since it covered only the Sumclearing itself and not the underlying two sub-clearings.</p> <p><i>Available skills in the Payment Systems</i>  The oversight section in the Payment Systems Department is staffed by four persons with a background in economics and legal.</p>
<p><i>Assessment</i></p>	<p><b>Broadly observed</b></p>
<p><i>Comments</i></p>	<p>Danmarks Nationalbank oversees at the moment VP and Sumclearing in cooperation with the DFSA—the two systems deemed systemically important by the Danish authorities. However, the oversight task is still in development and could be strengthened further, especially, since the legal basis of the oversight task of Danmarks Nationalbank and the available instruments are first now being spelled out in the STA.</p> <p>In the work plan for 2006, the Payment System Department has given high priorities to work out procedures and manuals for oversight and to strengthen the oversight task of all systemically important payment systems,</p>

	<p>Recommendations:</p> <ul style="list-style-type: none"> <li>- formalize the oversight policy with respect to systems operated outside Danmarks Nationalbank by working out the oversight methodology; written procedures and manuals and ensure the gathering of reliable information about the functioning of the systems involved;</li> <li>- ensure that new strategies and plans for the development of the infrastructure are discussed with the overseers before they are implemented;</li> <li>- broaden the scope of the oversight with respect to the Sumclearing;</li> <li>- establish a crisis management framework with respect to problems in the infrastructure;</li> <li>- ensure that the oversight can be adequately performed in case of outsourcing by the system provider and, if deemed necessary, on-site inspections can be carried out;</li> <li>- strengthen the cooperation with other Danish authorities that have responsibilities with respect to the infrastructure for payment and securities settlement such as the Danish Securities Council, the Danish Competition Authority, the Consumer Ombudsman, and with relevant foreign authorities;</li> <li>- increase the involvement of the participants in the oversight; and</li> <li>- strengthen the reporting of oversight in the annual Financial Stability Report.</li> </ul>
<p><b>Responsibility D – The central bank, in promoting payment system safety and efficiency through the core principles, should cooperate with other central banks and with any other relevant domestic or foreign authorities.</b></p>	
<p><i>Description</i></p>	<p><i>Cooperation with the DFSA</i></p> <p>As the payment systems and securities settlement systems issues are within the responsibility of both institutions, Danmarks Nationalbank and the DFSA cooperate to cover all aspects of the payment and securities settlement systems. The arrangements are laid down in a MOU that is published on the website of the two institutions. The two institutions have agreed:</p> <ul style="list-style-type: none"> <li>(i) which systems are systemically important and should be overseen;</li> <li>(ii) which standards are applicable;</li> <li>(iii) the coordination of their joint task concerning verification of observance with these standards;</li> <li>(iv) consultation with respect to any ruling or decision of vital importance to the designated systems; and</li> <li>(v) collecting and exchange of information.</li> </ul> <p><i>International cooperation</i></p> <p>Danmarks Nationalbank has regular meetings with other central banks and participates in forums with industry representatives for discussion of payment system issues.</p> <p>In June 2003, the governors of the central banks of the Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden) signed a MOU on the management of financial crises in a Nordic bank with activities in two or more Nordic countries. The agreement is based on the standard MoU developed within the EU. It contains principles for crisis management, the required flows of information, and the practical aspects of supplying information. In a potential crisis, the central banks establish a crisis group responsible for providing joint and rapid access to and management of information. The crisis group contacts relevant authorities in the different countries, including the relevant supervisory authorities. If a bank's solvency is in doubt, the countries' Ministries of Finance should be consulted.</p>
<p><i>Assessment</i></p>	<p><b>Observed</b></p>

**Table 8. Summary Observance of Danmarks Nationalbank of the Responsibilities of the Central Bank in Applying the Core Principles**

<i>Assessment Grade</i>	<i>Principles Grouped by Assessment Grade</i>	
	<i>Count</i>	<i>List</i>
Observed	2	A and C
Broadly observed	2	B and D
Partly observed		None
Non-observed		None
Not applicable		None

**Table 9. Recommended Actions to Improve Observance of the Responsibilities of the Central Bank in Applying the Core Principles**

<i>Reference principle</i>	<i>Recommended action</i>
<b>Responsibility A</b> Disclosure of objectives, role and major policy	- None
<b>Responsibility B</b> Compliance of central bank systems	<ul style="list-style-type: none"> <li>- Draft a mission statement and work out the oversight methodology and an implementation plan;</li> <li>- Ensure that the oversight of KRONOS is performed on a continuous basis;</li> <li>- Ensure that sufficient resources and expertise are available;</li> <li>- to establish internal and external relationships within the context of the oversight policy; and</li> <li>- Analyze in more depth the pros and cons of the different roles and their usefulness to tackle specific issues in the Danish institutional context and coordinate the use of the different roles.</li> </ul>
<b>Responsibility C</b> Oversight of non-central bank systems	<ul style="list-style-type: none"> <li>- Formalize the oversight policy with respect to systems operated outside Danmarks Nationalbank;</li> <li>- Broaden the scope of the oversight with respect to the Sumclearing;</li> <li>- Establish a crisis management framework with respect to problems in the infrastructure;</li> <li>- Ensure that the oversight can be adequately performed in case of outsourcing;</li> <li>- Strengthen the cooperation with other Danish authorities and relevant foreign authorities;</li> <li>- Increase the involvement of the participants in the oversight; and</li> <li>- Strengthen the reporting of oversight in the annual Financial Stability Report.</li> </ul>
<b>Responsibility D</b> Cooperation with other authorities	- None

21. Information on other assessments of systemically important payment systems in other industrialized countries can be found in Table 10.

