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DANMARKS NATIONALBANK

Description of Kronos2 in relation to international principles



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Summary

Danmarks Nationalbank owns and operates the only system for real-time settlement of large, time-critical payments in Danish kroner, Kronos2. The central position of Kronos2 in the financial infrastructure places strict requirements on the safety and efficiency of the system. Consequently, Danmarks Nationalbank makes continuous adjustments to Kronos2 to make sure that international standards are observed.

The daily value of Kronos2 transactions is more than kr. 250 billion, of which payments between the participating credit institutions amount to almost kr. 90 billion. In addition, Kronos2 is used for the settlement of monetary policy transactions and net positions from connected payment and settlement systems.

This report provides a detailed description of Kronos2's observance of the international principles of financial market infrastructures formulated by the Committee on Payments and Market Infrastructures in collaboration with the International Organization of Securities Commissions (collectively referred to as 'CPMI-IOSCO').

The description is structured as prescribed in the guidelines prepared by CPMI-IOSCO and begins with a summary of significant changes since the last update. This is followed by a general description of Kronos2. Finally, the individual principles are reviewed, with descriptions of how each requirement which is relevant to Kronos2 is met.

Summary of significant changes since the last update

Since the last update of the description of Kronos in July 2016, there have been several significant changes to Danmarks Nationalbank's payment and settlement system:

- In August 2018, Danmarks Nationalbank's existing real-time gross settlement system, Kronos, was replaced by Kronos2 – a more up-to-date system with a more robust underlying technical infrastructure.
- In connection with the implementation of Kronos2, responsibility for the calculation of the

traditional collateral provided by participants was moved from VP Securities A/S (VP) to Kronos2.

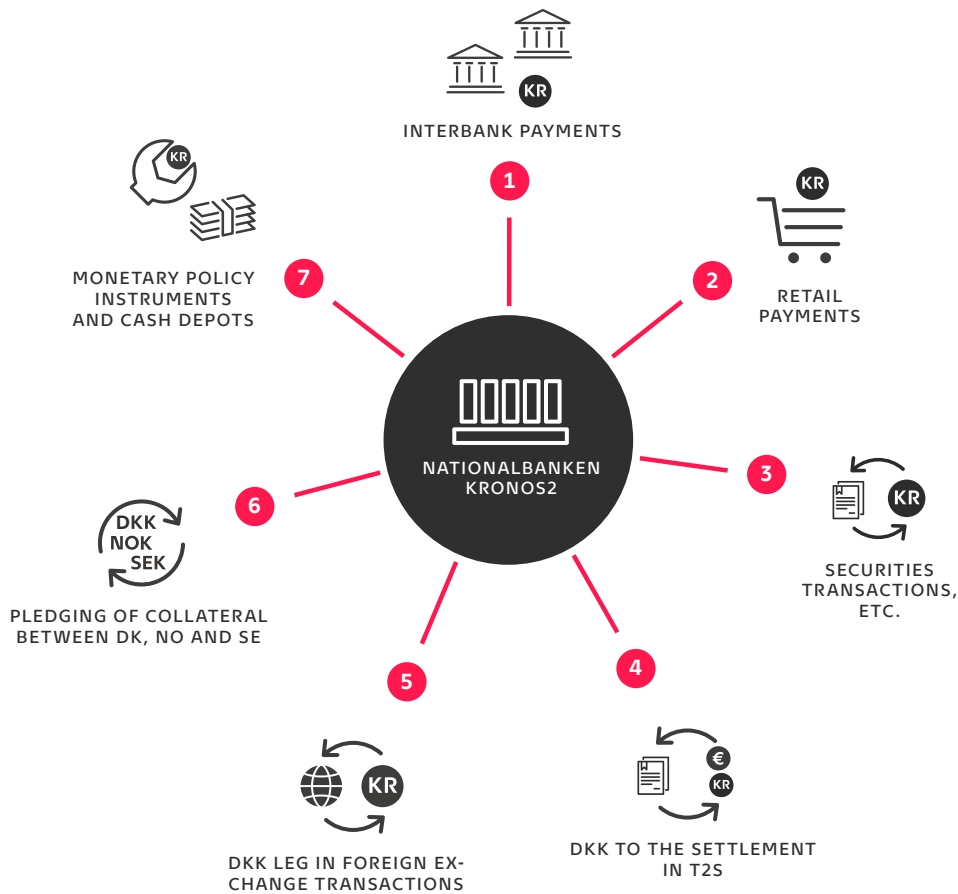
- In October 2018, the Danish krone joined the pan-European securities settlement platform, TARGET2Securities (T2S), which is operated by the Eurosystem. Kronos2 is the only RTGS system other than the euro area TARGET2 system to have joined T2S. Since then, securities settlement is handled by two systems: VP and T2S. VP has migrated the settlement of securities transactions of professional players to T2S, while the transactions of private investors continue to be settled on VP's own platform.
- As a result of joining T2S, the monetary policy day has been brought forward from 17.30 to 16.45 on the following day, from previously 16.30 to 15.30.
- A new pricing model has been introduced for Kronos2 participants. The allocation key is now based on the number and value of the participants' transactions in Kronos2, whereas in the past the allocation of the costs to be covered by the participants was based on the working capital of the participants.

General background on Kronos2

General description of Kronos2

Kronos2 is a real-time gross settlement (RTGS) system, and is used for the individual and immediate settlement of primarily large or time-critical payments in Danish kroner. Kronos2 plays a key role in the Danish payment infrastructure, as Kronos2 is used to settle payments between banks and mortgage credit institutions in Denmark and to settle net positions from connected payment and settlement systems. Kronos2 is also used for monetary policy transactions in connection with Danmarks Nationalbank's monetary policy management. This document primarily describes Kronos2 as a payment and settlement system.

Most banks and mortgage credit institutions in Denmark hold accounts with Danmarks Nationalbank in the same way private individuals hold accounts with commercial banks. In other words, Danmarks Nationalbank serves as banker to the banks for payments in Danish kroner. Besides the banks, a number of payment and settlement systems and clearing centrals also hold accounts with Danmarks Nationalbank.



Payments in kroner involving more than one bank ultimately go via Kronos2 for settlement, either as an interbank payment or via a payment or settlement system, i.e. VP, T2S, CLS, Sum Clearing, Intraday Clearing and Express Clearing.

Settlement in Kronos2

Chart 1 shows which payments are settled via Kronos2:

1. Interbank payments are payments between two financial institutions in the interbank market, also known as the money market. These payments are settled individually and instantly, i.e. immediately after Danmarks Nationalbank's receipt of the payment instructions. If both institutions participate in Kronos2, the payment can be settled via their current accounts with Danmarks Nationalbank. If the institutions do not participate in Kronos2, their payments can be settled via correspondent banks participating in Kronos2. Kronos2 participants may also settle payments in Kronos2 on behalf of their customers, known as customer payments.
2. Sum Clearing, Intraday Clearing and Express Clearing are Finance Denmark's systems for clearing and settlement of Danish retail payments, e.g. Dankort (debit card) transactions, Betalings-service (direct debit) and credit transfers. Sum Clearing and Intraday Clearing are multilateral net settlement systems, in which final transfer of funds between participants takes place via Kronos2 accounts. Express Clearing is a real-time settlement system for payments of up to kr. 500,000, pre-financed via Kronos2.
3. VP settlement is owned by VP Securities A/S (VP) and is a system for settlement of securities transactions and periodic payments (interest, repayments and dividend). For securities transactions, the securities leg is settled in VP, while the cash leg is settled via the participants' accounts with Danmarks Nationalbank. In addition, gross

transactions may be settled in real time, i.e. instantly. In a securities transaction, securities are exchanged in custody accounts in VP, while payment is exchanged via the participants' accounts in Kronos2 or TARGET2, the European RTGS system for payments in euro.

4. The T2S settlement is a pan-European securities settlement system for the settlement of both cross-border and national securities transactions. In the T2S settlement process, the securities and money legs are settled via T2S, while Danish kroner for the settlement of the money leg of T2S are covered via Kronos2. Similarly, excess liquidity in Danish kroner in the participants' accounts in T2S is transferred to the participants' accounts in Kronos2.
5. CLS is a multilateral clearing and settlement system for foreign exchange transactions in currently 18 currencies. The krone leg in the participants' foreign exchange transactions is settled via CLS Bank's account with Danmarks Nationalbank. CLS is owned by a number of large international banks.
6. Scandinavian Cash Pool, SCP, is a system for the provision of cross-border collateral for intraday credit in Danish and Norwegian kroner and Swedish kronor. The main principle of SCP is that liquidity raised from the central bank of one country can be provided as collateral to the central bank of another country.

7. Kronos2 also handles monetary policy instruments and cash depots.

In 2020, an average of approximately 6,100 daily interbank payments with a total value of kr. 87.6 billion were settled in Kronos2, see Table 1. The average value of the individual payments was approximately kr. 14 million. There are no upper or lower limits on the size of each payment in Kronos2.

Participants

Kronos2 participants are primarily banks, mortgage credit institutions and branches of foreign credit institutions. Other entities may also participate if Danmarks Nationalbank consider them to be significant to the settlement of payments. Examples are CLS Bank and EuroCCP. These participants must be subject to supervision by the Danish Financial Supervisory Authority or subject to supervision in another EU member state or in a country with which the EU has concluded a cooperation agreement on home country supervision. In 2020, there were 85 Kronos2 participants.

General organisation of Kronos2

Kronos2 is operated by Danmarks Nationalbank, as in many other countries it is the central bank that operates the national RTGS system. Hence, the top management of Danmarks Nationalbank consti-

Transactions in Kronos2

Table 1

Kr. billion,
averages per banking day

	2016	2017	2018	2019	2020
Interbank payments	83.0	74.0	83.0	87.4	87.6
- Customer payments	11.5	11.5	13.6	14.0	14.0
Monetary policy operations	28.7	39.9	36.9	48.4	34.5
- Sale of certificates of deposit	28.6	39.9	36.9	48.4	33.3
- Monetary policy lending	0.1	0.0	0.0	0.0	1.3
Transfers to settlement systems	283.4	316.3	237.3	115.1	113.8
- Sum Clearing, Intraday Clearing and Express Clearing	242.7	273.8	177.2	40.5	39.9
- VP settlement	31.7	32.5	40.6	46.4	41.2
- CLS	9.0	10.0	19.6	28.2	32.8
Net positions settled	25.1	24.8	24.1	16.3	16.6
- Sum Clearing, Intraday Clearing and Express Clearing	7.6	8.0	8.1	8.3	8.3
- VP settlement	10.6	10.1	9.1	1.0	0.9
- CLS	6.9	6.7	6.8	7.0	7.3

tutes the top management of Kronos2. Danmarks Nationalbank is a self-governing institution, and the composition of the top management is documented in the National Bank of Denmark Act, which is publicly accessible.

At Danmarks Nationalbank, responsibility for Kronos2 operations is broken down at the strategic, tactical and operational levels in accordance with Danmarks Nationalbank's internal guidelines for management of system ownership. This model ensures that strategic decisions are elevated to the highest management level, while tactical and operational issues can be handled at the lower levels. In other words, top management charts the course for Kronos2, while the day-to-day management can be handled closer to the business.

Legal framework

Section 1 of the National Bank of Denmark Act 1936 states that Danmarks Nationalbank must "maintain a safe and secure currency system in this country, and [...] facilitate and regulate the traffic in money and the extension of credit". This section is the foundation for Danmarks Nationalbank's operation of the payment system Kronos2, and hence the system has, in all respects, been designed with a view to ensuring and facilitating the exchange of large, time-critical payments between participants. Danmarks Nationalbank's oversight of systemically important payment and settlement systems, which is also based on section 1 of the National Bank of Denmark Act, ensures that Kronos2 meets international standards.

Danmarks Nationalbank has outsourced the IT operation of Kronos2 to BEC Financial Technologies (BEC). The day-to-day operations and management are thus handled jointly by the BEC (IT operation), Danmarks Nationalbank's management and the software provider Perago. Responsibilities, obligations and rights between Danmarks Nationalbank and the BEC are contractually regulated.

The contractual basis between Danmarks Nationalbank and Kronos2 participants is the documentation for settlement of payments in kroner, which is part of the 'Documentation for monetary-policy instruments and settlement of payments in DKK and EUR', hereinafter referred to as the 'terms and conditions for accounts'. The terms and conditions for accounts regulate all matters between the participants and Danmarks Nationalbank in connection with settlement of payments in Danish kroner at Danmarks Nationalbank.

The Kronos2 system

Account structure

All Kronos2 participants must hold a current account in Danish kroner. In Kronos2, the current account is divided into two accounts: a settlement account where incoming and outgoing payments are booked and where the balance can be positive or nil, and a loan account which is the participant's account for the utilisation of intraday credit and where the balance can be negative or nil. Payments from the current account (settlement account and loan account) are made individually and instantly in real time via the real-time mechanism (RTM) feature. The settlement account and loan account are collectively referred to as a current account.

