

DANMARKS
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OVERSIGHT OF THE FINANCIAL INFRASTRUCTURE IN DENMARK

2016



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FOREWORD

It is important for society that payments and securities transactions can be effected in a safe and efficient manner. Danmarks Nationalbank contributes to this process by overseeing the core payment and settlement systems in Denmark and the most important payment instruments.

Oversight takes place on the basis of section 1 of the Danmarks Nationalbank Act, stating that Danmarks Nationalbank shall “maintain a safe and secure currency system in this country, and [...] facilitate and regulate the traffic in money and the extension of credit”. Danmarks Nationalbank’s powers are also supported by section 86(2) of the Danish Securities Trading Act, which states that Danmarks Nationalbank shall oversee payment systems that are, in the opinion of Danmarks Nationalbank, “of major significance to payment settlement [...] with a view to promoting the smooth functioning of the systems by contributing to their efficiency and stability”.

Danmarks Nationalbank’s oversight comprises the systemically important parts of the financial infrastructure, i.e. the systems and instruments where errors and failures are assessed to constitute a potential threat to financial stability or

to weaken confidence in the financial system in Denmark. Oversight is based on international standards for safety and efficiency. Danmarks Nationalbank assesses whether the structures and functionalities of the systems and instruments subject to oversight comply with the international standards and instigates changes to the systems/instruments as required. Danmarks Nationalbank’s oversight is described in detail in Danmarks Nationalbank’s policy for oversight.¹

Danmarks Nationalbank cooperates with the Danish Financial Supervisory Authority regarding areas of oversight where their powers overlap. The purpose is to avoid double regulatory control, to utilise the competencies of the respective authorities and to ensure that relevant information is shared.² Danmarks Nationalbank does not supervise the individual firms within the infrastructure.

In this publication, Danmarks Nationalbank presents the general conclusions from its oversight activities, as well as positions and recommendations that can contribute to a safe and efficient financial infrastructure.

1 Danmarks Nationalbank, Oversight Policy 2015, June 2015 ([link](#)).

2 The overall framework for cooperation between Danmarks Nationalbank and the Danish Financial Supervisory Authority is laid down in the Memorandum of Understanding between Danmarks Nationalbank and the Danish Financial Supervisory Authority ([link](#)).

SUMMARY AND RECOMMENDATIONS

The Danish payments infrastructure is the network of systems that makes it possible for consumers, firms and public authorities to exchange payments. Danmarks Nationalbank oversees the most important infrastructure systems and payment instruments, i.e. Kronos, the Sumclearing, the Intradagclearing and the Straksclearing, the VP securities settlement system and the most important payment instruments such as the Dankort.

Oversight of the payment and settlement systems is based on the 2012 CPMI-IOSCO principles. In recent years, those responsible for the Danish systems have worked to ensure compliance with the stricter requirements of these principles. In 2015 there was particular focus on finalising adjustment of governance structures and risk management frameworks. This process has taken place in a dialogue with Danmarks Nationalbank. In this connection, the stricter requirements for managing risks related to interdependencies between the various systems have also been discussed. The principles prescribe that risks should be identified and addressed, that robust contingency procedures should be established across systems and that the crisis management measures of the various systems should be sufficiently coordinated.

In view of generally increased concerns about cybercrime, CPMI-IOSCO is preparing a comprehensive guidance document on cyber resilience for financial market infrastructures. Special importance is attached to governance structures and processes to ensure effective management of cyber risk. The guidance addresses various elements of risk management and contingency planning in the individual payment and settle-

ment systems and emphasises the importance of working together across systems within areas such as testing, crisis management exercises and information-sharing. The guidance has been subject to public consultation and is expected to be published in its final form during 2016.

Danmarks Nationalbank and the Danish Financial Supervisory Authority have prepared an assessment of VP in relation to the CPMI-IOSCO principles for securities settlement systems. The main conclusion is that the VP system is secure and efficient and that VP observes most of the principles without major deficiencies. Four recommendations have been issued to VP.

Danmarks Nationalbank has initiated assessments of Kronos and the retail payment systems, respectively, in relation to the CPMI-IOSCO principles. Furthermore, work is underway on an assessment of the Dankort system in relation to the ECB's standards for card systems.

OPERATIONAL RELIABILITY AND LIQUIDITY

Kronos operations were satisfactory in 2015; system uptime was lower than the agreed service level in only one month. VP system uptime was a little lower than in 2014, but satisfactory from an overall perspective. The operational stability of the Sumclearing, Intradagclearing and Straksclearing and of Nets' card platforms was generally satisfactory in 2015. It is assessed that for all systems/solutions minor incidents during the year have been followed up in a satisfactory manner.

Overall, there was ample liquidity for settlement of payments in the Danish systems in 2015. In February 2015, available liquidity rose sharply

as a result of Danmarks Nationalbank's net sales of Danish kroner in connection with the upward pressure on the krone. As this pressure subsided, the level of krone liquidity normalised again. The participants in the retail payment systems have generally had considerably excess liquidity for settlement. One of the reasons is that most participants use the automated liquidity management tools introduced in 2013. A participant had reserved insufficient liquidity for settlement in only one case.

In the VP settlement there were several cases in 2015 where individual participants had not reserved sufficient liquidity for settlement due to poor liquidity management. The share of securities transactions settled on time was in line with the level in the previous year. VP imposes sanctions on participants who fail to observe their settlement obligations. Danmarks Nationalbank monitors the development in settlement discipline with a view to assessing the efficiency of VP's sanctioning regime.

Settlement of foreign exchange transactions in Danish kroner in the CLS system and settlement of Danish participants' payments in euro in Target2 ran smoothly throughout the year.

CHANGES TO THE PAYMENTS INFRASTRUCTURE

Danmarks Nationalbank's project to replace the systems supporting its handling of payments, collateralisation and monetary policy operations continued in 2015. The new RTGS system, Kronos2, will be implemented on 18 April 2017. The ongoing assessment of Kronos in relation to the CPMI-IOSCO principles focuses on the administration of the system, which will also apply to Kronos2.

Target2-Securities, T2S, is a trans-European securities settlement system that has been in operation since June 2015. A total of 21 international central securities depositories, CSDs, have concluded agreements to join T2S. VP will connect to T2S for settlement in euro on 12 September 2016 and in kroner in the autumn of 2018. A sector test of VP's T2S settlement in euro is taking place in the 1st half of 2016.

In connection with discussions between Danmarks Nationalbank and the market participants about the participants' access to liquidity in euro in T2S, it was decided to discontinue Danmarks Nationalbank's euro facility, which was relatively expensive for participants to use. Participants who

want direct access to liquidity in euro must therefore open an account with a central bank in the euro area via a branch in that member state.

When Danish kroner join T2S, the close of the monetary policy day in Denmark will be postponed from 3:30 pm to 5 pm. Longer opening hours in Kronos will make it possible to keep the Intradagclearing open correspondingly longer so that more credit transfers can be settled within the same day.

RECOMMENDATIONS

Danmarks Nationalbank's general assessment is that the Danish payment and settlement systems are safe and efficient. On the basis of Danmarks Nationalbank's oversight activities, the following recommendations are made with a view to further promoting safe and efficient settlement of payments and securities transactions.

COLLABORATION ON MANAGEMENT OF THE RISKS RELATED TO INTERDEPENDENCIES

To increase the operational robustness of the Danish payments infrastructure, collaboration between Kronos, VP and the retail payment systems should be established before the end of 2016 with a view to identifying and addressing risks related to system interdependencies. In this context, the possibility of establishing joint testing of crisis management plans across systems should be considered.

CPMI-IOSCO GUIDANCE ON CYBER RESILIENCE

CPMI-IOSCO is preparing a guidance document on cyber resilience for financial market infrastructures. Kronos, VP settlement and the retail payment systems should perform analyses of whether their cyber resilience observes the CPMI-IOSCO guidance and, if necessary, take initiatives to ensure observance.