**Table 10. Observance of Core Principles for Systemically Important Payment Systems in Selected Industrialized Countries<sup>1/</sup>**

	Observed	Broadly Observed	Partly Observed	Non-Observed	Number of assessments <sup>2/</sup>
	Percent of assessments				
<b>Core principles</b>					
1. Well-founded legal basis	63	20	14	3	35
2. Clear rules and procedures	80	11	9	--	35
3. Management of credit risks and liquidity risks	80	11	6	3	35
4. Prompt settlement	89	6	3	3	35
5. Same day settlement in netting or deferred gross settlement systems	44	--	33	22	9
6. Settlement asset	100	--	--	--	35
7. High degree of security and operational reliability	83	17	--	--	35
8. Practical and efficient for users	74	23	3	--	35
9. Fair and open access	80	14	--	6	35
10. Governance arrangements	83	9	3	6	35
<b>Responsibilities:</b>					
A. Objectives and disclosure	68	12	4	16	25
B. Compliance with the core principles	75	13	--	13	24
C. Oversight	62	10	10	19	21
D. Cooperation	80	8	--	12	25

1/ Based on 35 assessments of different payment systems in 25 industrialized countries, excluding Denmark. The figures may not add up due to rounding.

2/ Some principles may not be applicable.

## **Authorities' response**

### **Large-value payment system (KRONOS)**

22. The assessments and recommendations for improvements in relation to KRONOS essentially reflect the findings of Danmarks Nationalbank.

23. With regard to the recommendation to renegotiate with the system operator, the legal binding maximum restart time so that it can be reduced from four to two hours, please note that numerous tests in recent years consistently have shown that KRONOS can in practice be restarted in less than one and a half hours. Nevertheless, Danmarks Nationalbank agrees with the recommendation and has started negotiations with the system operator with the aim of resolving the issue.

24. Regarding the recommendation to further analyze the system's efficiency, Danmarks Nationalbank notes that the large number of direct participants shows that an appropriate balance between security and efficiency seems to have been reached. The cost recovery in the system is less than full, but seems adequate and in line with similar RTGS-systems in other small- to medium-sized European countries.

### **Retail payment system (Sumclearing)**

25. The assessments and recommendations for improvements in relation to the Sumclearing are broadly in line with the findings of Danmarks Nationalbank and the DFSA. However, we would like to emphasize that the participants generally have far more eligible collateral than needed for their daily net payments in not only the Sumclearing, but also in the VP settlement and CLS.<sup>16</sup>

26. Danmarks Nationalbank and the DFSA agree to the recommendation that the practice of booking retail payments in customer accounts before the settlement of the payments are final should be terminated. Therefore, Danmarks Nationalbank and the DFSA will start discussions with the banking sector with the aim of changing this practice.

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<sup>16</sup> In a study triggered by this assessment, it was demonstrated that in 2005, all larger banks' eligible collateral significantly exceeded their total net payment obligations in all systems—even when the participant with the largest net payment obligation was withdrawn from the settlement on every day during 2005 and all the remaining participant's net positions were recalculated. Among the minor banks, however, only a handful of banks had recalculated net positions, which on very few days surpassed the value of their eligible collateral. However, this reflects flaws in the methodology used in the study that tends to exaggerate the effects on small banks and does not include the fact that banks can pledge securities for intraday credit already in the settlement cycle in which the securities are received. The study "Protection of Settlement in Danish Payment Systems" can be found in *Financial Stability 2006* published by Danmarks Nationalbank (Copenhagen). It is available on: <http://www.nationalbanken.dk/>.

27. Danmarks Nationalbank and the DFSA take note of the recommendation to lower the financial risks in the system by implementing additional measures such as loss-sharing agreements or pools of collateral or by lowering the net positions settled, for instance, by restructuring the settlement cycle and introduce new settlement blocks during the day. These proposals will in the near future be further analyzed. Danmarks Nationalbank will start discussions with the system owner with a view to identifying costs and benefits associated with the various proposals.

28. The supervision of settlement agents and the indirect participants as well as possible concentration risks related to such indirect participation lies primarily with the DFSA. The DSFA has taken note of the recommendation to gather information on possible concentration risk, etc., and analyze the consequences for smaller banks and the trust in the system in case of a default of one of the larger settlement banks. As the DFSA has already considered these questions as part of its supervision of settlement banks, the DSFA's understanding of the recommendation is that such supervision, in the opinion of the IMF, should be carried out on a more formalized and recurrent basis. Steps will be taken to this effect.

### **Central bank responsibilities**

28. The recommendations to further strengthen the oversight of the Danish payment and settlement systems are consistent with the self-assessment done by Danmarks Nationalbank. It should be noted though that important steps towards full observance of the international standards on central bank oversight have already been taken. The legal basis, for instance, has been strengthened by an amendment to the STA, which has become effective from March 1, 2006. Following this amendment, the "memorandum of understanding between Danmarks Nationalbank and the Danish Financial Supervisory Authority concerning payment systems and clearing centres" will be revised with a view to further enhancing the cooperation between the two authorities. In addition, Danmarks Nationalbank will take the necessary steps to broaden the oversight of the retail payment system (Sumclearingen) with a view to cover all major components of the system, including different payment instruments and sub-clearings. High priority will be assigned to formalize the oversight task through written procedures and guidelines. Thus, full observance is expected to be achieved in 2006.