In addition, a Kronos2 participant may link a number of accounts related to payment and securities settlement systems' settlement of payments in Danmarks Nationalbank. Participants may request one or more of the following settlement accounts:

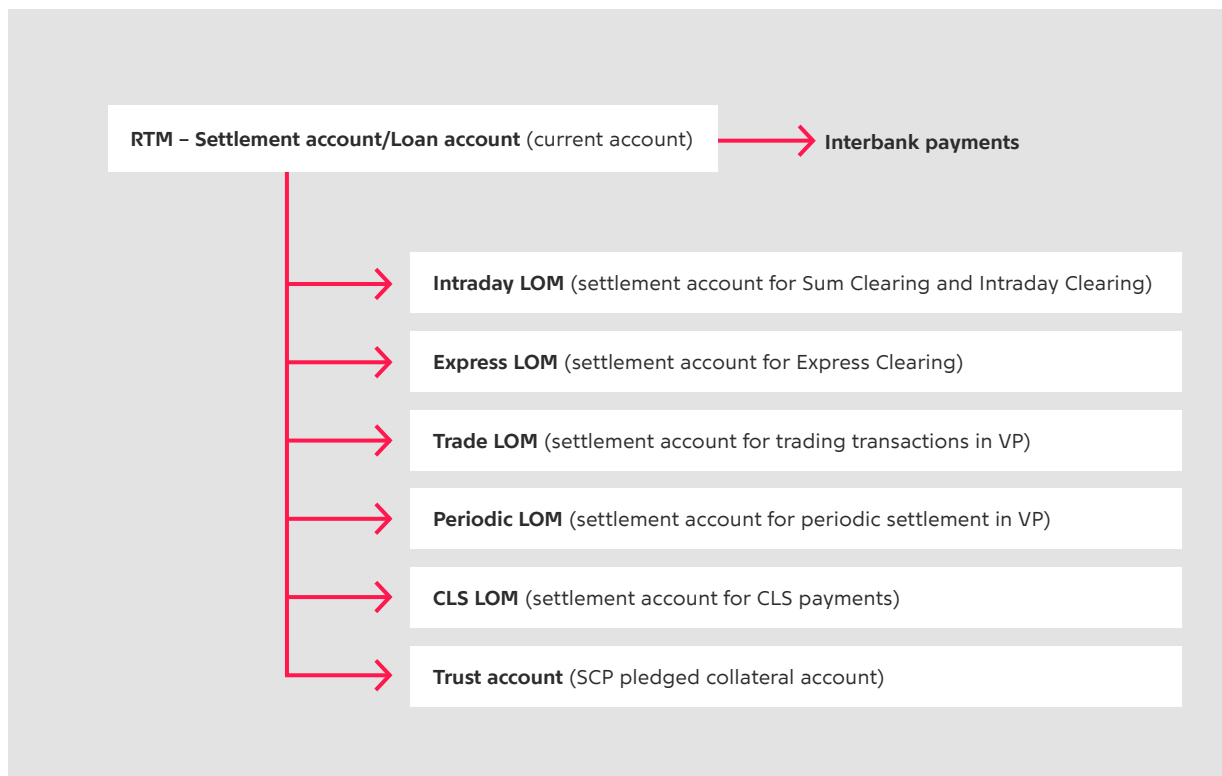
- settlement accounts for retail payments, including settlement accounts for Sum Clearing, Intraday Clearing and Express Clearing
- settlement accounts for securities settlement in VP, including settlement accounts for trading transactions and periodic settlements
- settlement accounts for settlement of CLS payments
- pledged collateral accounts for the provision of cross-border collateral under Scandinavian Cash Pool, SCP.

The account setup is illustrated in Chart 2:

Kronos2 participants participating in the securities settlement in T2S also have one or more settlement accounts in T2S known as dedicated cash accounts (DCAs). Participants can transfer liquidity in Danish kroner to and from their DCA in T2S via Kronos2.

Remuneration

The current account is remunerated at the 'current account rate', which is one of the monetary policy interest rates. Interest is calculated on the basis of the balance in the current account at the close of the monetary policy day, i.e. at 16.45. Settlement accounts are non-interest bearing, and no interest is payable on intraday credit either. When the monetary policy day ends, all intraday loans must have been covered, and settlement accounts must have been emptied.



Structure of Kronos2

Kronos2 is composed of the following two modules, which the participants can use depending on the individual participant's role in the system:

- RTGS – Real-time gross settlement
- GCSD – General central securities depository.

The RTGS module

All participants have access to the RTGS module, which is at the heart of Kronos2. The RTGS module allows participants to make payments, participate in settlements, get an overview of liquidity, perform transaction searches etc. The RTGS module is accessed by the participants via the Kronos2 graphical user interface (GUI), which serves as an online banking service for the participants.

Participants using SWIFT typically have their own automated systems allowing them to use SWIFT to

settle payments in Kronos2 without manual interference, i.e. by means of straight-through processing (STP). Kronos2's RTGS module automatically translates payment messages between the Kronos2 GUI and SWIFT, allowing participants with and without SWIFT to send payments to each other. Participants with SWIFT send nearly all payments via SWIFT, while smaller participants without SWIFT send all their payments manually via the Kronos2 GUI. So by not requiring that participants use SWIFT, Kronos2 caters to both large and small participants.

The GCSD module

The GCSD module is accessed via the Kronos2 GUI and is used by monetary policy counterparties and by participants using traditional pledging of collateral in Kronos2.¹ Participants can access monetary policy instruments through the GCSD module, including certificates of deposit and monetary policy loans, and request the depositing and removal of securities

¹ See the section 'Traditional provision of collateral' in the section 'Intraday credit and collateral'.

to/from their custody account.² Banks, which also serve as cash centres, also use the GCSO module to record transactions in and out of the cash centre.

Payment instructions in Kronos2

Participants can choose from the following types of payment instructions in Kronos2:

- Payments to other participants (MT202)
- Payments to and from a customer (MT103)
- Transfers between own accounts
- Transfers to and from settlement accounts in T2S.

Payment instructions are executed immediately unless the participant has submitted the payment instruction with a later value date. Payments can be scheduled for settlement on a future value date up to 14 calendar days ahead, in which case payments are placed in a value date queue. In the Kronos2 GUI, participants can view and cancel payment instructions in a value date queue. Payment instructions can also be registered with an execution time which is linked to a specific time or event in Kronos2, for example the start of a settlement run.

Checks and rejection of payments

Before a payment instruction is executed, a check is performed to ensure that the instruction contains all the information necessary to settle the payment, and that the sender has sufficient funds available to send the payment. A payment instruction is rejected if the time or value date stated in the instruction is incorrect, if the recipient or currency is unknown, or if the payment instruction was submitted outside Kronos2's opening hours. For current accounts, payments can only be made in real time, which means that the payment is rejected if there are insufficient funds available to execute the payment instruction at the time of payment. Consequently, liquidity queues are not used for current accounts in Kronos2.

Sufficient funds availability

check prior to payment processing

Sufficient funds availability checks of the participant's current account and unutilised intraday credit (provided that the participant is using collateral in Kronos2) are carried out automatically. When

intraday credit is used to execute a payment instruction, a withdrawal is automatically made from the loan account corresponding to the amount needed to execute the payment instruction. The amount is transferred from the loan account to the settlement account, from which the payment instruction is executed. The utilised intraday credit is shown in the participant's collateral list in Kronos2.

Settlements in Kronos2

Danmarks Nationalbank serves as a settlement bank for payments in Danish kroner for other payment and settlement systems in the Danish payment infrastructure, i.e. VP, CLS, Sum Clearing, Intraday Clearing and Express Clearing. In addition, participants can transfer liquidity in Danish kroner to and from T2S via Danmarks Nationalbank.

Settlement times

The money leg of settlements in Danish kroner is settled in Kronos2³ at fixed times throughout the monetary policy day:

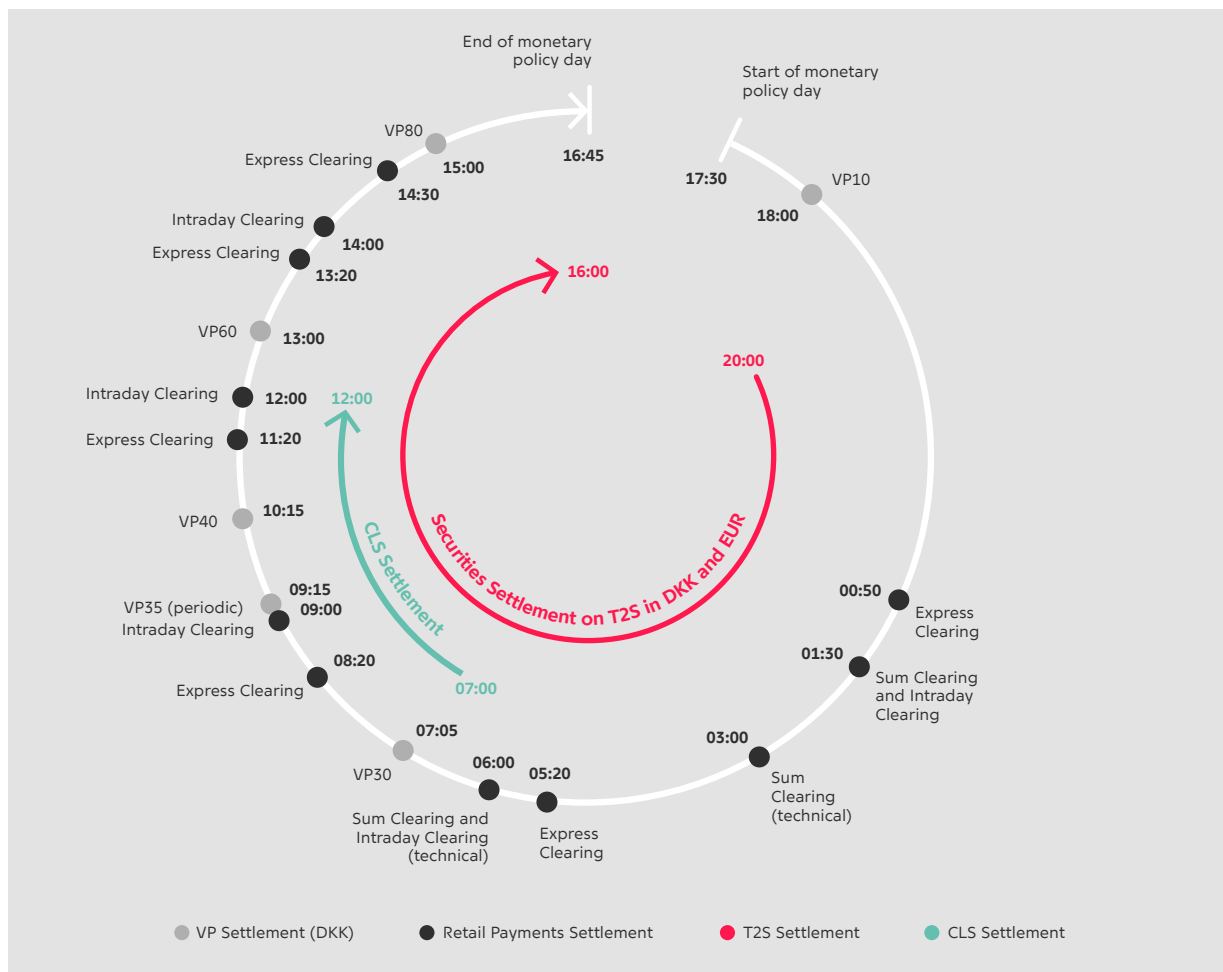
- Sum Clearing takes place at 01.30 and at 06.00 on the first banking day after a bank closing day.
- Intraday Clearing takes place at 01.30, 09.00, 12.00 and 14.00.
- Express Clearing takes place at 00.50, 05.20, 08.20, 11.20, 13.20 and 14.30.
- VP settles five settlement cycles for securities transactions at around 18.00, 07.05, 10.15, 13.00, 15.00, and a settlement cycle for periodic payments at 09.15.
- CLS settlement takes place from 07.00 to about 12.00.
- T2S settlement takes place primarily in night-time net settlement cycles, but is also open for gross settlement during the day until 16.00. Participants can transfer liquidity to and from T2S during the T2S settlement day, from 20.00 to 16.00 the following banking day.

In value terms, most of the settlements take place outside Kronos2's normal opening hours.

The settlement times are illustrated in Chart 3:

² The further processing of participants' requests for the depositing and removal of securities is handled by Danmarks Nationalbank's collateral management system, CMS, which is managed by Danmarks Nationalbank's portfolio management system, Calypso, which is integrated with Kronos2.

³ With the exception of T2S settlement, where both the money and securities legs are settled in T2S.



Settlement process

The money leg of VP settlement and Sum Clearing, Intraday Clearing and Express Clearing is settled in ‘cycles’ via designated settlement accounts. Before a settlement cycle starts, liquidity is transferred from the participants’ current accounts to the appropriate settlement account. Kronos2 then sends credit lines for each participant, informing VP or Mastercard Payment Services⁴ of the balance in the participants’ settlement accounts, i.e. the amount guaranteed by Danmarks Nationalbank on behalf of the participants. After settlement, any balance in the settlement accounts is automatically transferred to the participants’ current accounts. CLS settlement

in Danish kroner takes place continuously between CLS’s account in Kronos2 and the participants’ CLS settlement accounts in Kronos2.

Obtaining liquidity for settlements

Kronos2 offers several methods of obtaining liquidity for settlements. Participants can transfer liquidity to the settlement accounts via SWIFT or the Kronos2 GUI, either on an ad hoc basis or via standing orders, i.e. a regular transfer from a current account to a settlement account. In Sum Clearing and Intraday Clearing, liquidity is obtained automatically in Kronos2, which means that the system automatically transfers the required liquidity of the participants

⁴ Mastercard Payment Services is the operator of retail payment settlements via Sum Clearing, Intraday Clearing and Express Clearing.

prior to settlement, based on information received from Mastercard Payment Services about each participant's net position. In Express Clearing, liquidity is also reserved automatically but as a current credit line, for which collateral is provided in the participants' collateral list⁵. Express Clearing is thus pre-financed.

The obtaining of liquidity in Kronos2 is generally based on current account balances, available intraday credit and the automatic collateralisation available to participants participating in VP automatic collateralisation⁶. Kronos2 thus has various built-in features which are designed to smoothen the process of reserving participant liquidity for settlements.

Intraday credit and collateral

Intraday credit

The individual and ongoing settlement of all payments in an RTGS system such as Kronos2 means that participants need to maintain a high level of intraday liquidity. To ensure that participants have sufficient liquidity to smoothly settle payments, Danmarks Nationalbank offers participants intraday credit. The credit consists in a drawing right on the participant's loan account with Danmarks Nationalbank and is collateralised against a wide range of securities.

Participants may provide collateral for intraday credit in the form of traditional pledging of collateral, certificates of deposit and via automatic collateralisation (floating charge) in VP and via SCP.

The participants' available credit with Danmarks Nationalbank is shown in a special list in Kronos2 – the collateral list. The list illustrates pledged collateral, intraday and interday credit⁷ and available collateral.

Traditional pledging of collateral

The most commonly used form of collateral in Kronos2 is the traditional pledging of collateral, where participants transfer eligible securities to a custody account pledged to Danmarks Nationalbank. The collateral value of the assets is calculated on the ba-

sis of their market value less a market price haircut. In the absence of a market value for a given security, the collateral value is calculated on the basis of a synthetic price. In this case, a further haircut of 5 per cent is taken on top of the market price haircut. The haircuts applied are based on the degree of liquidity of the assets and their remaining time to maturity. If euro-denominated securities are provided as collateral for credit in Danish kroner, a currency haircut is also deducted. The collateral basis is limited to securities for which the underlying legislation ensures a high credit quality. Eligibility criteria and valuation are automatically handled in the CMS module, which is part of Danmarks Nationalbank's portfolio management system, Calypso. An overview of eligible securities for credit in Danish kroner is provided in the list of eligible assets, the LEA list, which is available in Kronos2. The list is updated daily on all Danish banking days. The LEA list is also available on Danmarks Nationalbank's website, where it is updated weekly.