LONGER OPENING HOURS IN THE INTRADAGCLEARING

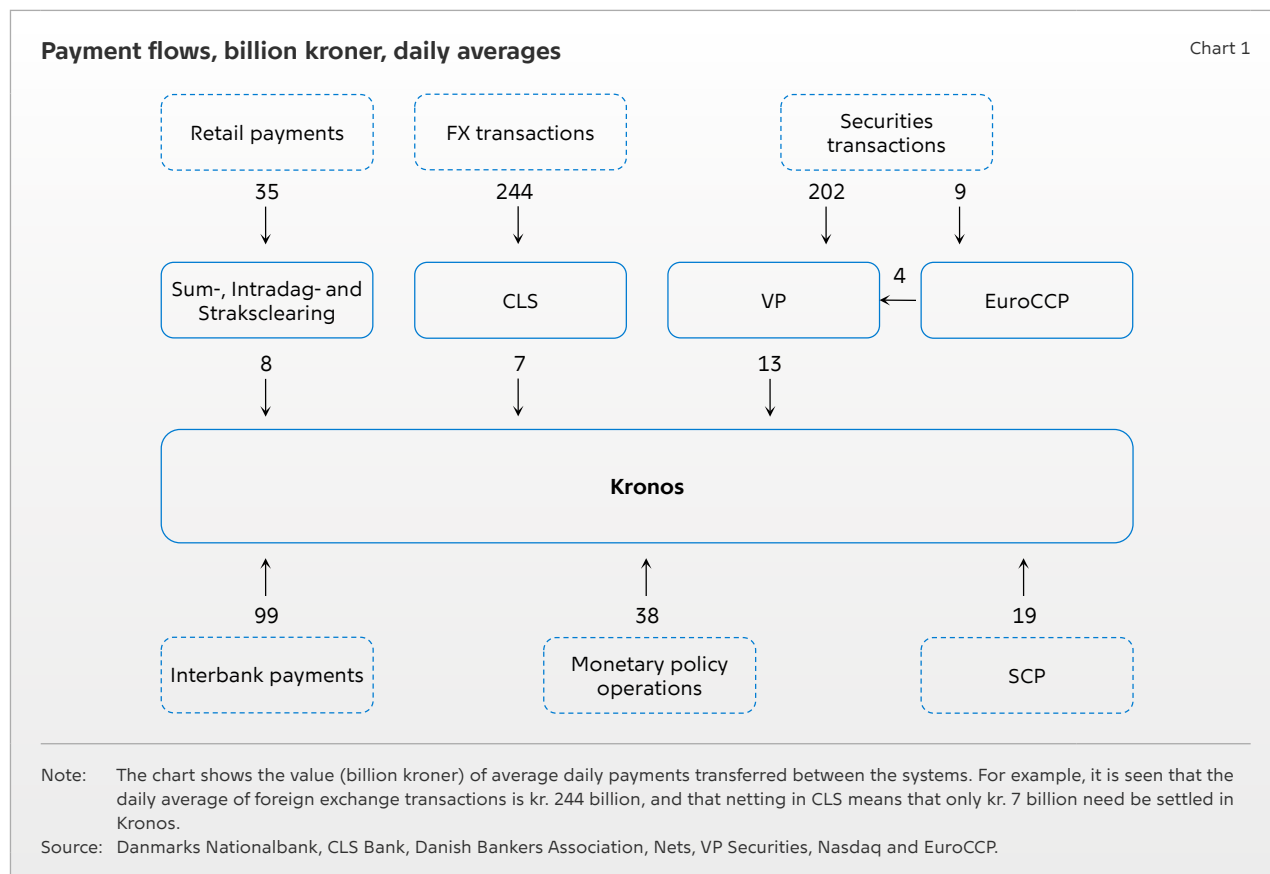
In order that as many credit transfers as possible can be settled within the same day, the last settlement cycle in the Intradagclearing should be postponed from 2 pm to 3:30 pm when the longer opening hours in Kronos make this possible from the autumn of 2018.

THE DANISH PAYMENTS INFRASTRUCTURE

The Danish payments infrastructure is the network of systems that makes it possible for consumers, firms and public authorities to exchange payments. Danmarks Nationalbank's payment system, Kronos, plays a central role in this infrastructure, both in relation to settlement of large, time-critical payments between banks and in view of Danmarks Nationalbank's role as settlement bank for the retail payment systems – the Sumclearing, the

Intradagclearing and the Straksclearing – the VP securities settlement system and the foreign exchange settlement system CLS. Every day, billions of kroner are exchanged via the Danish payments infrastructure, cf. Chart 1.

The banks exchange payments via Kronos. These interbank payments make up just over half of the payments in Kronos. In addition, transactions are executed in connection with monetary



policy operations and transactions in relation to SCP, a system for pledging of cross-border collateral.

The other payment and settlement systems in the infrastructure, i.e. the Sumclearing, the Intradagclearing and the Straksclearing, CLS and VP settle their participants' net positions in Kronos. Net positions are calculated by offsetting participants' claims and obligations in the respective systems. Netting reduces the participants' liquidity requirement for settlement considerably compared with a situation where all payments are settled individually. Settlement of net positions in Kronos takes place at fixed times during the day, while interbank payments are settled on a continuous basis.

Retail payments are payments between consumers, firms and public authorities, e.g. by Dankort or as credit transfers. On the basis of the individual payments, the participants' net positions have been calculated at a daily average of kr. 8 billion for settlement in Kronos. This means that the participants' liquidity requirement for settlement of retail payments is reduced by 77 per cent on average.

Foreign exchange transactions in CLS comprise e.g. FX spot, FX forward and FX swap transactions. FX swaps are typically used for hedging foreign exchange risk and constitute by far the largest share of foreign exchange transactions in Danish kroner.³ In CLS, the daily value of the krone leg of foreign exchange transactions averages kr. 244 billion, corresponding to approximately 70 per cent of all foreign exchange transactions in Danish kroner. After netting, approximately 3 per cent of the daily value is settled in Kronos.

Securities transactions in VP comprise trading in bonds, equities and investment fund shares. Securities can also change owners without payment, e.g. in connection with securities lending or transfer of securities for use as collateral. The market value of the securities changing ownership in VP with or without payment averages kr. 206 billion per day. Some securities transactions, such as equity trades, are settled via a central counterparty, CCP. However, this applies to only a limited share of the total turnover. After netting, 6 per cent of the daily value of securities transactions is settled in Kronos.

OVERSIGHT BY DANMARKS NATIONALBANK

It is important to society that payments and securities transactions can be effected in a safe and efficient manner. Danmarks Nationalbank contributes to this process by overseeing the core payment and settlement systems in Denmark and the most important payment instruments. Oversight by Danmarks Nationalbank comprises:

- Kronos
- Sumclearing, Intradagclearing and Straksclearing
- VP settlement
- Dankort, Betalingsservice and credit transfers

In addition, Danmarks Nationalbank contributes to other central banks' oversight of international systems of relevance in Denmark. The systems subject to oversight are described in Box 1.

Oversight is based on international standards laying down requirements for safety and efficiency, including high operational stability and comprehensive risk management; in addition, the systems and instruments must be up-to-date and cost-effective. As part of its oversight, Danmarks Nationalbank assesses whether systems and instruments meet the international standards, and system/instrument developments are monitored on an ongoing basis by collecting information and via dialogues with the system owners. If necessary, changes to the systems/instruments are initiated.

The overall results of the oversight are presented below. First, two cross-sector themes involving all the systems subject to oversight are described. This is followed by presentations of the conclusions regarding the individual systems and instruments.

³ BIS, Triennial Central Bank Survey of foreign exchange and derivatives markets activity in 2013 ([link](#))

Payment and settlement systems in Denmark

Box 1

Kronos is Danmarks Nationalbank's real-time gross settlement, RTGS, system of payments in Danish kroner. It is used mainly for settlement of large, time-critical payments between banks. BEC is the system operator. Kronos is subject to oversight by Danmarks Nationalbank.

Target2 is the Eurosystem's RTGS system for euro payments. The ECB is the primary oversight, while Danmarks Nationalbank has joint oversight powers and is responsible for oversight of the Danish Target2 components.

The Sumclearing, Intradagclearing and Straksclearing are the Danish Bankers Association's systems for clearing and settlement of Danish retail payments. The Sumclearing and Intradagclearing are multilateral net settlement systems, in which transfer of funds between participants takes place via Kronos accounts. The Straksclearing is a real-time clearing system for payments of up to kr. 500.000, prefunded via Kronos. Nets is the system operator. The Sumclearing, Intradagclearing and Straksclearing are subject to oversight by Danmarks Nationalbank.

VP settlement which is owned by VP Securities A/S, is primarily a multilateral net settlement system for clearing and settlement of securities transactions. In addition, settlement of gross transactions in real time, i.e. instant settlement, may take place. In a securities transaction, securities are exchanged via custody accounts in VP, while payment is exchanged via the participants' Kronos or Target2 accounts. VP settlement is subject to oversight by Danmarks Nationalbank in cooperation with the Danish Financial Supervisory Authority.

EuroCCP is a central counterparty, CCP, for equity transactions concluded at Nasdaq OMX in Copenhagen. The Dutch central bank heads a CCP college of which the Danish Financial Supervisory Authority is a member with voting rights. Danmarks Nationalbank participates as an observer.

NASDAQ OMX Clearing is a CCP for repo transactions in government bonds and the most frequently traded mortgage bonds in Denmark. The Swedish Financial Supervisory Authority heads a CCP college of which the Danish Financial Supervisory Authority is a member with voting rights.

CLS which is owned by large international banks, is a multilateral clearing and settlement system for foreign exchange transactions in 18 currencies at present. The krone leg in the participants' foreign exchange transactions is settled via CLS Bank's account at Danmarks Nationalbank. The Federal Reserve System, FED, is the primary oversight authority, while the central banks of the participating currencies, including Danmarks Nationalbank, hold joint oversight powers of CLS. A joint CLS Oversight Committee has been established as a forum for cooperation in relation to the central banks' national oversight duties.

Scandinavian Cash Pool, SCP, is a system for pledging of cross-border collateral for intraday credit in Danish, Swedish kronor and Norwegian kroner. The main principle of SCP is that liquidity raised from the central bank of one country can be pledged as collateral to the central bank if another country. SCP is subject to oversight by Danmarks Nationalbank as an element of its oversight of Kronos.

1. These systems are described in more detail at www.nationalbanken.dk under Banking and payments.

CROSS-SECTOR OVERSIGHT THEMES

In Danmarks Nationalbank's dialogue with the systems subject to oversight, there was special focus in 2015 on management of risks resulting from system interdependencies and on the forthcoming CPMI-IOSCO guidance on cyber resilience for financial market infrastructures.

COLLABORATION ON MANAGEMENT OF THE RISKS RELATED TO INTERDEPENDENCIES

Oversight of the core payment and settlement systems is based on CPMI-IOSCO's⁴ "Principles for Financial Market Infrastructures" from 2012. These principles lay down a number of requirements for the overall structure of the systems, including a solid legal basis, a clear and transparent organisational and governance structure and a robust risk management framework. Furthermore, the principles lay down requirements for the management of all potential risks associated with clearing and settlement of financial transactions.

In recent years, those responsible for Kronos, the VP settlement system and the retail payment systems, respectively, have worked towards meeting these requirements. In 2015 there was focus on final adjustment of governance structures and risk management frameworks. This process has taken place in a dialogue with Danmarks National-

bank. In this connection, the stricter requirements for managing risks related to interdependencies between the various systems have also been discussed. Danmarks Nationalbank has recommended that collaboration between Kronos, VP and the retail payment systems be established before the end of 2016 with a view to identifying and addressing risks related to system interdependencies.

Stronger cooperation in relation to managing the risks arising from interdependencies should ensure that risks across the infrastructure systems are identified and addressed. For example, operational risks in one system may have a direct impact on settlement in another system, or there may be external risks that pose a threat to all the systems, e.g. the risk of cyberattacks. For all types of risk that may have an impact across systems, the probability and consequences should be assessed, and on that basis suitable measures should be implemented to counter the mutual risks. This could be done e.g. by ensuring that there are robust contingency procedures across systems and that the crisis management of the various systems are sufficiently coordinated. In this context, the possibility of establishing joint testing of crisis management plans across the infrastructure should be considered.

Danmarks Nationalbank has invited those responsible for VP settlement and the retail

⁴ The Committee on Payment and Market Infrastructures, CPMI, is based at the Bank for International Settlements, BIS. The International Organization of Securities Commissions, IOSCO, is an international forum of cooperation between supervisors of securities markets.

payment systems to a kick-off meeting on collaboration regarding risks arising from interdependencies.

CPMI-IOSCO GUIDANCE ON CYBER RESILIENCE

Internationally, there is a large focus on cyber risk, and in Denmark the Centre for Cyber Security assesses that the threat towards public authorities and private companies is very high.⁵

The CPMI-IOSCO principles for financial market infrastructures contain requirements for IT security and management of operational risk in payment and settlement systems. In view of generally increased concerns about cybercrime, CPMI-IOSCO is preparing a guidance document on cyber resilience for financial market infrastructures as a supplement to the principles. The guidance, which elaborates on the general requirements in the principles, has been subject to public consultation and is expected to be published in its final form during 2016.⁶

The need for more detailed guidance should be viewed in the light of the unique characteristics of cyber risk, which should be taken into account in the system set-up for management of operational risk. Cyberattacks are of a persistent nature and can be more difficult to identify than ordinary IT failures. Due to the interconnectedness of the infrastructure, cyberattacks may come through many entry points; these include participants, other systems and service providers. Furthermore, cyberattacks can affect both the primary IT systems and the backup systems at the same time, and attacks may spread within IT systems. Hence, it must be possible to detect and counter cyberattacks rapidly.

The CPMI-IOSCO guidance attaches special importance to governance structures and processes to ensure effective management of cyber risk, including that the work to ensure cyber resilience should be anchored at the top management level. The guidance also addresses various elements of risk management and contingency planning in the individual payment and settlement systems and emphasises the importance of working together across the financial infrastructure within areas such as testing, crisis management exercises and information-sharing. The guidance is described in Box 2.

Danmarks Nationalbank recommends that analyses be performed of whether the cyber resilience strategies in relation to Kronos, VP settlement and the retail payment systems observe the CPMI-IOSCO guidance and, if necessary, that initiatives be taken to ensure observance.

⁵ The Threat Assessment Branch under the Centre for Cyber Security, *The cyber threat against Denmark*, 2016 ([link](#)).

⁶ CPMI-IOSCO Guidance on cyber resilience for financial market infrastructures, Consultative report, November 2015 ([link](#)).

The guidance addresses five primary risk management categories in the individual payment and settlement systems, cf. the first five headings below. Furthermore, three overarching components of cyber resilience are addressed, cf. the last three headings below.

Governance

A payment or settlement systems' effective management of cyber risk starts with a clear and well-documented cyber resilience framework and a cyber resilience strategy approved by the organisation's board. The strategy should address people, processes and technology, as well as communication with relevant parties. There should be clearly defined roles and responsibilities in relation to management of cyber risk and accountability for decisions in a crisis. The board should be ultimately responsible for management of cyber risk and should endorse the cyber resilience framework, set the level of risk tolerance and regularly apprise its observance. Senior management should oversee the implementation of its cyber resilience framework, and the policies, procedures and controls that support it. In addition, the board and management should cultivate a strong level of awareness of and commitment to cyber resilience and designate a senior executive to be responsible and accountable overall for the cyber resilience framework within the organisation.

Identification

Critical business functions and supporting processes should be identified and classified as a point of departure for prioritisation of cyber risk activities. Access rights to systems and data should be monitored with a view to identifying anomalous activities. Cyber risk in relation to interconnected systems and processes should be identified and measures coordinated with stakeholders.

Protection

The confidentiality, integrity and availability of a system should be ensured by means of strong information and communication technology, ICT, and security controls and other protective measures as required for the payment or settlement system. Whenever possible, resilience should be built into the design of systems and new solutions, e.g. by means of extensive network segmentation. The payment or settlement system should take into account potential insider threats, including via analysis of anomalous behaviour in the systems, screening/background checks of employees, strong access control and restriction of rights. It should also be ensured that employees receive appropriate training and are always aware of cyber risk.

Detection

There should be effective capabilities for detecting anomalous activities in the systems, including continuous moni-

toring of system activities relating to people, processes and technology.

Resumption

It should be possible to resume operations rapidly, safely and with accurate data. It should be possible to resume critical operations rapidly – preferably within two hours so that settlement can be completed within the same day. In a situation where full resumption within two hours is not possible, the most critical elements should be resumed first. This requires that a plan for this scenario has been prepared beforehand. All plans etc. should be tested and updated on an ongoing basis. It should be considered whether a technically independent third data centre is required. Plans should be established for communication with relevant stakeholders, including participants, interconnected systems and authorities, and such plans should include clearly defined escalation and decision-making procedures.

Testing

Comprehensive testing should take place before systems and procedures are employed, and subsequently there should be regular testing, including vulnerability assessments, penetration tests and "red team tests", which simulate a real cyberattack. These tests should comprise extreme but plausible scenarios based on updated information. The test results should support the ongoing improvement of the system's cyber resilience. Employees as well as relevant external parties, such as participants, critical service providers and linked systems, should be involved in the testing. The systems should participate in crisis exercises organised by relevant authorities and in industry-wide tests.

Situational awareness

All threats, including potential but extreme scenarios, should be identified and assessed. A process should be established to gather and analyse relevant cyber threat information. This information must be made available to appropriate staff with responsibility for the mitigation of cyber risks at the strategic, tactical and operational levels. An important element of situational awareness is that the system participates actively in relevant forums for information-sharing and works with stakeholders in and outside the sector.

Learning and evolving

As the cyber threat environment constantly changes, a system's cyber resilience framework must constantly be adapted. Key lessons from cyber events that have occurred within and outside the organisation should systematically be identified and distilled. Technological developments should be monitored actively in terms of both threats and measures to counter them. Efforts should be made to actively predict events by analysing relevant statistics and activity that deviates from the baseline.

INTERBANK PAYMENTS

Interbank payments are the payments exchanged between banks. Such payments are typically characterised by being time-critical and of high value, and hence they are settled in real-time gross settlement, RTGS, systems, where payments are settled individually and immediately. Most Danish banks are connected to the RTGS system Kronos, which settles interbank payments in Danish kroner. Many Danish banks are also connected to Target2, which settles interbank payments in euro.

KRONOS

Interbank payments in Danish kroner are settled in Danmarks Nationalbank's RTGS system, Kronos, which is also used for settlement of monetary policy operations and net positions from connected payment and settlement systems.