Certificates of deposit

Participants may invest surplus liquidity in certificates of deposit. Certificates of deposit are zero-coupon securities where the remuneration consists of the difference between the purchase price and the redemption price of the certificates of deposit. The certificates of deposit have a maturity up to the next ordinary open market operation (typically seven days). The nominal value of the participants' certificates of deposit is included in the participant's collateral, less a haircut of 1 per cent. The collateral value of certificates of deposit can be used as collateral for the participant's intraday credit.

VP automatic collateralisation

Automatic collateralisation is a system for the provision of collateral for intraday credit in Danish kroner. In automatic collateralisation, the participant may provide collateral securities deposited in one or more designated custody accounts with VP, typically trading accounts. Unlike a traditional pledge, automatic collateralisation does not tie certain assets to a custody account. Instead, in automatic collateralisation, part of

5 The collateral list is an inventory of the participant's reserved and utilised collateral as well as available collateral; see also the section 'Intraday credit and collateral' below.

6 See also the section 'VP automatic collateralisation' in the section 'Intraday credit and collateral' below.

7 Unlike *intraday credit*, *interday credit* is an overnight loan, i.e. a loan with a maturity of more than one day. One example is monetary policy loans, which typically has a maturity of one week.

the value of the participant's securities corresponding to the amount borrowed, less a haircut, is pledged to Danmarks Nationalbank. The securities in the automatic collateralisation account are at the disposal of the participant as long as the value of the account exceeds the total loans raised under automatic collateralisation. Eligible securities under automatic collateralisation are also shown in the LEA list.

SCP – Scandinavian Cash Pool

SCP is a system for the provision of cross-border collateral for intraday credit in Danish kroner, Norwegian kroner and Swedish kronor. SCP may be used by participants with branches in two or more of the countries covered by the agreement. When an SCP participant reserves liquidity in Swedish or Norwegian kroner as collateral for the participant's intraday credit in Kronos2, Kronos2 automatically converts the reserved currency amount into Danish kroner and deducts a haircut of 5 percent. The calculated collateral value of SCP is shown in the participant's collateral list.

Sufficient funds availability for intraday credit

Sufficient funds must be available for intraday credit by 16.45 when the monetary policy day ends. If a participant does not have sufficient funds in their loan account by 16.45, Kronos2 automatically transfers an amount from the settlement account to the loan account corresponding to the negative balance in the loan account.

For Kronos2 participants participating in the T2S settlement process, the participants' end-of-day position in T2S is automatically transferred to Kronos2 after the payment settlement cut-off in T2S at 16.00. If the participants have used intraday credit in T2S, any negative positions of the participants will automatically be covered by their current accounts in Kronos2. If a participant does not have sufficient liquidity in Kronos2, the outstanding loan is automatically transferred from T2S to Kronos2. The loan

is then converted into an intraday credit in Kronos2 (drawing right on the loan account), for which sufficient funds must also be available by 16.45.

Opening hours

Danmarks Nationalbank's monetary policy day begins at 17.30 on every banking day and ends at 16.45 on the following banking day.

Kronos2 is open for payment settlement (interbank payments) on all Danish banking days between 07.00 and 16.45⁸. Kronos2 is open for adjustment of the participants' collateral during the same period.

Kronos2 is open for payment and securities settlement systems' payment settlement from 17.30 until the cut-off for individual settlements at 15.55 (VP) and 16.15 (retail clearing and CLS), respectively.

Prices

All participants are charged a fixed, monthly, individual Kronos2 fee. Kronos2 participants participating in the T2S settlement process are also charged a separate Kronos2 T2S fee. The fees cover Danmarks Nationalbank's ongoing operating and development costs.

The fees, which are adjusted annually, are based on two components: The collection basis and the allocation key.

- The collection basis is the total amount to be paid by the participants in the coming year. It consists of Danmarks Nationalbank's expected operating and development costs in the coming year plus or minus the difference between last year's expected and actual costs and income. A separate collection basis is calculated for Kronos2 and Kronos2 T2S, respectively, since the costs associated with Kronos2 T2S are to be covered solely by the participants in the T2S settlement process.
- For Kronos2, the allocation key is as follows:⁹

⁸ Most payments are settled in the morning.

⁹ The model for operating cost allocation corresponds to the model prepared by Finance Denmark for the allocation of the initial development costs of Kronos2. The model is based on usefulness, where usefulness is represented by the total number and value of participant transactions in Kronos2. However, a small part (1 per cent) of the costs is distributed equally among the participants, so that everyone pays the same basic amount. This should reflect that all participants have access to the system's facilities, regardless of whether they use the system a lot or not very often.

- 1 per cent of the total Kronos2 collection basis is distributed equally among all participants.¹⁰
- The remaining 99 per cent is distributed on the basis of an equal weighting of the participants' share of the total number and the total value of transactions in Kronos2 in the year of calculation. The transaction target is all transactions in the current account.¹¹
- For Kronos2 T2S, the collection basis is distributed equally among the T2S participants, as the amount is modest.

In addition to the fees, participants in the T2S settlement process pay a monthly amount on account to cover their own use of information services on the T2S platform.

A new Kronos2 participant will be charged a share of the initial development costs as an entry payment, corresponding to what the institution would have paid had it been a participant from the time Kronos2 was commissioned.¹²

The entry payment from a new participant is included in next year's total fee calculation and thus benefits those participants who paid the initial development costs. The same principles apply to new participants in the T2S settlement process.

Fees

Danmarks Nationalbank may charge fees to participants with an overdraft and when returning error payments to Danmarks Nationalbank:

- The intraday overdraft fee is DKK 25,000 for overdrafts existing at 16.45 and another DKK 25,000 if the overdraft persists at 17.15. In the event of repeated overdrafts by the same participant, Danmarks Nationalbank is entitled to either bar access to overdrafts without notice or terminate the customer relationship.
- The fee for returning error payments is DKK 500. Error payments are payments that were sent from a participant to Danmarks Nationalbank by mistake.

10 However, account holders with a transaction volume below a certain limit are exempted.

11 However, no account holder at group level is required to pay more than one third of the total collection basis. If the group's total payment exceeds one third, the payment for the largest of the group's institutions is reduced.

12 The initial cost of developing Kronos2 and Kronos2 T2S was charged to the participants as a one-off payment in connection with the commissioning of the systems.

Principle 1: Legal basis

An FMI should have a well-founded, clear, transparent, and enforceable legal basis for each material aspect of its activities in all relevant jurisdictions.

KC 1:

Legal basis

The legal basis should provide a high degree of certainty for each material aspect of an FMI's activities in all relevant jurisdictions.

The legal basis for Kronos2 comprises:

- The contractual basis for Kronos2 (Danmarks Nationalbank's terms and conditions for accounts)
- National Bank of Denmark Act 1936
- Other relevant Danish legislation¹³.

Contractual basis for Kronos2

The contractual basis for Kronos2 comprises: 'Danmarks Nationalbank's terms and conditions for accounts – documentation for monetary-policy instruments and settlement of payments in DKK and EUR' (Danmarks Nationalbank's terms and conditions for accounts) ([link](#)).

Principle of freedom of contract

The general principle of freedom of contract in Danish law means that agreements between two or more parties enjoy extensive protection. Danmarks Nationalbank is regarded as a 'special administrative body', and preparation of the terms and conditions for accounts, including the rules for Kronos2, is a general administrative act within Danmarks Nationalbank's remit as the central bank of Denmark. This means that Danmarks Nationalbank's terms and conditions for accounts are not subject to negotiation (unlike traditional contracts). But when preparing the terms and conditions for accounts, Danmarks Nationalbank must observe a number of administrative rules and basic principles.

National Bank of Denmark Act 1936

Section 1 of the National Bank of Denmark Act 1936 states that Danmarks Nationalbank must 'maintain a safe and secure currency system in this country, and [...] facilitate and regulate the traffic in money and the extension of credit'. This section forms the legal basis for Danmarks Nationalbank's operation of the Kronos2 payment system.

Other relevant Danish legislation

The rules in Danish law relevant to Kronos2 are set out in Danish property law (freedom of contract) and the Danish Capital Markets Act, among others, which implements Directive 98/26/EC of the European Parliament and of the Council of 19 May 1998 (the Finality Directive); see below. These rules address the issue of finality of payment and access to realisation of collateral. Relevant rules are described below.

Electronic payment rules

Payments via electronic transfer methods are recognised as legally valid, and electronic entries are recognised by the Danish courts as sufficient documentation.

Finality rules

Kronos2 is registered as a designated payment system with the European Securities and Markets Authority (ESMA) in accordance with the rules of the Finality Directive, which have been implemented in the Danish Capital Markets Act. The Finality Directive generally focuses on two issues: the finality of settlement in payment and settlement systems, and the option to satisfy claims by realising collateral, irrespective of a participant's possible insolvency.

In accordance with section 166 of the Danish Capital Markets Act, Kronos2 contains rules on

- when a transfer order is deemed to have been entered into the system, and
- the time when a transfer order entered into the system can no longer be revoked by a participant or a third party.

¹³ All laws etc. passed by the Danish Parliament are publicly accessible at retsinformation.dk (in Danish). In addition, the most important legislation for the financial sector is available in English on the Danish Financial Supervisory Authority's website, www.finanstilsynet.dk.

According to Danmarks Nationalbank's terms and conditions for accounts, a Kronos2 transaction has been executed when it has been registered in the current account. A transaction between two or more account holders at Danmarks Nationalbank has been executed when it has been registered on all accounts with Danmarks Nationalbank affected by the transaction.

Hence, all payments in Kronos2 are final and irrevocable, even in the event of the bankruptcy or resolution/restructuring of a participant, when the amount has been debited from/credited to the account.

Netting rules

Multilateral netting is recognised in Danish law, also if a participant in a payment system goes bankrupt or is subject to resolution/restructuring proceedings; see section 163 of the Danish Capital Markets Act.

Netting is not used as Kronos2 is an RTGS system where all payments are settled individually and immediately following a payment instruction, unless the participant has submitted the payment with a later value date.

In addition, recognition of netting is important to ensure an overall smooth settlement process in Kronos2, as several multilateral netting systems settle via Kronos2.

Rules on the provision of collateral and enforcement of collateral

Kronos2 participants may use various forms of collateral for intraday credit in Danish kroner: Traditional pledging of collateral, certificates of deposit, automatic collateralisation as set out in sections 181(3) and 182(2) of the Danish Capital Markets Act, and Scandinavian Cash Pool as described in further detail in Principle 5.

As a general rule, under Danish law the extent of the pledge is determined by the agreement between the pledgor and the pledgee. According to the 'Deed of Pledge for Credit Facilities in Danish Kroner at Danmarks Nationalbank', the pledge to Danmarks Nationalbank includes repayments and interest on pledged securities falling due before the time of realisation. Repayments and interest are credited to yield accounts pledged to Danmarks Nationalbank as collateral for any debt owing to Danmarks Nationalbank by the institution at that time or in the future.

Collateral in the form of securities or account balances may be realised at once if a prior agreement to this effect has been concluded; see section 168 of the Danish Capital Markets Act. Such an agreement has been concluded between Danmarks Nationalbank and the individual account holder in the signed Deeds of Pledge. The deeds state that should Danmarks Nationalbank wish to enforce its collateral rights to the securities registered to the account, Danmarks Nationalbank is entitled without prior legal action or prior warning to realise such securities in the manner determined by Danmarks Nationalbank. Furthermore, Danmarks Nationalbank is entitled to take over ownership of the securities so pledged. In the case of collateral in the form of account balances, the securities are realised through offsetting.

The provision of collateral for credit in Kronos2 cannot be reversed pursuant to sections 70(1) or 72(2) of the Danish Insolvency Act.¹⁴ This follows from section 167 of the Danish Capital Markets Act, whereby collateral provided to securities settlement systems, registered payment systems, interoperable systems, Danmarks Nationalbank or participants in such systems cannot be reversed (unless the collateral has not been provided without undue delay or it does not appear to be ordinary).¹⁵

¹⁴ It is a condition, however, that the collateral is provided without undue delay after the lack of collateral occurred, and the collateral must be provided in accordance with normal procedures. Kronos2 fulfils these conditions.

¹⁵ It should be noted that the issue of collateral pledged for old debt will, in fact, not be relevant for Kronos2, as a participant's maximum intraday credit is calculated on the basis of collateral provided prior to the granting of credit. Thus, section 167 of the Danish Capital Markets Act only matters if the market value of the securities decreases and outstanding credit to the participant exceeds the value of the pledged securities. In this situation, the pledgor must immediately provide additional collateral as stated in section 16 of the 'Terms and Conditions for Pledging of Collateral for Credit Facilities in Danish Kroner at Danmarks Nationalbank'.

In addition, Danmarks Nationalbank has the right to perform close-out netting in accordance with Danmarks Nationalbank's terms and conditions for accounts and section 206 of the Danish Capital Markets Act if a Kronos2 participant fails to fulfil its obligations, including commences bankruptcy proceedings.

KC 2:

Clear rules consistent with relevant regulations

An FMI should have rules, procedures, and contracts that are clear, understandable, and consistent with relevant laws and regulations.

The contractual basis for Kronos2 comprises the documentation for the settlement of payments in Danish kroner, which is part of Danmarks Nationalbank's terms and conditions for accounts. The terms and conditions for accounts regulate all matters between the account holders and Danmarks Nationalbank in connection with the settlement of payments in Danish kroner at Danmarks Nationalbank. By signing a 'Request for a Current Account in Danish Kroner at Danmarks Nationalbank', the account holder accepts the terms and conditions for accounts.

Participation in Kronos2

All participants must accept Danmarks Nationalbank's terms and conditions for accounts, thereby accepting that Kronos2 is regulated by Danish law, which has implemented the provisions of the Settlement Finality Directive.

Foreign participants¹⁶ are subject to Danmarks Nationalbank's terms and conditions for accounts in the same way as Danish participants. Foreign participants domiciled outside the EU must document their home country's legal recognition of the finality and irrevocability of payments transacted via Kronos2, even in the event of insolvency proceedings against the participant. Foreign participants domiciled in the EU are subject to the Settlement Finality Directive.

Exclusion of participants

Participation in Kronos2 requires a current account in Danish kroner. According to the 'Terms and Conditions for a Current Account in Danish Kroner at Danmarks Nationalbank', Danmarks Nationalbank is

at any time entitled to terminate the current account and/or exclude the account holder from the monetary policy instruments without notice, regardless of whether a breach has taken place, and to require the immediate payment of any outstanding amount. If the outstanding amount is not paid, Danmarks Nationalbank is entitled to enforce the collateral provided by the account holder without notice.

Dealing with failing account holders according to the BRRD

The new EU framework for the recovery and resolution of credit institutions, the BRRD, has introduced common rules for dealing with failing banks and mortgage credit institutions in the EU. The BRRD has been implemented into Danish law, partly via amendments to the Danish Financial Business Act and the Danish Financial Stability Act, partly via a new act on the restructuring and resolution of certain financial enterprises. First, the framework includes a number of recovery tools to prevent emerging difficulties in an institution from escalating into a crisis. Second, it lays down a framework for dealing with an institution if the recovery measures prove to be insufficient so that the institution is no longer viable. In such case, the institution is regarded as likely to fail or failing and must be resolved or restructured, unless a private sector solution is found. If, subject to a number of conditions being met, an institution becomes subject to resolution/restructuring, Finansielt Stabilitet as the resolution authority assumes control of the institution with a view to ensuring continuation of the institution's critical functions. Resolution/restructuring entails continuation of the institution, meaning that it also continues as a Kronos2 participant. An institution subject to control must still meet the requirements for participation in Kronos2. The option for Finansielt Stabilitet to suspend the payment and delivery obligations of the failing institution does not apply to the institution's obligations towards Danmarks Nationalbank and the payment systems.¹⁷ From the time when Finansielt Stabilitet decides to assume control of an institution, Danmarks Nationalbank must abide by the decisions made by the Finansielt Stabilitet. The institution's existing signature rules and powers of attorney remain in force with respect to Danmarks Nationalbank until changed by Finansielt Stabilitet.

¹⁶ The 'Terms and Conditions for a Current Account in Danish Kroner at Danmarks Nationalbank' state which foreign institutions can have access to current accounts with Danmarks Nationalbank, which means that they have the option to join Kronos2.

¹⁷ Pursuant to section 32(4)(ii) of the Danish Act on Restructuring and Resolution of Certain Financial Enterprises.

Bankruptcy

In the future, failing banks and mortgage credit institutions will – in the vast majority of cases – be subject to resolution/restructuring rather than bankruptcy proceedings. However, it cannot be ruled out that a situation may arise in which a Kronos2 participant becomes subject to bankruptcy proceedings. In that case, Danmarks Nationalbank will observe the provisions of the Danish Insolvency Act. This means, among other things, that all accounts belonging to the bankrupt participant will be blocked by Danmarks Nationalbank. A participant who is subject to bankruptcy proceedings may no longer participate in Kronos2.

KC 3:

Articulation of legal basis to relevant parties

An FMI should be able to articulate the legal basis for its activities to relevant authorities, participants, and, where relevant, participants' customers, in a clear and understandable way.

Kronos2 has clear rules, procedures and contracts that are freely accessible at Danmarks Nationalbank's website. Danmarks Nationalbank's terms and conditions for accounts provide detailed descriptions of all relevant conditions applying in connection with participation in Kronos2; see KC 2 above. At least 14 days' notice is given of any amendments to the terms and conditions for accounts.

Furthermore, user group meetings are held, at which Kronos2 participants can raise questions about, for example, the terms and conditions for accounts.

KC 4:

Enforceable rules, procedures and contracts in all relevant jurisdictions

An FMI should have rules, procedures, and contracts that are enforceable in all relevant jurisdictions. There should be a high degree of certainty that actions taken by the FMI under such rules and procedures will not be voided, reversed, or subject to stays.

Kronos2 operates exclusively in Denmark and is subject to Danish law.

The rules, procedures and contracts of Kronos2 are based on relevant Danish legislation; see KC 1 and KC 2. This means that foreign participants agree to being governed by Danish legislation when participating in Kronos2.

Principle 2: Governance

An FMI should have governance arrangements that are clear and transparent, promote the safety and efficiency of the FMI, and support the stability of the broader financial system, other relevant public interest considerations, and the objectives of relevant stakeholders.

KC 1: **General objectives**

An FMI should have objectives that place a high priority on the safety and efficiency of the FMI and explicitly support financial stability and other relevant public interest considerations.

The objective of Kronos2 follows the objective set out in section 1 of the National Bank of Denmark Act. The section states that the objective of Danmarks Nationalbank is 'to maintain a safe and secure currency system in this country, and to facilitate and regulate the traffic in money and the extension of credit'. Danmarks Nationalbank focuses on safety and efficiency in the operation of Kronos2. The areas 'Stability in the financial system' and 'Secure payments' are described in the annual report of Danmarks Nationalbank.¹⁸

Danmarks Nationalbank strives to maintain high levels of efficiency and safety in every aspect of the operation of Kronos2, for example in relation to intraday credit against collateral and focus on operational stability. This gives the financial sector comprehensive access to real-time settlement of payments through Kronos2.

KC 2: **Governance arrangements**

An FMI should have documented governance arrangements that provide clear and direct lines of responsibility and accountability. These arrangements should be disclosed to owners, relevant au-

thorities, participants, and, at a more general level, the public.

The composition of the top management of Danmarks Nationalbank, and hence of Kronos2, is documented in the National Bank of Denmark Act, which is publicly accessible. The Act lays down the powers of the Board of Directors, the Committee of Directors and the Board of Governors, respectively.

Danmarks Nationalbank's Banking and Markets department is the Kronos2 system owner.

Responsibility for Kronos2 operations is broken down at the strategic, tactical and operational levels in accordance with Danmarks Nationalbank's internal guidelines for system ownership management.

KC 5: **Roles and responsibilities of management**

The roles and responsibilities of management should be clearly specified. An FMI's management should have the appropriate experience, a mix of skills, and the integrity necessary to discharge their responsibilities for the operation and risk management of the FMI.

Under the National Bank of Denmark Act, Danmarks Nationalbank is an independent self-governing institution.¹⁹

Management of Kronos2 is clearly defined, see KC 2 above. Banking and Markets, which is the system owner, holds monthly meetings with a representative of the Board of Governors, at which any issues related to Kronos2 are discussed. Issues of a principal or strategic nature are discussed with the whole Board of Governors.

The operation of the Kronos2 platform is outsourced to BEC Financial Technologies. To ensure that the service provider meets Danmarks Nationalbank's requirements, committees have been set up at the operational level and at a high management level. These committees follow up on BEC's operation of the Kronos2 platform on a regular basis. The agreement is supported by a service level agreement.

¹⁸ Financial statements and annual report 2020 ([link](#)).

¹⁹ See also Danmarks Nationalbank's website for a description of independence and self-governing institution ([link](#)) as well as the organisation ([link](#)).

KC 6:
Risk-management framework

The board should establish a clear, documented risk-management framework that includes the FMI's risk tolerance policy, assigns responsibilities and accountability for risk decisions, and addresses decision making in crises and emergencies. Governance arrangements should ensure that the risk management and internal control functions have sufficient authority, independence, resources, and access to the board.

The composition of the Committee of Directors follows Danmarks Nationalbank's role as central bank in Denmark and thus does not follow Danmarks Nationalbank's role as system owner of Kronos2. Therefore, it is the Board of Governors which, as the top management of Danmarks Nationalbank, establishes the risk management framework.

Danmarks Nationalbank's operational risk management is based on the risk management framework in the financial sector and on the principles established by the Bank for International Settlements, BIS. A comprehensive framework establishes a fixed structure for identification, assessment, mitigation and follow-up of risks across Danmarks Nationalbank. The framework ensures a structured approach to risk management and is based on recognised working methods and concepts adapted to the needs of Danmarks Nationalbank.

The operational risk management framework lays down rules for preparing and maintaining risk assessments, including how to deal with residual risks.

Furthermore, the framework addresses emergency measures, and consequently contingency plans have been prepared, both for Danmarks Nationalbank as a whole and for Kronos2 specifically.

Danmarks Nationalbank has set up a Risk and Security Board, RSU chaired by a representative of the Board of Governors. Operational Risk reporting facilitated by the 2nd Line of Defence is carried out on a quarterly basis to Senior Management, the Risk and Security Board, and the Board of Governors. The Board of Directors receives a status on the significant operational risks every half-year.

KC 7:
Reflection of legitimate interests

The board should ensure that the FMI's design, rules, overall strategy, and major decisions reflect appropriately the legitimate interests of its direct and indirect participants and other relevant stakeholders. Major decisions should be clearly disclosed to relevant stakeholders and, where there is a broad market impact, the public.

Participants and stakeholders are informed and widely involved in major decisions concerning changes to Kronos2.

Participants and other relevant stakeholders were widely involved in the transition to Kronos2. This was done through a reference group and working groups with participation from VP, Finance Denmark, e-nettet, Mastercard Payment Services (the former Nets), data centres, banks, mortgage credit institutions and Danmarks Nationalbank, among others.

A sector group with management-level members has also been set up. The aim is to keep the sector informed, also at management level, and provide it with background information about the Kronos2 system complex.

There is a close bilateral cooperation on development and testing between Danmarks Nationalbank and the connected settlement systems, i.e. VP, Finance Denmark, e-nettet and Mastercard Payment Services.

Following the implementation of Kronos2, RTGS forums have been established where operational and strategic considerations are discussed.²⁰ At the meetings, participants also have the opportunity to raise any questions and issues regarding Kronos2 that they want clarified.

²⁰ Due to the close ongoing cooperation on the development of Kronos2, no annual RTGS user group meetings have been held while Kronos2 was being developed.

Principle 3: Framework for the comprehensive management of risks

An FMI should have a sound risk-management framework for comprehensively managing legal, credit, liquidity, operational, and other risks.

KC 1: Robust risk management

An FMI should have risk-management policies, procedures, and systems that enable it to identify, measure, monitor, and manage the range of risks that arise in or are borne by the FMI. Risk-management frameworks should be subject to periodic review.

As far as *legal risk* is concerned, see Principle 1.

The account holders may expose Danmarks Nationalbank to *credit risk* through their use of intraday credit. Therefore, account holders must provide collateral for use of the intraday credit; see Principles 4 and 5.

Liquidity risk is not subject to formalised management as Danmarks Nationalbank is not exposed to liquidity risk. Account holders have efficient tools to manage their own liquidity risk using the account setup, the intraday credit facility, automated processes for transferring liquidity to the settlement systems, and access to Kronos2, where liquidity and incoming and outgoing payments can be monitored in real time. Furthermore, Danmarks Nationalbank regularly performs stress tests of the participants' liquidity risk, see Principle 7.

Other sources of risk, such as business risk (see Principle 15), the bankruptcy, liquidation or failure of a participant (see Principle 13), interdependencies (see Principles 17 and KC 3 below) and indirect participants (see Principle 19) are discussed below.

Operational risk management

Danmarks Nationalbank has a structured framework for operational risk management, which is based on international best practice and adapted to the business practices, work and size of Danmarks Nationalbank. The framework ensures that risks are identified, assessed, mitigated and reported, see Principle

17. As part of the framework, risk and security policy and underlying security guidelines have been developed. The framework is continuously developed and updated once a year.

Several technical and business risk assessments of Kronos2 have been established. Based on the risks identified, a comprehensive overview of the most significant residual risks related to Kronos2 is established. The overview is reported as part of Danmarks Nationalbank's aggregate risk profile, and underlying risk assessments are updated at least once a year.

Danmarks Nationalbank also maintains a contingency plan for Danmarks Nationalbank and the emergency response plan for the Financial Sector Forum for Operational Resilience, FSOR; see Principle 17.

KC 2: Incentives for participants to manage and contain risks

An FMI should provide incentives to participants and, where relevant, their customers to manage and contain the risks they pose to the FMI.

Account holders wishing to keep a current account and participate in Kronos2 must endorse the terms and conditions for accounts, which are available on Danmarks Nationalbank's website.

The terms and conditions for accounts state that account holders are fined if they do not ensure the availability of sufficient funds for their intraday credit at the end of the monetary policy day; see Principles 4 and 5.

Danmarks Nationalbank conducts tests and holds regular meetings with account holders; see more in Principle 23. This helps to ensure the account holders' insight and understanding of Kronos2.

KC 3: Regular review of material risks stemming from and posed to other entities

An FMI should regularly review the material risks it bears from and poses to other entities (such as other FMIs, settlement banks, liquidity providers, and service providers) as a result of interdependencies and develop appropriate risk-management tools to address these risks.

SIA/Perago delivers a standard RTGS system to Danmarks Nationalbank. The system is adapted to

support functionality specific to Denmark such as automatic collateralisation and Express Clearing. Danmarks Nationalbank has a formalised agreement with SIA/Perago, which states, among other things, what SIA/Perago has committed itself to.

BEC Financial Technologies and Danmarks Nationalbank have entered into an operating agreement describing the operational, support and management services provided by BEC. Danmarks Nationalbank maintains a close dialogue with BEC, and several fixed board meetings are held on regular basis. BEC provides Danmarks Nationalbank with monthly operating reports.

Risk Forum for Interdependencies, RGA, has been established, under the structure supported by the *Financial Sector Forum for Operational Resilience, FSOR*. Danmarks Nationalbank, VP, Finance Denmark and e-nettet are working together to identify and manage risks and incidents arising from interdependencies between the FMIs, i.e. Kronos2, VP settlements and retail payment systems. A Steering Committee for RGA has been established which lays down the overall framework for risk management of interdependencies. In addition, a risk manual has been prepared for RGA, which contains provisions and agreements on common risk policy, risk management processes and risk management strategy.

Principle 4: Credit risk

An FMI should effectively measure, monitor, and manage its credit exposures to participants and those arising from its payment, clearing, and settlement processes. An FMI should maintain sufficient financial resources to cover its credit exposure to each participant fully with a high degree of confidence.

Danmarks Nationalbank incurs a credit risk on the participants as Danmarks Nationalbank offers the participants access to credit against collateral. The credit risk is significantly limited by the fact that credit is granted against adequate collateral that exceeds the value of the credit granted. This means that two events are needed for Danmarks Nationalbank to lose money: First, a participant must be unable to repay the amount borrowed and, second, the value of the participant's collateral must have fallen below the value of the credit granted. This could happen, for example, if the market price of the collateral falls extraordinarily quickly. Credit risk is minimised by accepting collateral in the form of government securities and guaranteed or covered bonds, as well as by taking appropriate haircuts when calculating the collateral value. The collateral value is calculated daily, based on updated market prices, and if a security has not been traded, a synthetic price is calculated from which an additional haircut is taken. Risks are managed in a fixed framework, and a risk assessment has been prepared which is updated on a regular basis.

Participants incur no credit risk when using Kronos2, as Kronos2 is an RTGS system, which means that all payments are settled immediately and are final and irrevocable when credited to the recipient's account with Danmarks Nationalbank. Since settlement takes place in central bank money via accounts with Danmarks Nationalbank, participants do not incur any credit risk on the settlement bank either.