USE

Kronos has 94 participants: 71 Danish banks, 6 mortgage banks, 10 branches of foreign banks and 7 other participants.⁷

In 2015, approximately 4,400 interbank payments were settled via Kronos every day, corresponding to approximately kr. 99 billion. This is an increase on 2014, cf. Table 1. The value of monetary policy operations in the form of sale of certificates of deposit and transfers to settle-

ment systems also rose considerably in 2015, cf. below.

The activity in Kronos reflects the activity in the financial sector, but it is also affected by the monetary policy situation. Due to the upward pressure on the Danish krone in the spring of 2015, Danmarks Nationalbank intervened by purchasing foreign currency and selling kroner. The kroner were deposited in the banks' accounts at Danmarks Nationalbank. This meant that the participants' liquidity increased. As a result, there was an increased need to invest in certificates of deposit, and larger transfers for settlement in the Sumclearing, Intradagclearing and Straksclearing, to which participants typically transfer all available liquidity for the night-time settlement cycles. As the pressure on the krone subsided during 2015, Danmarks Nationalbank gradually purchased kroner so that the total liquidity available in kroner was reduced again. This is evident from the figures for the first months of 2016 in Table 1.

OPERATIONAL RELIABILITY

Kronos' uptime⁸ exceeded 99.8 per cent in 2015, which is satisfactory. However, two minor incidents meant that in one month system uptime was lower than the agreed service level. In 2015 Kronos was also affected by a number of minor incidents that did not have any impact on the uptime. It is assessed that all incidents have been satisfactorily followed up.

⁷ Other participants can be e.g. settlement systems or investment firms.

⁸ The uptime is the technical uptime supplied by Kronos' IT service provider. Operational disruptions caused by other sources are not included.

Payments in Kronos, daily averages

Table 1

Kr. billion	2012	2013	2014	2015	2016Q1
Interbank payments	109.3	96.1	92.0	99.3	88.4
- Of which customer payments	11.8	10.3	11.0	12.8	11.7
Monetary policy operations	36.3	33.5	25.5	37.5	21.9
- Of which sale of certificates of deposit	35.9	33.4	24.9	37.3	21.8
- Of which monetary policy lending	0.4	0.2	0.6	0.2	0.1
Transfers to settlement systems	122.4	196.5	329.5	389.6	275.4
- Of which for the Sum-, Intradag- and Straksclearing	53.8	130.1	272.2	332.3	221.5
- Of which for VP settlement	47.9	44.7	40.9	40.8	37.7
- Of which for CLS	20.7	21.8	16.5	16.5	16.2
Net positions settled	20.7	21.7	25.8	27.6	25.8
- Of which Sum-, Intradag- and Straksclearing	1.1	3.1	7.0	7.6	7.6
- Of which VP settlement	13.0	11.5	12.2	12.7	11.0
- Of which CLS	6.5	7.1	6.5	7.2	7.2

Note: Transfers to settlement systems comprise both traditional liquidity reservations from current accounts to settlement accounts and reservations from and use of automated collateralisation (Sikkerhedsretten).

Source: Danmarks Nationalbank.

LIQUIDITY

Kronos participants had ample liquidity for settlement of payments in 2015 overall, cf. Chart 2, which shows the participants' excess liquidity cover. Traditionally, the liquidity requirement is particularly high on days when auctions of fixed rate bullet bonds for financing adjustable rate mortgage loans are settled, i.e. typically at the start of the year and at the end of the quarterly settlement periods. In February 2015, the liquidity available to participants rose sharply due to Danmarks Nationalbank's net sales of Danish kroner in this period.

The ample liquidity among Kronos participants contributed to smooth settlement of payments in 2015. In general, ample liquidity means that incidents and failures which prevent individual participants from settling payments have no impact on the settlement of other participants' payments in Kronos.

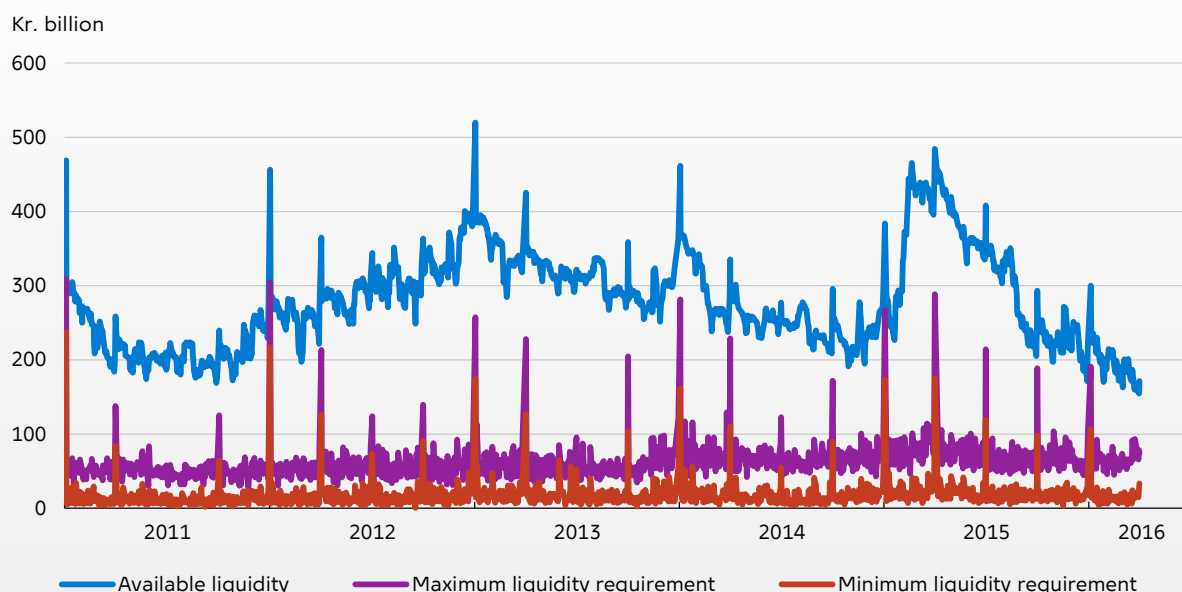
INTERNATIONAL STANDARDS

In 2015, work was carried out to improve risk management in Kronos in accordance with previous recommendations, cf. Oversight of the Financial Infrastructure 2015. The most important issue, regarding documentation and management of risks related to external service providers, has been closed. Another recommendation, regarding management of risks related to interdependencies with other payment and settlement systems, is being addressed jointly across the systems subject to oversight, cf. the section "Cross-sector oversight themes".

Danmarks Nationalbank has initiated an assessment of Kronos in relation to the CPMI-IOSCO principles. Since Kronos will be replaced by Kronos2 in 2017, focus is primarily on the administration related to the operation of an RTGS system, which will also apply to Kronos2.

Participants' liquidity requirements in Kronos, daily observations

Chart 2



Note: Available liquidity is the participants' total line plus their current account balances when Kronos opens (at 7:00 am), and from 24 June 2013 including amounts received in VP settlement cycle 30 at 7:05 am. The maximum liquidity requirement corresponds to the liquidity that the participants need for settlement of all that day's payments without delay. The amount depends on the sequence of the payments within the day. The minimum requirement is calculated as the liquidity that the participants need for settlement of all the day's payments after maximum netting of incoming and outgoing payments.

Source: Danmarks Nationalbank.

SYSTEM UPDATES

Danmarks Nationalbank's project to replace the systems that support Danmarks Nationalbank's management of payment systems, collateralisation and monetary policy operations continued in 2015. In connection to this, Kronos is to be replaced by a new RTGS and collateralisation system, Kronos2. The system test is based on two standard systems: the Perago system (RTGS part), which is also used by Sveriges Riksbank and Norges Bank, among others, and the Calypso system, which will be the new collateral management system. Kronos2 will be implemented on 18 April 2017. In May 2016, an introduction day to Kronos2 will be organized for all participants, followed by various testing and training sessions until 2017.

In connection to the implementation of Kronos2, a model is to be prepared for invoicing the operating costs related to Kronos2 to participants. Initially, Danmarks Nationalbank has collected information about pricing and price models in other RTGS systems. Box 3 describes how much Norges Bank and Sveriges Riksbank charge participants in their respective RTGS systems.

TARGET2

Denmark is connected to Target2, the trans-European RTGS system for settlement of payments in euro. Payments between financial institutions and transfers for settlement in other euro payment and settlement systems are settled in Target2.

USE

There are 29 Danish participants in Target2. In 2015, Danish participants' daily interbank payments averaged 10.9 billion euro, which is in line with the level in 2014, cf. Chart 3.

The Danish participants use Target2 mainly for intergroup payments and payments to foreign participants. Exchange of euro mostly takes place with participants in Germany, Finland, France and the Netherlands.