KC 1: **Establishing a framework for the management of credit risk**

An FMI should establish a robust framework to manage its credit exposures to its participants and the credit risks arising from its payment, clearing, and settlement processes. Credit exposure may arise from current exposures, potential future exposures, or both.

Danmarks Nationalbank has established a framework for credit risk management that includes both current and potential future credit exposures. Danmarks Nationalbank extends credit to its account holders as monetary policy loans, loans to cash centres and intraday credit in kroner.²¹ For all types of credit, Danmarks Nationalbank requires high-quality assets as collateral. The rules are set out in Danmarks Nationalbank's terms and conditions for accounts and specifically in the section 'Terms and conditions for Pledging of Collateral for Credit Facilities in Danish kroner at Danmarks Nationalbank'. Danmarks Nationalbank's framework for credit operations can be found there: How credit is obtained, information about the collateral basis and collateral value, how checks of the availability of sufficient funds are performed and how the removal of collateral and requirements for top-up collateral are handled.

KC 2: **Identifying, measuring and monitoring credit risk**

An FMI should identify sources of credit risk, routinely measure and monitor credit exposures, and use appropriate risk-management tools to control these risks.

Credit risks are identified via risk assessments, which are reviewed annually, and it is regularly assessed whether there is a need to adjust the collateral basis or parts of it. At least every other year, it is analysed whether haircuts sufficiently hedge the risk of losses on collateral, and each year it is checked whether synthetic prices (i.e. calculated prices for securities not traded) reflect the actual value of the securities. On the basis of the analyses, the haircuts are adjusted as required.

Credit risks are monitored and managed through continuous sufficient funds availability checks and daily valuation of the collateral value, and haircuts

²¹ In addition, Danmarks Nationalbank may establish extraordinary facilities, such as during the corona pandemic: One-week and three-month loans in Danish kroner on favourable terms (lower interest rates than on ordinary monetary policy loans) and currency loans via auctions.

are deducted on the basis of the market, liquidity and credit risk of the assets. The market value of securities accepted as collateral are updated at the beginning of the day based on the previous day's closing prices from Nasdaq OMX Copenhagen. If the security has not been traded on the day in question, a calculated synthetic price is used.²²

Collateral is provided by a Kronos2 participant transferring a VP-registered asset to a VP account pledged by the participant to Danmarks Nationalbank. In the period from 7.00 to 16.45, the participant may apply via Kronos2 to withdraw VP-registered assets from the VP account. The VP-registered assets are transferred to a VP account designated by the account holder, provided that there are still sufficient funds available for the credit granted to the participant. Pledged assets can be substituted by transferring new VP-registered assets to the participant's VP account and then withdrawing previously transferred VP-registered assets from the VP account.

Sufficient funds availability checks are continuously performed in Kronos2 to ensure that there is always sufficient collateral for a given credit and that no unintentional credit risk arises. Sufficient funds availability checks are performed automatically by simulating the execution of a transaction, and if sufficient funds are available, the transaction is executed. In addition, daily overdraft checks of *loan accounts* are carried out before and at the end of the monetary policy day at 16.45. Overdraft checks are also carried out of the intraday facilities Scandinavian Cash Pool, SCP, VP automatic collateralisation accounts and T2S auto-collateral loans (at 15.00, 15.55 and 16.05, respectively).²³

KC 3:
Use of collateral and other financial resources

A payment system or SSS should cover its current and, where they exist, potential future exposures to each participant fully with a high degree of confidence using collateral and other equivalent financial resources (see Principle 5 on collateral). In the case of a DNS payment system or DNS SSS in which there is no settlement guarantee but where its participants face credit exposures arising from its payment, clearing, and settlement processes, such an FMI should maintain, at a minimum, sufficient resources to cover the exposures of the two participants and their affiliates that would create the largest aggregate credit exposure in the system.

Danmarks Nationalbank always uses collateral to hedge the credit risk associated with the granting of credit to Kronos2 participants; see above. Consequently, Danmarks Nationalbank has not set aside financial resources specifically to cover potential losses in Kronos2. Under the terms and conditions for accounts, Danmarks Nationalbank is entitled to immediately liquidate the securities pledged as collateral.

KC 7:
Explicit rules and procedures for covering credit losses

An FMI should establish explicit rules and procedures that address fully any credit losses it may face as a result of any individual or combined default among its participants with respect to any of their obligations to the FMI. These rules and procedures should address how potentially uncovered credit losses would be allocated, including the repayment of any funds an

22 For VP automatic collateralisation and T2S auto-collateral loans, the lists are also generated at the beginning of the day, but since these two recipients cannot use the list of eligible assets during an ongoing monetary policy day, the list will not be used until the next monetary policy day which begins in the evening of the same day.

23 If there are insufficient funds in automatic collateralisation accounts, securities are retained in a VP custody account, and for T2S auto-collateral loans securities are pledged to Danmarks Nationalbank and an intraday overdraft is generated in Kronos2 for which sufficient funds must be available no later than at 16.45 at the close of the monetary policy day. For SCP, Danmarks Nationalbank is authorised to charge the account holder's settlement account an amount equal to the shortfall and transfer the amount to the account holder's loan account to reduce the account holder's intraday loan. If there are insufficient funds in the settlement account, Danmarks Nationalbank retains the collateral for as much of the currency deposit in SCP as is necessary to fully cover the account holder's total outstanding exposure.

FMI may borrow from liquidity providers. These rules and procedures should also indicate the FMI's process to replenish any financial resources that the FMI may employ during a stress event, so that the FMI can continue to operate in a safe and sound manner.

Danmarks Nationalbank assumes potential credit risks on participants as mentioned above, but Kronos2 does not have explicit rules on losses resulting from credit risk, as Kronos2 is a central bank-driven system. In other words, Danmarks Nationalbank does not need to hold liquidity or provide liquidity support to ensure the business continuity of Kronos2 in the event that a participant files for bankruptcy.

Principle 5: Collateral

An FMI that requires collateral to manage its or its participants' credit exposure should accept collateral with low credit, liquidity, and market risks. An FMI should also set and enforce appropriately conservative haircuts and concentration limits.

KC 1:

Collateral with low risk

An FMI should generally limit the assets it (routinely) accepts as collateral to those with low credit, liquidity, and market risks.

Kronos2 participants may use the following arrangements to provide collateral for intraday credit in Danish kroner:

- *Traditional pledging of collateral:* Provision of securities as collateral takes place by transferring securities to a custody account with VP pledged to Danmarks Nationalbank. Based on the value of the pledged securities, the account holder is granted a drawing right for credit facilities in Danish kroner equivalent to the collateral value thereof.
- *Certificates of deposit:* The account holder's certificates of deposit are automatically included in the drawing right for intraday credit in Danish kroner.
- *Automatic collateralisation:* Account holders may provide securities deposited in one or more custody accounts with VP, typically trading accounts, as collateral for intraday credit in Danish kroner. Only securities complying with the collateral value rules are included.

- *T2S auto-collateral loans:* Account holders may provide securities in T2S custody accounts (created by VP in the name of the account holder) as collateral for intraday credit in Danish kroner for the purchase of securities and settlement of periodic payments in T2S. Only securities complying with the collateral value rules are included.
- *Scandinavian Cash Pool, SCP²⁴:* Liquidity in one Scandinavian central bank may be provided as collateral for intraday credit from another Scandinavian central bank.

Danmarks Nationalbank grants access to credit facilities in Danish kroner to account holders at Danmarks Nationalbank against a number of high-quality, low-risk assets. These are:

- Securities issued by the Danish state
- Bonds guaranteed by the Danish state
- Bonds issued by KommuneKredit
- Bonds issued by Føroya Landsstýri (the Faroese government)
- Mortgage bonds (ROs), covered bonds (SDOs) and covered mortgage bonds (SDROs) issued by institutions subject to the Danish Financial Business Act.²⁵

The assets must be registered with VP, admitted to trading at Nasdaq OMX Copenhagen and denominated in Danish kroner or euro. With some exceptions, the above assets must not have been issued or guaranteed by the account holder or by an entity with which the account holder has close links as defined in Article 4(1), paragraph 38, of Regulation (EU) no. 575/2013.²⁶

In addition, the balances of yield accounts in Danish kroner with Danmarks Nationalbank are included in the collateral basis. At the request of the account holders and subject to a concrete assessment, Danmarks Nationalbank may also include other assets in the collateral basis for credit facilities in Danish kroner.

²⁴ The term in Kronos2 (Perago) is Regional Cash Pool, RCP.

²⁵ See Danmarks Nationalbank's website ([link](#)).

²⁶ The exception applies to (i) ministries of finance and public authorities, (ii) close links between the account holder and public authorities in EEA countries, (iii) bonds which fully comply with the criteria set out in Article 52(4) of the Directive on undertakings for collective investment in transferable securities (Directive 2009/65) and (iv) cases where the bonds are protected by specific legal security provisions equivalent to (iii).

KC 2:**Valuation practices and haircuts**

An FMI should establish prudent valuation practices and develop haircuts that are regularly tested and take into account stressed market conditions.

Securities included in the collateral basis are valued daily at the beginning of the day on the basis of the previous day's closing prices from Nasdaq OMX Copenhagen. In the absence of a market price, a calculated synthetic rate (also from the previous day) is used.²⁷

The collateral value of the securities is calculated as the market value inclusive of accrued interest less a haircut; see the terms and conditions for accounts. The current collateral value of the securities is published as a report in Kronos2 (and on the participant's *collateral list* of currently pledged securities). The collateral value is stated in Danish kroner, and the collateral value of VP-registered assets in euro is calculated on the basis of the official exchange rate from Danmarks Nationalbank on the preceding day of listing. The list of eligible securities without collateral values is also published on Danmarks Nationalbank's website²⁸, where the haircuts applying at any time can also be found.

A securities-specific market price haircut is deducted when calculating the collateral value of all eligible securities. When determining the market price haircut, the haircut of the bonds becomes larger the longer the remaining time to maturity is, as the interest rate sensitivity increases as a function of the remaining time to maturity. Furthermore, eligible assets are divided into four liquidity categories²⁹, where the least liquid assets have larger haircuts. The most liquid assets, i.e. government securities, are placed in liquidity category 1. They have smaller haircuts because they have very high liquidity and an expected short realisation period and, consequently, their value cannot fall as much as the value of securities with

longer realisation periods. The range of eligible asset classes (securities only) has remained unchanged for a number of years, and it is believed that the liquidity of eligible securities has not changed significantly during the period.

If a theoretical price is used, an extra haircut of 5 per cent is deducted for all types of securities except for securities issued by the Danish state, and a currency haircut of 3 per cent is deducted when securities denominated in euro are provided as collateral for credit in Danish kroner.

KC 3:**Procyclical adjustments**

In order to reduce the need for procyclical adjustments, an FMI should establish stable and conservative haircuts that are calibrated to include periods of stressed market conditions, to the extent practicable and prudent.

Haircuts are generally conservative in order to avoid unnecessary procyclical effects. Haircuts are assessed on the basis of long-term developments over periods³⁰ covering both recessions and booms.

However, in special cases it may be necessary to adjust the collateral basis. For example, a number of expansions of the collateral basis were introduced during the financial crisis in 2008 and onwards. These have now been phased out. The experience gathered has been incorporated in Danmarks Nationalbank's contingency plans for extraordinary measures.

KC 4:**Concentration limits**

An FMI should avoid concentrated holdings of certain assets where this would significantly impair the ability to liquidate such assets quickly without significant adverse price effects.

27 For VP automatic collateralisation and T2S auto-collateralisation, the lists are also generated at the beginning of the day, but since these two recipients cannot use the list of eligible assets during an ongoing monetary policy day, the list will not be used until the next monetary policy day which begins in the evening of the same day.

28 See Danmarks Nationalbank's website ([link](#)).

29 Liquidity category 2, which consists of RO and SD(R)O jumbo issuances (i.e. a circulating volume of more than EUR 1 billion or the equivalent value in Danish kroner), for which Danmarks Nationalbank has approved a market maker scheme with at least three market makers, has not been active for several years.

30 The latest analysis, conducted in autumn 2019, used historical exchange rate changes since 2004 and zero coupon rates since 1995/96.

If participants provide too large concentrations of certain assets as collateral, there is a risk that the assets in question cannot be realised without a significant impact on the market price. A high concentration means that a single participant provides a large share of the total issued volume of a given asset as collateral. The concentration may be calculated for each issuer, for each asset type and for individual securities included in the collateral provided by a participant.

Danmarks Nationalbank's current terms and conditions do not explicitly limit the concentration of certain assets held by the individual participants, but regular analyses of the composition of the pledge are made on a monthly basis. Based on these analyses, concentration risks are assessed on a continuous basis.

KC 5:
Cross-border collateral

An FMI that accepts cross-border collateral should mitigate the risks associated with its use and ensure that the collateral can be used in a timely manner.

Danmarks Nationalbank participates in the Nordic cooperation on the Scandinavian Cash Pool, SCP. With SCP, a participant can obtain intraday credit

from a Nordic central bank by providing collateral in an account with another Nordic central bank. The credit is always collateralised and is granted intraday only, and a currency haircut of 5 per cent is applied as per the terms and conditions for accounts (the section 'Terms and Conditions for Use of Scandinavian Cash Pool in Danish Kroner as Collateral at Danmarks Nationalbank').

Foreign securities are *not* accepted in the collateral basis of the traditional pledging of collateral.

KC 6:
Flexible collateral management system

An FMI should use a collateral management system that is well-designed and operationally flexible.

Danmarks Nationalbank uses an up-to-date and fully automated IT system, Calypso. Changes in the field of collateral, for example adjustments of static data filters to identify eligible securities or changes to haircuts, are tested and processed in a controlled release process. Due to large related IT projects, the potential of the current collateral system has not been fully exploited. In terms of collateral, it has been decided that major changes will await the ongoing version upgrade of the system.³¹

³¹ The collateral framework has remained more or less unchanged since the last self-assessment (2016), but the quality of operational collateral management has increased significantly due to the implementation of new IT systems.

Principle 7: Liquidity risk

An FMI should effectively measure, monitor, and manage its liquidity risk. An FMI should maintain sufficient liquid resources in all relevant currencies to effect same-day and, where appropriate, intraday and multiday settlement of payment obligations with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate liquidity obligation for the FMI in extreme but plausible market conditions.

KC 1: **Robust framework for managing liquidity risk**

An FMI should have a robust framework to manage its liquidity risks from its participants, settlement banks, nostro agents, custodian banks, liquidity providers, and other entities.

Kronos2 does not incur liquidity risk on participants, but the participants incur liquidity risk on each other. Participants' liquidity risk is limited through free access to intraday credit against collateral and net settlement of their positions in Sum Clearing and Intraday Clearing. In general, participants have access to ample liquidity for settlement purposes. Ample liquidity ensures that the participants' payments are generally settled without significant delays, which minimises liquidity risk.