OPERATIONAL RELIABILITY

The operational reliability of the local Target2 components for which Danmarks Nationalbank is responsible was satisfactory in 2015. Only one

Invoicing of operating costs for the RTGS systems of Norges Bank and Sveriges Riksbank¹

Box 3

Invoicing of operating costs for an RTGS system to participants typically comprises fixed monthly (or annual) fees, entry fees and fees per transaction, if any.

Norges Bank charges:

- A fixed monthly fee of NOK 10,000 - 275,000. The size of the monthly fee depends on the RTGS system functionality that each participant has access to and whether the participant participates in the Norwegian securities settlement system.
- An entry fee of NOK 10,000 for new participants.
- There are no transaction fees.

Sveriges Riksbank charges:

- A fixed monthly fee of SEK 40,000 for monetary policy counterparties (SEK 35,000 for "restricted monetary policy counterparties") and SEK 10,000 for participants with access to intraday credit. Fees totalling a further SEK 1,500,000 per month are distributed on the monetary policy counterparties with domestic revenues of at least SEK 1 billion.
- An entry fee for new participants of SEK 125,000 for monetary policy counterparties and SEK 50,000 for restricted monetary policy counterparties.
- A fee of SEK 4.50 per transaction.

¹ Norges Bank's prices apply in 2016. Sveriges Riksbank's prices apply from 1 March 2016.

incident affected the availability of Target2 for Danish participants.

After the launch of Target2-Securities in June 2015, it has been necessary to postpone the closing time of Target2 on several occasions due to problems with automatic liquidity transfers from T2S at the close of the day. These incidents are being handled in the context of the oversight co-operation between participant member states, in which Danmarks Nationalbank also participates.

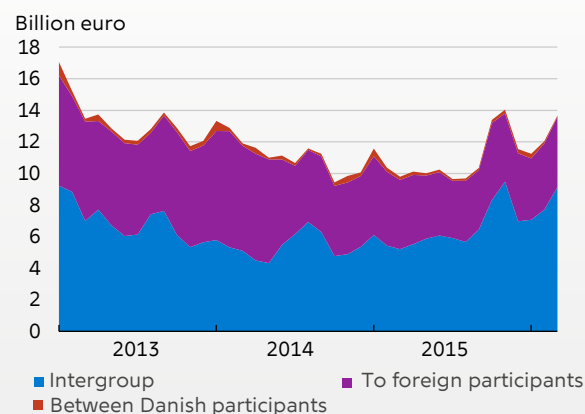
SYSTEM UPDATES

At the end of October 2015, Danmarks Nationalbank's intraday credit facility in euro was discontinued. This facility enabled Danish Target2 participants to obtain intraday credit in euro against collateral. Since Denmark has not adopted the euro, it was expensive and cumbersome for Danmarks Nationalbank to offer this facility, and as a consequence in consultation with the market participants it was decided to close it.

Under the auspices of the ECB, work has been initiated to modernise the European payments infrastructure towards 2020; this project is known as Vision 2020. One of the work streams relates to the modernisation of the Eurosystem's RTGS services, i.e. Target2. In the spring of 2016, European market participants (including those from Denmark) have been asked about their wishes and needs in terms of technical, functional and business aspects of the development of new RTGS services.

Interbank payments in Target2, daily averages

Chart 3



Note: The chart shows payments submitted by Danish participants via Target2. Daily averages have been calculated on a monthly basis.

Source: Danmarks Nationalbank.

RETAIL PAYMENTS

Payments between consumers, firms and public authorities can be made using banknotes and coins or various payment solutions such as the Dankort. A payment instrument is used to initiate a payment, which is then settled in a retail payment system. Danmarks Nationalbank oversees the most important payment instruments, as well as the retail payment systems: the Sumclearing, the Intradagclearing and the Straksclearing.

PAYMENT INSTRUMENTS

Modern consumers use a number of different payment instruments. This could be the Dankort for payments in supermarkets, Betalingsservice for paying rent or a credit transfer to settle a bill. Danmarks Nationalbank oversees the Dankort, Betalingsservice and credit transfers. In addition, developments in the payments area, including the introduction of new functions or brand new payment instruments, are monitored.

OPERATIONAL RELIABILITY

The operational stability of Nets' card systems was generally satisfactory in 2015. However, there were incidents where errors and system downtime affected the availability of the Dankort system. Danmarks Nationalbank has discussed these incidents and the measures to be taken to avoid

similar incidents with Nets. It is assessed that Nets has followed up on the incidents in a satisfactory manner.

In connection with failure of the card system, Nets encourages retailers to use the offline functionality of the card terminals so that payments can still be received. Nets currently focus on improving communication with retailers and cardholders, e.g. by transferring Dankort information to a dedicated site, dankort.dk.

In 2015 there were no incidents that affected the availability of Betalingsservice.

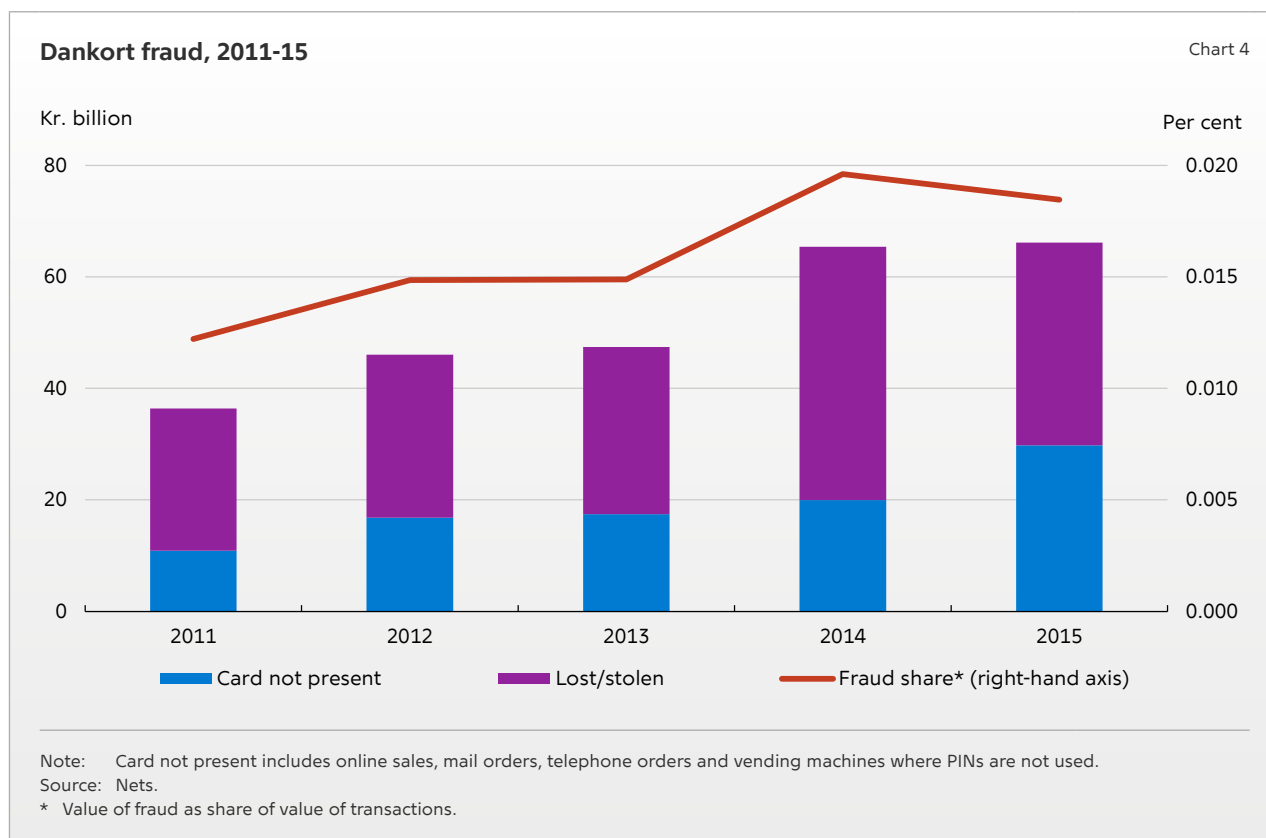
FRAUD AND FRAUDULENT USE

Dankort fraud accounted for just under 0.02 per cent of total turnover in 2015. This is slightly less than in 2014. Fraudulent use of the Dankort is low in an international comparison. The ECB has calculated fraudulent use of cards issued in the SEPA⁹ at 0.04 per cent of the total transaction volume in 2013.¹⁰

In absolute figures, Dankort fraud totalled kr. 66 million in 2015. Fraud in connection with card not present sales, primarily via the Internet, has risen since 2011 and now constitutes 45 per cent of all fraudulent use, cf. Chart 4. This should be viewed against the backdrop of a 45 per cent increase in transactions on Danish websites in 2015. Fraudulent use is possible where the cardholder inadvertently enters card details on fraudulent

⁹ The SEPA (Single Euro Payment Area) comprises 34 countries – the 28 EU member states plus Switzerland, Norway, Iceland, Liechtenstein, San Marino and Monaco.