Danmarks Nationalbank is responsible for managing liquidity in the sector. This is done through liquidity forecasts and monetary policy operations, which ensure sufficient liquidity in the sector at all times. Until 19 March 2021, this was also done through a system of current-account limits, which was suspended following an adjustment of monetary policy instruments.

The adjustment means that it is no longer necessary for banks to buy or sell certificates of deposit daily in order to adjust liquidity levels, as there is no limit on the balance in the current account. Therefore, from 30 April 2021, Danmarks Nationalbank will transition

from daily to weekly open market operations. It will still be possible for participants to trade certificates of deposit bilaterally with each other.

The adjustment of monetary policy instruments also means that Danmarks Nationalbank will have a uniform deposit rate, as the current rate and the deposit rate are identical. This means that, as a rule, participants have no incentive to place their liquidity in certificates of deposit instead of having it remain in their current account. As a result, monetary policy counterparties remain able to influence the sector's overall net position daily. This minimises liquidity risk in the sector because the availability of liquidity to banks at the end of a business day is determined by the banks' net positions towards Danmarks Nationalbank.

KC 2: **Identifying, measuring and monitoring liquidity risk**

An FMI should have effective operational and analytical tools to identify, measure, and monitor its settlement and funding flows on an ongoing and timely basis, including its use of intraday liquidity.

Participants can monitor their Kronos2 transactions in real time. The individual participant can see payments settled, payments rejected and lists of own standing orders and settlement cycles executed. Participants are responsible for managing their own liquidity.

In the main settlement account in Kronos2, there is no liquidity queue, i.e. a queue in which payments are placed if the sender does not have sufficient liquidity to settle the payment. Participants must resend any payments rejected due to a liquidity shortfall.

KC 3: **Sufficient liquid resources**

A payment system or SSS, including one employing a DNS mechanism, should maintain sufficient liquid resources in all relevant currencies to effect same-day settlement, and where appropriate intraday or multi-day settlement, of payment obligations with a high degree of confidence under a wide range of potential stress scenarios that should include, but not be limited to, the default of the participant and its affiliates that would generate the largest aggregate payment obligation in extreme but plausible market conditions.

Since Kronos2 does not incur liquidity risk on participants, there is no need for liquidity reserves to hedge this risk.

However, if sufficient liquid resources are seen as sufficient liquidity among participants to execute the payments as requested, participants have until now had ample liquidity which means that payments can generally be settled without significant delays.

In the event of a lack of liquidity in the system, Danmarks Nationalbank would be able to provide additional liquidity in various ways, for example by expanding the collateral basis and hence access to intraday credit or loans.

To test whether participants have sufficient liquidity to settle their payments even in critical situations, regular stress tests are carried out of various stress scenarios. By default, the consequences of removing the largest and most critical participants from the settlement and reducing the collateral available to participants are tested. In addition, other scenarios are tested on an ad hoc basis. If appropriate, a stress test analysis may result in proposed changes to participant behaviour and/or the system design, for example queuing features, security basis and monetary policy day. Most recently, three different scenarios were stress tested in the period from January 2007 to August 2018. The three scenarios are:

1. A large participant cannot send payments for a full day
2. The money market is inaccessible
3. Participants' access to intraday credit is reduced.

The stress test showed that the system was resilient in all three scenarios. Resilience is measured as the change in participants' liquidity need and their ability to settle payments in a timely manner in a stress scenario. The stress test showed that a breakdown (see scenario 1) at one of the two largest Kronos participants could significantly increase the liquidity need of the other participants. The importance of the unsecured money market (see scenario 2) declined from 2009 to 2018, and Kronos participants will not be significantly affected by a reduction in their available intraday credit (see scenario 3). The stress test is described in further detail in *Danmarks Nationalbank Analysis*, no. 9, May 2019 ([link](#)).

KC 8:
Using central bank accounts, payment services, or securities services

An FMI with access to central bank accounts, payment services, or securities services should use these services, where practical, to enhance its management of liquidity risk.

Kronos2 payments are settled via accounts with Danmarks Nationalbank (i.e. in central bank money), and Kronos2 uses the account structures and collateralisation functions of Danmarks Nationalbank.

KC 10:
Rules and procedures for managing liquidity shortfalls

An FMI should establish explicit rules and procedures that enable the FMI to effect same-day and, where appropriate, intraday and multiday settlement of payment obligations on time following any individual or combined default among its participants. These rules and procedures should address unforeseen and potentially uncovered liquidity shortfalls and should aim to avoid unwinding, revoking, or delaying the same-day settlement of payment obligations. These rules and procedures should also indicate the FMI's process to replenish any liquidity resources it may employ during a stress event, so that it can continue to operate in a safe and sound manner.

Kronos2 has no rules and procedures for addressing situations with unforeseen liquidity shortfalls, as any liquidity shortfalls may potentially affect Kronos2 participants, not Kronos2 itself. It is not possible to unwind or revoke transactions due to liquidity shortfalls. Payments settled in Kronos2 are final, so payments cannot be reversed once they have been settled. Settlement in Kronos2 as such is not delayed by liquidity shortfalls, but it may take longer time for individual participants to settle payments if they are affected by liquidity shortfalls. Each participant is responsible for resending any payments rejected due to a liquidity shortfall, as there is no liquidity queue in the main settlement account in Kronos2; see KC 2.

Principle 8: Settlement finality

An FMI should provide clear and certain final settlement, at a minimum by the end of the value date. Where necessary or preferable, an FMI should provide final settlement intraday or in real time.

KC 1: Rules and procedures for final settlement

An FMI's rules and procedures should clearly define the point at which settlement is final.

Kronos2 has rules and procedures in place for ensuring settlement finality. Payments in Kronos2 are settled individually in real time. A payment is final and irrevocable when the sender's account has been debited and the recipient's account credited. After this time, the payment cannot be revoked. The time when a payment is final is defined in the terms and conditions for accounts (*link*). Finality is recognised in Danish law. Moreover, Kronos2 is registered as a designated payment system under the provisions of the Settlement Finality Directive (Directive 98/26/EC of the European Parliament and of the Council of 19 May 1998 on settlement finality in payment and securities settlement systems), which has been implemented in the Danish Capital Markets Act.

KC 2: Settlement no later than the end of the value date

An FMI should complete final settlement no later than the end of the value date, and preferably intraday or in real time, to reduce settlement risk. An LVPS or SSS should consider adopting RTGS or multiple-batch processing during the settlement day.

Kronos2 is an RTGS system, which means that settlement takes place in real time. In other words, all transactions are settled within the chosen value date.

Payments in Kronos2 are generally settled early in the day. One of the reasons is that most participants have signed an agreement with Finance Denmark whereby payments in connection with the settlement of FX, deposits and derivatives transactions must be sent as early as possible on the value date and preferably before 13.00. Payments via current accounts with Danmarks Nationalbank on behalf of customers or banks are settled at 16.00 at the latest.

Figures from January 2020 show that, in value terms, approximately 50 per cent of a day's payments in Kronos2 have been settled by 10.00, approximately 80 per cent by 13.00 and 97 per cent by 15.00.

KC 3: Revoking payments

An FMI should clearly define the point after which unsettled payments, transfer instructions, or other obligations may not be revoked by a participant.

The terms and conditions for accounts state that a payment can be revoked until it is final. Unsettled transactions in a participant's own value queue (transactions entered in the system for settlement on a future value date) may be revoked and cancelled during the settlement day.

Kronos2 does not offer a feature for queuing payments if a participant has insufficient liquidity in the current account to settle the payments at the desired time. If a participant attempts to settle a payment in Kronos2 without having sufficient liquidity, the payment is rejected. This also applies to transactions in the value queue. Rejected payments will therefore have to be recorded in the system again. Moreover, this was a wish of the participants, as a queuing feature had necessitated the transfer of outgoing payments to a special RTGS account.

Kronos2 may change its opening hours at its own discretion if necessary, for example if an extraordinary incident means that there are payments which should be settled at the value date.

If a participant sends a wrong transaction (for example to the wrong recipient or an incorrect amount), any reversal of the transaction in question must be agreed bilaterally between the sender and the recipient.

If Danmarks Nationalbank causes an error in a transaction, Danmarks Nationalbank corrects the error as far as possible and is entitled to reverse the transaction in this case.

Principle 9: Money settlements

An FMI should conduct its money settlements in central bank money where practical and available. If central bank money is not used, an FMI should minimise and strictly control the credit and liquidity risk arising from the use of commercial bank money.

KC 1:

Central bank money

An FMI should conduct its money settlements in central bank money, where practical and available, to avoid credit and liquidity risks.

Payments in Kronos2 are settled via the participants' accounts with Danmarks Nationalbank. The deposits in the participants' accounts are claims on Danmarks Nationalbank, and consequently settlement takes place in central bank money.

Central bank money in the relevant currency is the most appropriate settlement asset for systemically important payment systems. This is because there is no credit risk associated with a money-issuing central bank which can generate liquidity by increasing the amount of central bank money by lending it to participants for payment settlement.

Principle 13: Participant-default rules and procedures

An FMI should have effective and clearly defined rules and procedures to manage a participant default. These rules and procedures should be designed to ensure that the FMI can take timely action to contain losses and liquidity pressures and continue to meet its obligations.

KC 1: **Rules and procedures**

An FMI should have default rules and procedures that enable the FMI to continue to meet its obligations in the event of a participant default and that address the replenishment of resources following a default.

Resolution and bankruptcy

Danmarks Nationalbank has two procedures for dealing with failing institutions:

1. A procedure for resolution/restructuring
2. A procedure for bankruptcy.

Resolution/restructuring

If a resolution authority assumes control of an institution, the institution will continue to participate in Kronos2 unless the resolution authority makes changes to the institution's relationship with Danmarks Nationalbank. The institution continues to participate in the settlement of payments in Kronos2 and any settlements in which the institution may participate prior to the resolution authority assuming control of the institution, including in connection with VP and retail settlement, CLS and T2S. The other Kronos2 participants can continue their settlement of payments without being affected by the resolution of the institution. Payments to and from the institution follow the finality principle of Kronos2; see Principle 8. An institution which is under the control of the resolution authority must continue to comply with the requirements imposed on Kronos2 participants, including collateral requirements. Danmarks Nationalbank has internal guidelines describing Danmarks Nationalbank's practical handling of a participant in resolution/restructuring. If an institution under control fails to fulfil its obligations towards Danmarks Nationalbank, Danmarks Nationalbank

has the same remedies in case of an event of default as apply to other institutions.

Bankruptcy

It cannot be ruled out that a situation may arise in which a Kronos2 participant becomes subject to bankruptcy proceedings. In such cases, the institution's facilities with Danmarks Nationalbank are shut down, and steps are taken to secure Danmarks Nationalbank's claims. Danmarks Nationalbank will immediately block all accounts, including the current account and settlement accounts, for outgoing payments. However, any outstanding settlement in settlement accounts is executed before they are blocked if Danmarks Nationalbank has sent binding drawing rights to the systems that use the settlement accounts in question.

At the end of the monetary policy day on the day on which the bankruptcy order was issued, typically at 16.45, the current account will be closed and payments to the institution can no longer be deposited in the account and will be rejected. Before the account is closed, all incoming payments will be accepted and credited to the institution's current account.

Immediately after the bankruptcy order – or as soon as Kronos2 opens – Kronos2 will send out news about the situation to all participants, informing them of the rules for outgoing and incoming payments. Furthermore, it will be stated that the current account of the participant in bankruptcy will be closed at the end of the monetary policy day, after which incoming payments will be rejected.

Operational failures

If a participant is hit by an operational failure, such as an IT breakdown, preventing the participant from settling and receiving payments, guidelines have also been prepared to deal with the situation in the form of detailed internal guidelines and published descriptions of contingency procedures in Danmarks Nationalbank's terms and conditions for accounts.

Danmarks Nationalbank may, on behalf of the participant, make critical payments in Kronos2 by following the contingency procedures and adjust the participant's standing orders for the settlements as necessary to enable the affected participant to fulfil its obligations in these settlements. The obtaining of liquidity for the participants' settlements (Mastercard Payment Services, VP, T2S, CLS) in Kronos2 predominantly takes place automatically, either in the form

of the creation of standing orders or in the form of built-in automated processes in the system, including the automated obtaining of liquidity for Sum Clearing, Intraday Clearing and Express Clearing, based on the 'forecast' received from Mastercard Payment Services prior to each settlement. In addition, excess liquidity from the settlements is automatically released after the settlements have been executed. The inability of one or more participants to access Kronos2 will therefore only have a modest impact on the execution of the settlements.

In extreme situations where, for example, several participants are affected by breakdowns at the same time, Danmarks Nationalbank's contingency plan may be activated, including possible escalation to the Financial Sector Forum for Operational Resilience, FSOR.

KC 2:

Timely settlement and discretionary procedures

An FMI should be well prepared to implement its default rules and procedures, including any appropriate discretionary procedures provided for in its rules.

Kronos2 has sufficient operational capacity and trained staff to ensure timely performance of the required procedures in the event of a participant's bankruptcy/resolution or failure. Kronos2 is always staffed during its opening hours. The staff are trained to deal with a participant's resolution, bankruptcy or failure and is involved in any handling of such situation on an ongoing basis. Business procedures and instructions describing how to deal with the situation are in place. Regular testing of contingency procedures as well as testing of resolution/bankruptcy scenarios help to ensure that the staff are trained in the practical performance of the procedures.

Internal plans for the distribution of roles and responsibilities when dealing with failing banks and participants experiencing failures are in place. Kronos2's internal plans for handling participants' resolution, bankruptcy or failure include guidelines for coordination with relevant parties and timely communication. Kronos2 news and e-mails can be used to communicate with Kronos2 participants.

KC 3:

Public disclosure of key aspects of default rules and procedures

An FMI should publicly disclose key aspects of its default rules and procedures.

Default

If a participant defaults on its obligations, Danmarks Nationalbank has the right to liquidate assets provided by the participant as collateral for credit with Danmarks Nationalbank. This right is described in Danmarks Nationalbank's terms and conditions for accounts. They state that Danmarks Nationalbank is entitled to liquidate pledged securities without prior legal action and without notice, and to take ownership of a participant's pledged securities. Danmarks Nationalbank's right to perform close-out is described in Danmarks Nationalbank's terms and conditions for accounts.

Operational failures

Rules and procedures in relation to a participant's operational failures appear from Danmarks Nationalbank's terms and conditions for accounts, general provisions, section 5 on contingency procedures. If there is no connection to Kronos2, a participant may, by prior telephone agreement with Danmarks Nationalbank, perform critical transactions on request by using special forms that are faxed. The forms are included in the terms and conditions for accounts.