¹⁰ ECB, Fourth Report on Card Fraud, July 2015 ([link](#)).



websites or via fraudulent emails (phishing). To increase security when shopping online, Nets will introduce a solution in 2016 whereby not only Dankort details but also a code must be entered to complete the purchase. Nets will text the code to the consumer. This method is also used for purchases using international cards.

In 2015, Nets introduced a Dankort with contactless functionality. This function can be used for all physical transactions, provided that the terminal supports it. For purchases below kr. 200, PINs will be required only occasionally. For purchases exceeding kr. 200, PIN validation will always be required. According to Nets, the introduction of the contactless Dankort has not led to an increase in fraudulent use.

Fraud in connection with credit transfers is low, and losses resulting from online bank hackings accounted for only just over kr. 830,000 in 2015.¹¹ According to the Danish Bankers Association, online bank hackings were typically the result of insufficient IT security on the user's computer. Hacking occurs because IT criminals place spy-

ware on the users' computers and in this way gain access to the computer, including to the user's online bank.

INTERNATIONAL STANDARDS

Oversight of the most important payment instruments takes place in accordance with the ECB's standards for payment instruments. Danmarks Nationalbank is currently assessing the Dankort system in relation to the ECB's standards for card systems. The assessment is based on a self-assessment performed by Nets. Danmarks Nationalbank is in a dialogue with Nets about the assessment.

Danmarks Nationalbank regularly discusses oversight of the most important payment instruments with the Danish Financial Supervisory Authority to avoid overlapping regulatory control. In areas where it is relevant, Danmarks Nationalbank's assessment of the Dankort is based on the Danish Financial Supervisory Authority's IT inspection at Nets, which took place in the autumn of 2014 and over the turn of the year. The Danish Fi-

11 Danish Bankers Association, Online bank hackings – Statistics ([link](#)).

nancial Supervisory Authority issued a number of orders to Nets relating to e.g. IT security management, IT risk management, outsourcing, access to systems and data and follow-up of auditors' recommendations.¹² Nets expects to have complied with all orders and requests from the Danish Financial Supervisory Authority by the end of this year. Via its cooperation with the Danish Financial Supervisory Authority, Danmarks Nationalbank monitors the measures taken by Nets to comply with the orders.

Regulation

The framework conditions for payments are changing these years. At the end of 2015, the European Parliament and the Council adopted a new Payment Services Directive, PSD2, which replaces the Payment Services Directive from 2007.¹³ PSD2 modernises the rules governing payment services. A new element is the regulation of third parties providing payment services on the basis of access to user accounts in banks. A third party is another provider of payment services than the institution where the user holds an account. Such services could be e.g. to make payments from the user's account.

The Payment Services Directive should be viewed in the light of the regulation on interchange fees for card-based payment transactions.¹⁴ The regulation seeks to enhance competition for the services provided in connection with card payments. This applies both to technical processing of card payments and to the services performed by issuers and acquirers. Ultimately, this is to make it cheaper for retailers and consumers to make card payments.¹⁵

SETTLEMENT OF RETAIL PAYMENTS

Every time a payment instrument is used, money must be transferred from the payer's account to the payee's account. Such settlement of payments takes place via the Sumclearing, the Intradagclearing or the Straksclearing. Box 4 describes these systems in more detail, including an overview of the payment instruments settled in the systems.

USE

There are 52 direct participants in the retail payment systems and 34 indirect participants, who settle via direct participants. The daily average transaction volume in the retail payment systems was kr. 35 billion in 2015. The breakdown of transactions on the Intradagclearing and the Straksclearing can be seen in Box 4.

OPERATIONAL RELIABILITY

In general, retail payment system operations were satisfactory in 2015. There were a few system incidents that Danmarks Nationalbank has discussed with the Danish Bankers Association. It is assessed that satisfactory measures have been taken to avoid reoccurrence.

In the Straksclearing there were a number of incidents in the first months after the launch in November. These were to some extent teething problems, and subsequently the Straksclearing has run 24/7/365 without any major incidents.

LIQUIDITY

Settlement of participants' net positions in the Sumclearing and the Intradagclearing takes place at fixed times during the day. Settlement is only

12 Danish Bankers Association, Redegørelse om it-inspektion i Nets Danmark A/S (account of IT inspection of Nets Danmark A/S – in Danish only), May 2015 ([link](#)).

13 PSD2 has been published as EU Directive 2015/2366 ([link](#)). The Payments Council describes the new framework legislation in the area of payments in its Annual Report 2014 ([link](#)). The Payment Services Directive (PSD1) is described in Anders Mølgaard Petersen, The Directive on Payment Services, Danmarks Nationalbank, Monetary Review, 3rd Quarter 2007 ([link](#)).

14 The regulation on interchange fees for card-based payment transactions has been published as Regulation (EU) 2015/751 ([link](#)). The Danish Payment Services Act has been amended so as to empower the relevant minister to lay down more detailed rules on interchange fees. This has been done via an Executive Order (in Danish only) ([link](#)).

15 Danish Payments Council, Rapport vedrørende forslag til EU-forordning om interbankgebyrer (Report on proposal for EU regulation on interchange fees – in Danish only), March 2014 ([link](#)).

The *Sumclearing* is a net settlement system. This means that payments to and from the participating banks are offset against each other whenever possible so that the actual exchange of liquidity is reduced as much as possible. Settlement between banks takes place at night after banking days and for selected transactions also on the morning after bank holidays. In the Sumclearing, it takes at least one day for the amount to be credited to the recipient's bank account. The following payment instruments are settled in the Sumclearing:

- Inpayment forms
- Dankort
- Betalingsservice (direct debit)
- Leverandørservice (supplier service)
- International credit and debit cards

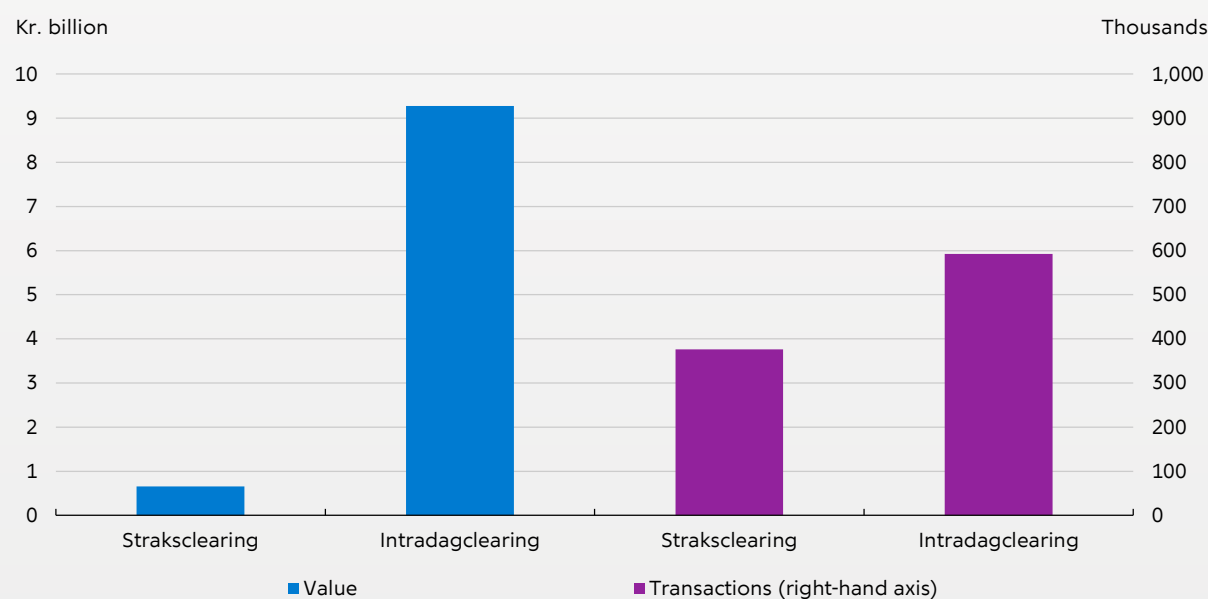
Like the Sumclearing, the *Intradagclearing* is a net settlement system. Settlement between banks takes place three times a day on banking days and at night after a banking day. This means that on banking days the payee may receive the funds on the same day as they were remitted. The following payment instruments are settled in the Intradagclearing:

- Credit transfers executed as intraday transfers or stand-alone transfers
- Overførselsservice (transfer service)

The *Straksclearing* is a real-time settlement system that differs significantly from the Sumclearing and the Intradagclearing. Firstly, customers experience that settlement takes place immediately so that the amount is credited to the recipient's account instantly. This is possible because the banks have funded the transfers beforehand, i.e. liquidity is constantly reserved for the Straksclearing. Liquidity is exchanged between the participating banks six times a day. Another difference is that there is a maximum limit of kr. 500,000 per transaction. The Straksclearing operates on a 24/7/365 basis. The following payment instruments are settled:

- Credit transfers up to kr. 500,000 made as instant payments
- Swipp
- MobilePay

Credit transfers in the Straksclearing and Intradagclearing, daily averages, 2015



Source: Nets.