KC 4:

Testing and review of rules and procedures with participants and others

An FMI should involve its participants and other stakeholders in the testing and review of the FMI's default procedures, including any close-out procedures. Such testing and review should be conducted at least annually or following material changes to the rules and procedures to ensure that they are practical and effective.

Resolution and bankruptcy

As a rule, the procedures for dealing with participants in liquidation and/or bankruptcy are checked annually, either in the form of testing or in connection with the practical handling of cases.

Operational failures

Contingency procedures for dealing with operational failures are tested on a regular basis. Tests are also performed with the participation of mutually dependent FMI's (VP, Finance Denmark, CLS). The test results are shared and evaluated at the relevant management level. In addition, the procedures for dealing with participants experiencing operational failures have been tested regularly in practice.

Principle 15: General business risk

An FMI should identify, monitor, and manage its general business risk and hold sufficient liquid net assets funded by equity to cover potential general business losses so that it can continue operations and services as a going concern if those losses materialise. Further, liquid net assets should at all times be sufficient to ensure a recovery or orderly wind-down of critical operations and services.

Kronos2 is a central bank owned RTGS system and hence there is no need to hold liquid net assets specifically to cover business risks or support a recovery plan. Nor does Kronos2 need to maintain a plan for raising further capital.

KC 1:

Robust management of general business risk

An FMI should have robust management and control systems to identify, monitor, and manage general business risks, including losses from poor execution of business strategy, negative cash flows, or unexpected and excessively large operating expenses.

Kronos2 has taken precautions to prevent financial losses. Operational sources of business risk are identified and assessed regularly in connection with risk assessments.

Danmarks Nationalbank has implemented legal safeguards to prevent business losses resulting from claims for damages in relation to Kronos2 operations. Operational risks that may result in losses are managed in collaboration with Kronos2's operational service provider; see Principle 17.

Developments within payment systems are monitored in collaboration with various international market players, and IT developments are also monitored.

Kronos2 has minimised the risk that its expenses will not be covered by adjusting participant fees annually so that income reflects actual expenses.

Principle 16: Custody and investment risks

An FMI should safeguard its own and its participants' assets and minimise the risk of loss on and delay in access to these assets. An FMI's investments should be in instruments with minimal credit, market, and liquidity risks.

KC 1: Registration of collateral

An FMI should hold its own and its participants' assets at supervised and regulated entities that have robust accounting practices, safekeeping procedures, and internal controls that fully protect these assets.

Kronos2 uses VP for registration of collateral. VP-registered assets may be pledged to Danmarks Nationalbank as collateral for participants' intraday credit, both as traditional pledges and by using automatic collateralisation under Part 33 of the Danish Capital Markets Act.

VP is subject to supervision by the Danish Financial Supervisory Authority and oversight by Danmarks Nationalbank. This ensures that accounting methods are reliable, that assets are stored in a secure manner and that internal controls are in place. The most recent assessment of VP was made in connection with the Danish Financial Supervisory Authority's authorisation of VP as a central securities depository in December 2017 under the Regulation on improving securities settlement in the European Union and on central securities depositories (CSDR).

Among other things, VP has a solid legal basis for its activities. This means that VP's own assets and the participants' securities are segregated, that the participants' securities are segregated by using separate accounts, and that securities kept by the participants in custody accounts are safeguarded against claims by VP's creditors. VP and the participants are insured against errors in the registration of securities in custody accounts, and VP also has adequate capital resources to ensure that its registration activities can continue during a prolonged period of losses.

KC 2: Prompt access to assets in safekeeping

An FMI should have prompt access to its assets and the assets provided by participants, when required.

Danmarks Nationalbank has prompt access to its assets in safekeeping which are pledged using traditional pledges and automatic collateralisation. An agreement on prompt realisation has been concluded between Danmarks Nationalbank and the individual account holders, who must sign the 'Deed of Pledge for Credit Facilities in Danish Kroner at Danmarks Nationalbank' in the terms and conditions for accounts. The same applies to those who use automatic collateralisation and sign the automatic collateralisation agreement which is also included in the terms and conditions for accounts.

Danmarks Nationalbank's right to promptly liquidate collateral also applies in the event of a participant's resolution or bankruptcy.

KC 3: Exposure to custodian banks

An FMI should evaluate and understand its exposures to its custodian banks, taking into account the full scope of its relationships with each.

Risks related to the use of collateral services at VP are regularly considered in risk assessments.

Principle 17: Operational risk

An FMI should identify the plausible sources of operational risk, both internal and external, and mitigate their impact through the use of appropriate systems, policies, procedures, and controls. Systems should be designed to ensure a high degree of security and operational reliability and should have adequate, scalable capacity. Business continuity management should aim for timely recovery of operations and fulfilment of the FMI's obligations, including in the event of a wide-scale or major disruption.

KC 1: **Establishing a risk-management framework**

An FMI should establish a robust operational risk-management framework with appropriate systems, policies, procedures, and controls to identify, monitor, and manage operational risks.

Danmarks Nationalbank applies a structured framework for operational risk management; see Principle 3. The framework outlines processes for risk identification and assessment, follow-up on incidents etc. In addition, external risks are also addressed, for example in a dialogue with the Centre for Cybersecurity, CFCS, Nordic Financial Computer Emergency Response Team, NFCERT, other central banks, local authorities and providers. Operational risks are addressed on a regular basis and in a managed process through the framework.

Danmarks Nationalbank and the IT supplier, BEC Financial Technologies, have prepared a joint technical risk assessment of Kronos2/DNP, which is updated regularly. Danmarks Nationalbank and BEC hold monthly staffing meetings to ensure adequate staffing for the forthcoming month's operations and projects. All changes and releases are made in a managed change management process. Critical FSOR³² days are taken into account when implementing changes.

KC 2: **Decisions on roles and responsibilities for addressing operational risk by the board of directors**

An FMI's board of directors should clearly define the roles and responsibilities for addressing operational risk and should endorse the FMI's operational risk-management framework. Systems, operational policies, procedures, and controls should be reviewed, audited, and tested periodically and after significant changes.

The Board of Governors of Danmarks Nationalbank has overall responsibility for ensuring appropriate and adequate security and operational risk management at Danmarks Nationalbank. The Board of Governors define Danmarks Nationalbank's risk strategy and tolerance. The Board of Governors has approved the organisation and division of responsibilities according to the 3 Lines of Defence; see Principle 3.

The Board of Governors has delegated the management of operational risks and the framework for operational risk management to the Risk and Security Committee, RSU, where the Board of Governors and department heads are represented. RSU is informed of identified risks related to Kronos2 and prioritises mitigating actions. RSU also approves significant changes and updates to the framework, such as updates to the risk and security policy.

The department head of the department in Danmarks Nationalbank, which carries system ownership, is responsible for identified risks related to Kronos2.

Danmarks Nationalbank conducts ongoing contingency and technical tests related to Kronos2. The result of the tests is presented to RSU. See also KC 6 and KC 7.

KC 3: **Operational reliability**

An FMI should have clearly defined operational reliability objectives and should have policies in place that are designed to achieve those objectives.

Danmarks Nationalbank and BEC have entered into a service level agreement specifying targets for the operation and availability of Kronos2. The overall

³² The Financial Sector Forum for Operational Resilience, FSOR, is a forum for cooperation between authorities and key players in the financial sector.

requirement for the availability of Kronos2 is 99.8 per cent. There is also an overall requirement for a maximum recovery time of 2 hours (recovery time objective = 2 hours) and no data loss (recovery point objective = 0).

Danmarks Nationalbank receives monthly service and risk reports from BEC, which include the status of service targets, incidents and changes to Kronos2. In addition, Danmarks Nationalbank and BEC hold monthly risk and security board meetings to follow up on agreed objectives; see Principle 3.

BEC must remedy, respond to and inform about operational incidents within the agreed time limits, depending on the severity of the incident.

KC 4:
Scalable capacity

An FMI should ensure that it has scalable capacity adequate to handle increasing stress volumes and to achieve its service-level objectives.

Perago (software provider) has conducted a performance test which shows that Kronos2 can handle significantly more transactions than are ever expected to be completed at the same time. Moreover, Kronos2 is located on an isolated platform, DNP, which is specific to Danmarks Nationalbank. The DNP only handles Danmarks Nationalbank traffic – Danmarks Nationalbank is therefore not affected by traffic from other BEC customers.

KC 5:
Security policies

An FMI should have comprehensive physical and information security policies that address all potential vulnerabilities and threats.

Danmarks Nationalbank has established a risk and security policy and 12 underlying security guidelines, which must be adhered to by the entire organisation. BEC complies with relevant parts of the security guidelines and compliance is continuously monitored.

The risk and security policy defines the overall framework for security management and operational risk management at Danmarks Nationalbank. The underlying security guidelines are based on the ISO/IEC 27002:2013 standard – Information technology – Security techniques – Code of practice for information security controls, supplemented by requirements from other relevant sources. The

security guidelines deal various aspects of security management, including physical and environmental safety, and information security, including security requirements for the bank's IT operations. Furthermore, the security guidelines lay down clear and implementable security requirements for Danmarks Nationalbank's business activities, including Kronos2, to ensure that these activities can be carried out efficiently and reliably.

The risk and security policy and the underlying security guidelines are revisited and updated annually.

KC 6:
Business continuity

An FMI should have a business continuity plan that addresses events posing a significant risk of disrupting operations, including events that could cause a wide-scale or major disruption. The plan should incorporate the use of a secondary site and should be designed to ensure that critical information technology (IT) systems can resume operations within two hours following disruptive events. The plan should be designed to enable the FMI to complete settlement by the end of the day of the disruption, even in case of extreme circumstances. The FMI should regularly test these arrangements.

Kronos2 is located on an isolated and dedicated IT platform for use only by Danmarks Nationalbank. All important components are duplicated (for example there is two-centre operation at JN Data), which supports the objective of a maximum recovery time of two hours after a major event or breakdown. The duplication also supports the data loss objective. If Kronos2/DNP breaks down, the operation of Kronos2 can continue via ECF, an extreme contingency facility, which is located on a different platform.

Danmarks Nationalbank maintains a contingency plan which is activated in the event of major incidents and crises. The contingency plan covers IT, business, communication, risk management etc. The purpose of the contingency plan is to strengthen the management of major incidents and restore operations at Danmarks Nationalbank in the event of a major incident such as a cyber incident and to minimise the impact on Kronos2 in the event of a crisis. The plan is regularly updated and tested at least annually. Testing of a secondary site is part of the test plan.

A coordinating FSOR crisis management setup has been established under Financial Sector Forum for

Operational Resilience, FSOR. Danmarks Nationalbank serves as the secretariat for the crisis management. The FSOR crisis management plan is tested twice a year and so far, the tests have confirmed that the crisis management plan is an efficient tool for structuring and managing critical situations such as cyber attacks posing a threat to financial stability.

Danmarks Nationalbank has set up a secondary site located at an appropriate geographical distance from Danmarks Nationalbank in Copenhagen. The secondary site is tested and evaluated on a regular basis (several times a year) and learning points are followed up on.

**KC 7:
Interdependencies**

An FMI should identify, monitor, and manage the risks that key participants, other FMIs, and service and utility providers might pose to its operations. In addition, an FMI should identify, monitor, and manage the risks its operations might pose to other FMIs.

Monthly meetings are held between Danmarks Nationalbank and BEC. BEC and Danmarks Nationalbank have also prepared a joint technical risk assessment of Kronos2, which is regularly followed up on; see KC 1.

A Risk Forum for Interdependencies, RGA, has been established under the Financial Sector Forum for Operational Resilience, FSOR, with the participation of Danmarks Nationalbank, Finance Denmark, VP Securities and e-nettet. RGA identifies and manages interdependence risks; see Principle 3. Contingency procedures have been established between Kronos2 and the connected settlement systems.

Principle 18: Access and participation requirements

An FMI should have objective, risk-based, and publicly disclosed criteria for participation, which permit fair and open access.

KC 1: Fair and open access criteria

An FMI should allow for fair and open access to its services, including by direct and, where relevant, indirect participants and other FMIs, based on reasonable risk-related participation requirements.

The access criteria for Kronos2 allow participants access without significant restrictions. Kronos2 is open to all credit institutions and branches in Denmark which are:

- under the supervision of the Danish Financial Supervisory Authority
- under the supervision of a body in another EU country
- under the supervision of a body in a country with which the EU has concluded a cooperation agreement on home country supervision
- essential to the settlement of payments.

The assessment of whether a participant is essential to the settlement of payments is made by Danmarks Nationalbank.³³

There is fair and open access for all potential Kronos2 participants, regardless of size. This is partly due to the non-discriminatory pricing structure. The allocation key for Danmarks Nationalbank's Kronos2 costs is based on its usefulness to the individual participants. Participants with the most transactions and the highest transaction volume pay the most. In addition, only external costs for the operation and further development of the Kronos2 platform are invoiced to the participants. Internal and indirect costs are borne by Danmarks Nationalbank. This

helps to keep down the participants' co-payment. The non-discriminatory pricing structure and the framework for the participants' co-payment have helped to bring a large number of banks and other financial institutions on the Danish market into Kronos2.

KC 2: Risk considerations

An FMI's participation requirements should be justified in terms of the safety and efficiency of the FMI and the markets it serves, be tailored to and commensurate with the FMI's specific risks, and be publicly disclosed. Subject to maintaining acceptable risk control standards, an FMI should endeavour to set requirements that have the least-restrictive impact on access that circumstances permit.

As stated above, Kronos2 requires that participants are subject to supervision, which is Danmarks Nationalbank's assurance for letting institutions participate in Kronos2. Moreover, access is not restricted unnecessarily.

Intraday credit in Kronos2 is collateralised, which minimises Danmarks Nationalbank's credit risk on participants, see Principle 4, which eliminates the need for further restricting the group of participants.

Kronos2 has well-documented internal business procedures for setting up new participants, which helps to counter the risk of errors in the process.

Danmarks Nationalbank's terms and conditions for accounts and price lists are publicly accessible on Danmarks Nationalbank's website for the participants' information. Furthermore, a Kronos2 user manual is available to participants on the Danmarks Nationalbank's extranet. The manual helps to prevent participants from making unnecessary errors when settling payments in Kronos2.

KC 3: Compliance with participation requirements and exit rules

An FMI should monitor compliance with its participation requirements on an ongoing basis and have clearly defined and publicly disclosed procedures for

³³ See Danmarks Nationalbank (2019), 'Terms and conditions for accounts', paragraph 1, and 'Terms and conditions for a current account in Danish kroner at Danmarks Nationalbank', paragraph 1a. ([link](#)).

facilitating the suspension and orderly exit of a participant that breaches, or no longer meets, the participation requirements.

Kronos2 receives information from the Danish Financial Supervisory Authority if a participant is resolved or files for bankruptcy and/or the Authority revokes the participant's licence, resulting in the participant no longer being subject to supervision. This helps to monitor the participants' continued compliance with participation requirements.

If necessary, participants' current accounts and access to Kronos2 are blocked with immediate effect.

Kronos2 participants may close their accounts and exit Kronos2 at any time. The criteria for exiting Kronos2 are described in the terms and conditions for accounts.³⁴ Danmarks Nationalbank has discretionary powers to exclude a participant and/or exclude an account holder from the monetary policy instruments settled via Kronos2 and to require immediate payment of any outstanding amount without notice, regardless of whether a breach has taken place. These powers are also described in the terms and conditions for accounts.

Internal procedures are in place which regulate a participant's exit.

³⁴ See Danmarks Nationalbank (2019), 'Terms and conditions for accounts', paragraph 3. ([link](#)).

Principle 19: Tiered participation arrangements

An FMI should identify, monitor, and manage the material risks to the FMI arising from tiered participation arrangements.

KC 1: **Gathering of information about indirect participation**

An FMI should ensure that its rules, procedures, and agreements allow it to gather basic information about indirect participation in order to identify, monitor, and manage any material risks to the FMI arising from such tiered participation arrangements.

Financial institutions that do not hold accounts with Danmarks Nationalbank and do not participate in Kronos2 must use correspondent banks to gain access to the Danish payments infrastructure. System-wise, there are therefore no indirect participants in Kronos2. In this description, an indirect participant is defined as a party that makes arrangements with a direct participant to settle through that participant. Kronos2 considers the legal relationship between direct participants and other parties to be irrelevant to Danmarks Nationalbank. Any transactions settled by a direct participant on behalf of an indirect participant are, from a Kronos2 perspective, equivalent to the direct participant's own transactions. Kronos2 has clear rules for the settlement of a payment at all stages of the settlement process; see Principle 8. These rules also apply to payments made by a direct participant on behalf of an indirect participant.

Kronos2 collects information on the settlement of transactions by indirect participants, which is used to identify:

- how much of the direct participant's settlement is carried out on behalf of indirect participants
- direct participants settling on behalf of a considerable number of indirect participants
- indirect participants settling a considerable number of transactions or transactions of considerable value

- indirect participants settling a considerable number of transactions or transactions of considerable value in relation to the direct participant through which they settle.

KC 2: **Identification of dependencies between direct and indirect participants**

An FMI should identify material dependencies between direct and indirect participants that might affect the FMI.

Dependencies between direct and indirect Kronos2 participants are identified on the basis of the above information; see KC 1. In addition, Kronos2 maintains a dialogue with relevant direct participants about their settlement of payments for indirect participants.

KC 3: **Managing risks arising from tiered participation**

An FMI should identify indirect participants responsible for a significant proportion of transactions processed by the FMI and indirect participants whose transaction volumes or values are large relative to the capacity of the direct participants through which they access the FMI in order to manage the risks arising from these transactions.

Risks relating to indirect participants' transactions are managed by including such risks in risk assessments. Kronos2 has identified indirect participants with large transaction volumes or values relative to the overall transaction volume/value in Kronos2 or relative to the direct participants through which these indirect participants settle. This identification is used to identify indirect participants who pose a potential risk to the direct participant through which the indirect participant settles.

KC 4: **Regular risk review and mitigating action**

An FMI should regularly review risks arising from tiered participation arrangements and should take mitigating action when appropriate.

Risks associated with the Kronos2 transactions of indirect participants are described in a risk assessment, which is revisited annually. Any need to introduce measures to limit risks is investigated and the measures are implemented if this is deemed to be necessary.

Principle 21: Efficiency and effectiveness

An FMI should be efficient and effective in meeting the requirements of its participants and the markets it serves.

KC 1: Meeting the needs of its participants and the markets it serves

An FMI should be designed to meet the needs of its participants and the markets it serves, in particular, with regard to choice of a clearing and settlement arrangement; operating structure; scope of products cleared, settled, or recorded; and use of technology and procedures.

The development of Kronos2 takes place with the involvement of the participants. Following the commissioning of Kronos2, users have had the opportunity to discuss needs and requests with Danmarks Nationalbank in the Kronos2 user forum. This forum works at the operational level. At the management level, there is also a sector management forum where system requests can be discussed. This helps to ensure that the RTGS system meets the requirements and needs of the participants. Danmarks Nationalbank also discusses experience with the RTGS system with the other Nordic countries, which have the same RTGS provider. The discussion takes place in a forum made available by the provider.

KC 2: Clearly defined goals and objectives that are measurable and achievable

An FMI should have clearly defined goals and objectives that are measurable and achievable, such as in the areas of minimum service levels, risk-management expectations, and business priorities.

Kronos2 has clearly defined service level objectives that have been laid down in a service level agreement with BEC Financial Technologies (BEC). This includes requirements for uptime and timely completion of settlements, among other things. There is also a capacity requirement that Kronos2 must be able to handle at least 18,000 payments per hour. Capacity testing has shown that Kronos2 can handle approximately 33,000 payments per hour.

Risk management in connection with Kronos2 has been approved by the Board of Governors of Danmarks Nationalbank and ensures distribution of roles and responsibilities in relation to the management of all relevant risks to which Kronos2 is exposed. Danmarks Nationalbank's risk management is discussed in Principle 3.

An FMI should have established mechanisms for the regular review of its efficiency and effectiveness.

The operation of Kronos2 is followed up at both the operational, tactical and strategic levels. At the operational level, follow-up takes place immediately during and after the incident, while follow-up meetings at the tactical level are held with BEC. A service delivery board meeting is held every two weeks to follow up on any incidents and whether BEC has met the objectives of the operation of Kronos2. Material incidents or deviations are reported to management.

Kronos2 makes a point of ensuring fair and open access for all. This includes maintaining a non-discriminatory pricing structure which does not restrict the use of the system and is transparent. Pricing is recalculated annually using an allocation key based on the usefulness to the individual participant; see Principle 18, KC 1.

Principle 22: Communication procedures and standards

An FMI should use, or at a minimum accommodate, relevant internationally accepted communication procedures and standards in order to facilitate efficient payment, clearing, settlement, and recording.

VP settlement is owned by VP and is a system for settling securities transactions. In a securities transaction, securities are exchanged in custody accounts with VP, while payment is exchanged via the participants' accounts in Kronos2.

Kronos2 communicates with the clearing and settlement systems via the MQ connection, and messages/data are exchanged via proprietary formats.

KC 1: **Internationally accepted communication procedures and standards**

An FMI should use, or at a minimum accommodate, internationally accepted communication procedures and standards.

SWIFT

By using SWIFT, Kronos2 observes internationally accepted communication procedures and standards. The messaging format follows the MT format, and procedures for the use of messages have been laid down in the SWIFT standards.

Account holders that use SWIFT typically have their own automated systems that send and receive Kronos2 payments to and from account holders through SWIFT. Account holders that use SWIFT will typically use SWIFT for as many of their payments as possible, while account holders that do not use SWIFT will use a graphical interface, the Kronos2 graphical user interface (GUI). To ensure that account holders with and without SWIFT can send payments to each other, Kronos2 contains functionality that enables account holders with SWIFT to send and receive all payments via SWIFT, regardless of whether the receiving and sending account holder uses SWIFT or only the Kronos2 GUI.

Kronos2 is compatible with the ISO 20022 standard in relation to communication with the pan-European securities settlement system, TARGET2-Securities.

Communication with settlement systems

Sum Clearing, Intraday Clearing and Express Clearing are Finance Denmark's clearing and settlement systems for settlement of Danish retail payments. The final transfer of money between the financial institutions takes place in accounts in Kronos2.

Principle 23: Disclosure of rules, key procedures, and market data

An FMI should have clear and comprehensive rules and procedures and should provide sufficient information to enable participants to have an accurate understanding of the risks, fees, and other material costs they incur by participating in the FMI. All relevant rules and key procedures should be publicly disclosed.

KC 1:

Clear and comprehensive rules

An FMI should adopt clear and comprehensive rules and procedures that are fully disclosed to participants. Relevant rules and key procedures should also be publicly disclosed.

Kronos2's rules and procedures are described in the terms and conditions for accounts, which are available in Danish and English on Danmarks Nationalbank's website ([link](#)). Settlement of payments in Danish kroner takes place in Kronos2, while settlement of payments in euro takes place via TARGET2.

The terms and conditions for accounts include descriptions of:

- General
- Settlement of payments in Danish kroner and monetary policy instruments
- Fax forms for contingency procedures in relation to Danish kroner
- Settlement of payments in euro.

In addition, the terms and conditions for accounts are supplemented by a number of user guides and documents on Kronos2, T2S, user management, pricing model, collateral and a list of eligible assets (LEA). These guides and documents as well as a general description of Kronos2 etc. are available (in Danish and English) on Danmarks Nationalbank's website ([link](#)) and on Danmarks Nationalbank's extranet.

Several employees in different departments have been assigned the task of ensuring that the terms and conditions for accounts are always updated. All

updates to the terms and conditions for accounts are posted on Danmarks Nationalbank's extranet with changes and markup shown so that participants can see exactly which changes have been implemented since the last version. Previous versions can also be accessed via Danmarks Nationalbank's extranet.

In extraordinary situations, i.e. situations where Kronos2's normal operations are disrupted, contingency procedures may be used. Contingency procedures for Kronos2 and TARGET2 are described in the terms and conditions for accounts. The terms and conditions for accounts also include contingency forms to be used by participants in order to ensure uniform and safe handling of contingency procedures. Schedules are determined on the basis of the specific situations, and participants are notified via broadcasts in Kronos2 for Danish kroner and in TARGET2 for euro, if possible, or by e-mail and similar means of communication. If Danmarks Nationalbank has knowledge of forthcoming extraordinary situations, it may choose to send out emails to participants informing them of the situation. The contingency procedures are tested to ensure that participants know how to handle such situations.

KC 2: Descriptions of system design and operations

An FMI should disclose clear descriptions of the system's design and operations, as well as the FMI's and participants' rights and obligations, so that participants can assess the risks they would incur by participating in the FMI.

Kronos2's structure and settlement cycles are described in the terms and conditions for accounts and on Danmarks Nationalbank's website under the 'Banking and payments' menu item ([link](#)). The terms and conditions for accounts describe the specific settlement times, while the overall description of Kronos2's structure and settlement process can be found in the documents 'Kronos2 T2S memo' ([link](#)) and 'Kronos2 memo' ([link](#)).

The rights and obligations of the participants are also described in the terms and conditions for accounts.

The terms and conditions for accounts do not describe credit risk, as Kronos2 always checks that there are sufficient funds in the participants' accounts before settling payments to eliminate any credit risk. When a payment has been settled, it is final, even if a participant is subject to bankruptcy proceedings. Since settlement takes place via accounts with Dan-

marks Nationalbank, participants do not incur any credit risk on the settlement bank either.

With regard to liquidity risk, the 'Kronos2 memo' ([link](#)) describes how the liquidity management tools are structured in Kronos2.

**KC 3:
Training of participants**

An FMI should provide all necessary and appropriate documentation and training to facilitate participants' understanding of the FMI's rules and procedures and the risks they face from participating in the FMI.

All Kronos2 participants have received training material and training at Danmarks Nationalbank. New participants wishing to join Kronos2 are provided with test material. Kronosgroup is also available for questions etc. and serves as a national service desk for the participants.

On Danmarks Nationalbank's website you will also find reports describing the structure of Kronos2.

Kronosgroup is staffed throughout the Kronos2 opening hours by experienced employees who can provide support and assistance to participants in the event of problems.

Participants are required to familiarise themselves with Kronos2, as they must sign a statement confirming that they understand and accept the terms and conditions for accounts when opening an account. In addition, participants are involved in the testing of contingency procedures to make sure that they are trained in these procedures.

**KC 4:
Costs of participation**

An FMI should publicly disclose its fees at the level of individual services it offers as well as its policies on any available discounts. The FMI should provide clear descriptions of priced services for comparability purposes.

Danmarks Nationalbank's terms and conditions for accounts contain a description of fees and prices. In addition, there is a description of the pricing model, which is updated annually with new prices. The pricing model is available on Danmarks Nationalbank's website: 'Pricing model in Kronos2' ([link](#)).

All account holders are charged a monthly account holder-specific Kronos2 fee based on an allocation

key, where most of the costs are allocated on the basis of an equal weighting of the account holders' share of the total number and total value of transactions in Kronos2 in the year of calculation, respectively. Account holders participating in T2S are also charged a separate Kronos2/T2S fee and a monthly payment on account for their use of information services on the T2S platform.

**KC 5:
Response to CPMI-IOSCO Disclosure framework and public disclosure of data**

An FMI should complete regularly and disclose publicly responses to the CPSS-IOSCO Disclosure framework for financial market infrastructures. An FMI also should, at a minimum, disclose basic data on transaction volumes and values.

This report is the second description of Kronos2 according to the CPMI-IOSCO Principles, i.e. the second disclosure. The latest version is available on Danmarks Nationalbank's website: 'Description of Kronos in relation to international principles' ([link](#)).

Basic data about transaction volumes and values is published in Danmarks Nationalbank's oversight publication 'Oversight of the financial infrastructure in Denmark' ([link](#)) on Danmarks Nationalbank's website.

List of publicly available resources

Danmarks Nationalbank, Payment systems in Denmark, *Danmarks Nationalbank publication*, first edition, 1 September 2005 ([link](#)).

Danmarks Nationalbank, Kronos2 memo, 3 October 2016 ([link](#)).

Danmarks Nationalbank, Oversight of the financial infrastructure 2020, *Danmarks Nationalbank Report*, no. 3, May 2021 ([link](#)).

Danmarks Nationalbank, Danmarks Nationalbank's terms and conditions for accounts, 19 March 2021 ([link](#)).

Danmarks Nationalbank, Pricing model in Kronos2, May 2020 ([link](#)).

Danmarks Nationalbank, Banks from more than 100 countries send payments via Kronos, *Danmarks Nationalbank Analysis*, no. 19, November 2017 ([link](#)).

Danmarks Nationalbank, Liquidity stress test shows that Kronos is resilient, *Danmarks Nationalbank Analysis*, no. 9, May 2019 ([link](#)).

Danmarks Nationalbank, Kronos2 T2S memo, 29 November 2017 ([link](#)).