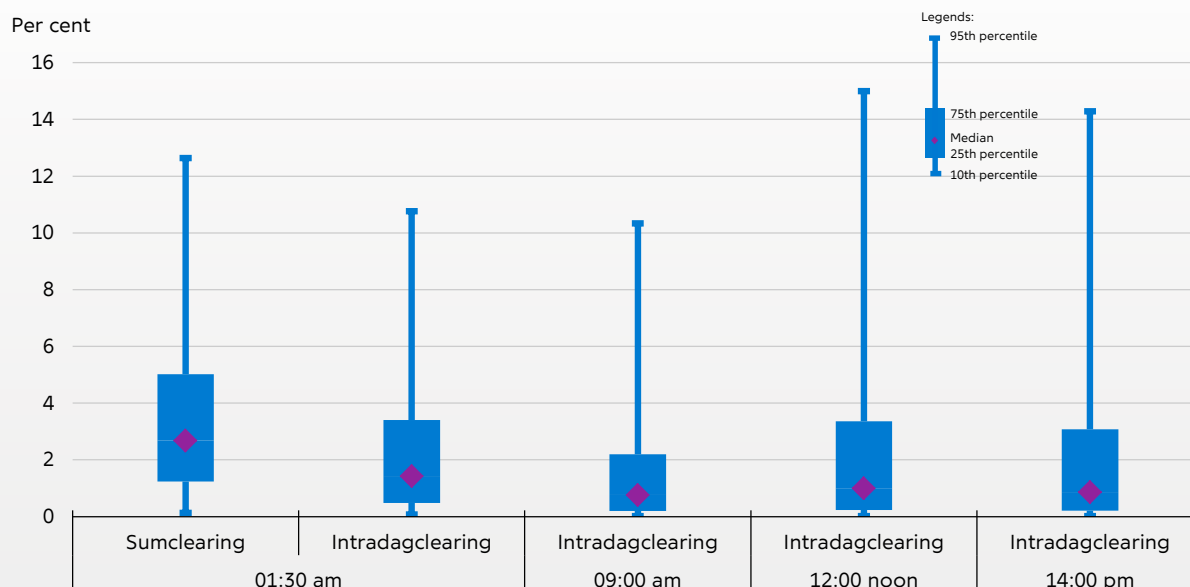
Following the launch of Swipp and MobilePay in 2013, it became possible to transfer cash between private individuals via mobile phones. Since then, it has also become possible to pay by Swipp and MobilePay in certain retail stores. Sector statistics¹ show that more than 3 million Danes regularly use these payment instruments. Both MobilePay and Swipp

are settled via the Straksclearing. This has contributed to the rapid growth in the transaction volume in the Straksclearing since its launch in November 2014. Despite their widespread use, instant transfers still account for only a small share of total retail payments in value terms.

¹ www.mobilepay.dk and www.swipp.dk.

Excess liquidity in the Sumclearing and Intradagclearing

Chart 5



Note: For the Sumclearing at 1:30 am, the 95th percentile is 13 per cent. This means that 95 per cent of participants use 13 per cent or less of the liquidity available to them.

Source: Danmarks Nationalbank.

possible if all participants have reserved sufficient liquidity in their settlement accounts. In general, participants had considerable excess liquidity for settlement of retail payments in 2015, cf. Chart 5. For example, the chart shows that the median value for use of liquidity in the Sumclearing is 2.5 per cent. This means that on average 50 per cent of participants use less than 2.5 per cent of their reserved liquidity. One of the reasons for the excess liquidity is that more than 90 per cent of participants use at least one of the automated liquidity management tools introduced together with the Intradagclearing in the autumn of 2013. These tools ensure that the liquidity available to participants is automatically transferred for night-time settlement and that liquidity is automatically reserved for daytime settlement in the Intradagclearing and the Straksclearing.¹⁶ In 2015 there was only one case in which a participant had not reserved sufficient liquidity for settlement.

INTERNATIONAL STANDARDS

In 2015, the Danish Bankers Association launched a number of measures to ensure compliance with the stricter requirements under the new CPMI-IOSCO principles. The governance structures of the systems have been formalised and documented in their internal business manuals, and a formalised risk management framework has been introduced. The establishment of formalised management of operational risk throughout the supply chain is expected to be finalised this year. Furthermore, a transfer process is underway, whereby a number of the Danish Bankers Association's administrative tasks in relation to the retail payment systems are being transferred to the sector-owned company e-nettet. For example, e-nettet is expected to take over regular risk management tasks. Ownership and ultimate decision-making powers in relation to the systems will still be vested in the Danish Bankers Association.

¹⁶ For more information on liquidity tools, see Jensen, Lars Egeberg, Tommy Meng Gladov and Majbrit Nygaard Christensen (2013), Liquidity management in connection with settlement of retail payments, Danmarks Nationalbank, *Monetary Review*, 3rd Quarter, Part 1 ([link](#)).

Danmarks Nationalbank has initiated an assessment of the retail payment systems in relation to the CPMI-IOSCO principles. The Danish Bankers Association is preparing a self-assessment of the retail payment systems, and in combination with the ongoing dialogue this will be the point of departure for Danmarks Nationalbank's assessment of the systems.

SYSTEM UPDATES

The connection of Danish kroner to T2S in the autumn of 2018 and the resultant adjustment of the monetary policy day provide an opportunity to reconsider the scheduling of daytime settlement in the retail payment systems. Longer

opening hours in Kronos will make it possible to keep the Intradagclearing open correspondingly longer. Postponing the last Intradagclearing settlement cycle from 2 pm to 3:30 pm will allow a larger share of transactions to be settled within the same day. This will also mean that the liquidity requirement for night-time settlement will be reduced. Therefore Danmarks Nationalbank recommends that the last Intradagclearing settlement cycle is moved from 2 pm to 3:30 pm when Kronos opening hours are extended to 5 pm from the autumn of 2018. Likewise, the day's last exchange of liquidity between Straksclearing participants can be moved from 2:30 pm to 4 pm.

SECURITIES SETTLEMENT

VP settlement is the Danish securities settlement system. VP Securities A/S, VP, also undertakes other key functions, e.g. registration of ownership of securities and handling of periodic payments, issuances, redemptions, etc. Much of the clearing of the most frequently traded equities at Nasdaq OMX Copenhagen takes place via a central counterparty, CCP. After CCP clearing, transactions are settled in VP.

In September 2016, VP will be connected to Target2-Securities, T2S, which is a European settlement system for cross-border securities transactions. Initially, VP will be connected for

settlement in euro, while settlement in Danish kroner is expected to begin in October 2018.

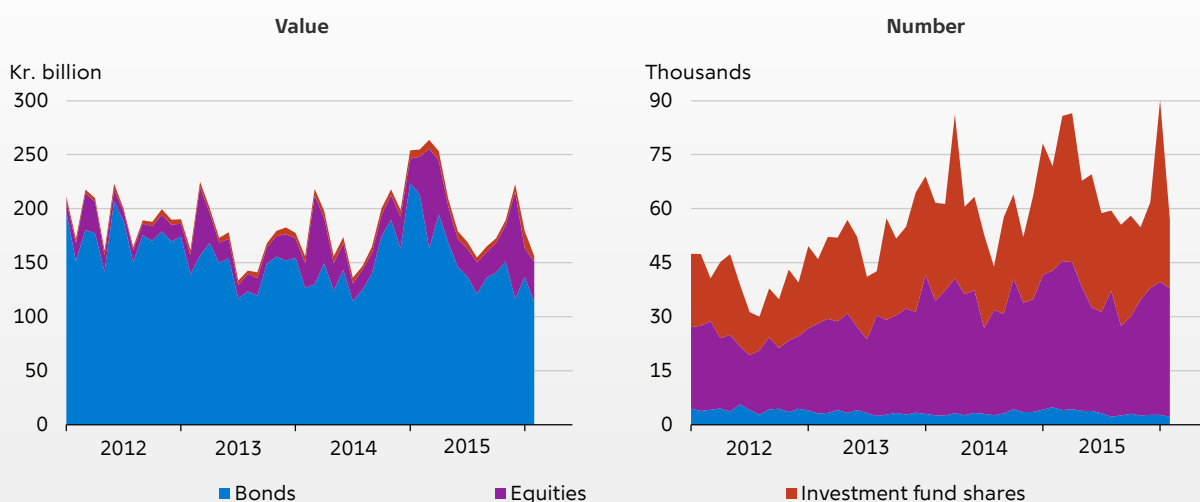
VP SETTLEMENT

USE

VP has 142 clearing and settlement participants, of which 69 are non-resident market participants. Securities transactions for an average daily value of kr. 206 billion were settled in 2015, cf. Chart 6. This was an increase of 16 per cent on 2014, main-

Equities, investment fund shares and bonds settled in VP, daily averages

Chart 6



Note: Daily averages calculated on a monthly basis.
Source: VP Securities A/S.

ly reflecting the upward pressure on the Danish krone in the spring of 2015, which increased demand for Danish securities in the first four months of the year.

OPERATIONAL RELIABILITY

VP system uptime¹⁷ was 99.88 per cent in 2015, which was a little lower than in 2014. On 14 and 28 September, respectively, VP's customer information systems were fully or partly inaccessible for a period of time due to system errors. VP's system was also briefly inaccessible on 19 October and 5 December. In nine months in 2015, system uptime was 100 per cent.

Overall, the operational reliability of the VP settlement system is considered to have been satisfactory in 2015. VP has followed up the above incidents in a timely manner, and their consequences were limited. Furthermore, the necessary measures have been implemented to prevent similar incidents in future.

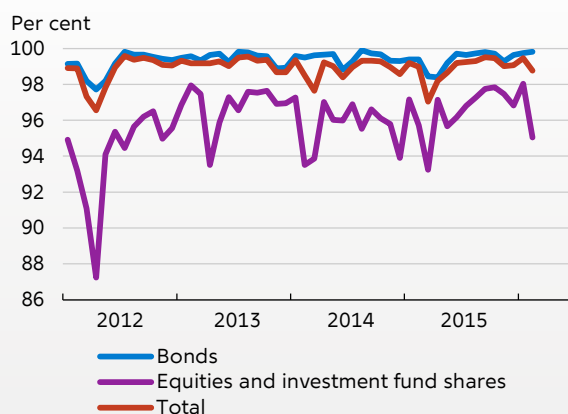
SETTLEMENT RATIO

As a main rule, securities transactions must be settled two days after the transaction date. The settlement ratio is the percentage of securities transactions settled in a timely manner. In 2015, the overall settlement ratio in VP was 98.9 per cent, which was in line with the previous year's ratio, cf. Chart 7.¹⁸ The settlement ratio for equity transactions, which had been rising for some time, dropped in February 2016. It is a recurring tendency for the settlement ratio for equities in VP to decline in February and March. These are the months when dividends are typically distributed, and participants' omissions in connection with dividend disbursements are among the factors behind the lower settlement ratio.

Participants in the VP settlement can be sanctioned, including by being fined up to kr. 100,000,

Settlement ratios in VP

Chart 7



Note: In the chart, the settlement ratios are calculated on the basis of settlement values. For equities and investment fund shares, the settlement ratio has been calculated as a weighted average of the two types of securities, while the total is a weighted average for all types of securities.

Source: VP Securities A/S and own calculations.

if their settlement ratio remains too low for a prolonged period of time.¹⁹ VP has applied the sanctioning regime on several occasions within the last year; one participant has been fined three times.

LIQUIDITY

VP participants reserve liquidity in accounts at Danmarks Nationalbank for VP's net settlement cycles in kroner and at the ECB for net settlement in euro. If VP's checks for adequate cover show that the buyer does not have sufficient liquidity, the reported purchases will as a main rule be postponed until the subsequent settlement cycle.²⁰ Participants who have overdrawn their liquidity lines may be fined. The size of the fine depends on how many times the participant has overdrawn its credit line within the last six

17 The uptime is the technical uptime supplied by VP's IT service provider.

18 The settlement ratio has been calculated as the value of transactions settled in a timely manner.

19 A participant who on average over a three-month period falls short of a benchmark for the settlement ratio will initially be asked to provide an account of the measures taken to improve the settlement ratio. If the settlement ratio has not been raised above the benchmark after a further three months, the participant will be contacted again by VP and asked to explain the reason for the low settlement ratio within one month. Based on this explanation, a meeting will be held to discuss the necessary steps and set a deadline for bringing the settlement ratio in line with the benchmark. If the participant has not rectified the matter by this deadline, VP will assess the reason and consider whether to fine the participant.

20 However, VP's clearing rules include "elimination rules" that entitle VP to execute the transactions for which cover can be found.

months.²¹ In 2015, there were a total of 121 overdrafts in VP, and 68 fines were issued, cf. Chart 8. This was a slightly higher number of overdrafts than in 2014. Danmarks Nationalbank monitors developments in the number of overdrafts with a view to assessing the efficiency of VP's sanctioning regime.

INTERNATIONAL STANDARDS

In 2015, Danmarks Nationalbank and the Danish Financial Supervisory Authority, DFSA, prepared an assessment of VP in relation to the CPMI-IOSCO principles for securities settlement systems.²² The assessment is based on, inter alia, a questionnaire (self-assessment) with some 300 questions relating to how VP complies with the specific requirements of the principles. In addition, VP, the DFSA and Danmarks Nationalbank have discussed VP's observance of the principles on several occasions.

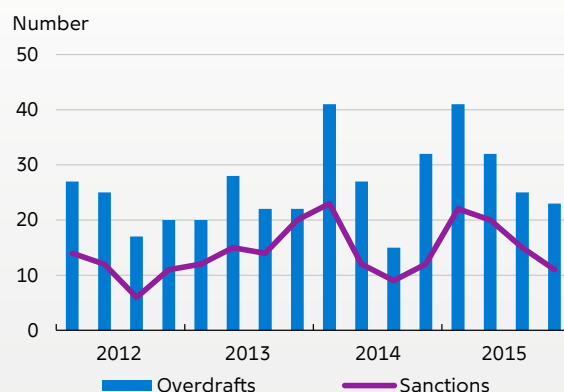
The main conclusion in the assessment is that VP's system is safe and efficient. VP observes most of the principles without major deficiencies, cf. Table 2.

Four recommendations have been issued to VP. Firstly, VP should adjust the composition of its Board so as to include independent members, and secondly, recovery and resolution plans for VP must be established to ensure that VP's core tasks can continue, even in the event of business-related difficulties. These two recommendations are also requirements under new legislation for securities settlement systems, and in future VP must meet these requirements in order to be authorised as a central securities depository and securities settlement system, cf. the CSDR²³.

Thirdly, VP should participate in a strengthened cooperative arrangement in relation to addressing the risks that may spread within the Danish financial infrastructure due to interdependencies. The cooperative arrangement should contribute to identifying and addressing risks across the infrastructure systems. In this context, VP should, together with the other players, consider the need for joint testing of crisis management across the

Overdrafts and sanctions in VP settlement on a quarterly basis

Chart 8



Note: A participant is fined only if the overdraft is the participant's own fault. In other words, no fine is imposed if the overdraft is due to non-payment by another participant who has reserved insufficient liquidity for settlement.

Source: VP Securities A/S.

Assessment of VP's observance of the CPMI-IOSCO principles

Table 2

Category	Principles
Observed	1, 7, 8, 9, 11, 12, 16, 17, 18, 19, 20, 21, 22, 23
Broadly observed	2, 3, 13, 15
Partly observed	-
Not observed	-
Not applicable	4, 5, 6, 10, 14, 24

Note: Observed is used when any identified gaps and shortcomings are not issues of concern and are minor, manageable, and of a nature that could be considered taking up in the normal course of its business.; broadly observed is used when one or more issues of concern have been identified that should be addressed within a defined timeline.; not applicable is used when the principle does not pertain due to particular legal, structural, or institutional characteristics. For a more detailed description of VP's observance of the principles, see the assessment of VP.

Source: Assessment of VP Securities (2016), Danmarks Nationalbank, April.

21 The size of the fine varies from kr. 5,000 to kr. 50,000 per incident.

22 Assessment of VP Securities, April 2016 ([link](#))

23 Regulation (EU) No 909/2014 of the European Parliament and of the Council of 23 July 2014 on improving securities settlement in the European Union and on central securities depositories and amending Directives 98/26/EC and 2014/65/EU and Regulation (EU) No 236/2012.

infrastructure. The collaboration regarding risks related to interdependencies is being established, cf. the section "Cross-sector oversight themes".

Fourthly, during 2016 VP should publicly disclose key aspects of guidelines for handling situations where one or several VP customers or a data centre experiences an operational failure and is therefore unable to settle in a timely manner. These guidelines, which should be anchored in VP's internal procedures, should promote openness and increase the operable participants' possibilities to make qualified decisions in situations where the usual settlement procedures are suspended.

VP has indicated to Danmarks Nationalbank that it is working to comply with all recommendations in the assessment.

SYSTEM UPDATES

VP introduced several system updates in 2015. This was done partly in response to EU harmonisation of the securities area and the implementation of a trans-European securities settlement system, Target2-Securities, T2S, cf. below.

In September 2015, VP launched a new redemption model for mortgage bonds whereby drawing of bonds for redemption, marking down of the general ledger and payment take place at the same time on the payment date (Due date). This means that partially redeemed positions are eliminated, i.e. bond holdings are no longer split into bonds redeemed and bonds not redeemed. The new model entails changes for investors only and has no bearing on the terms and conditions of the borrowers' mortgage loans.

In November 2015, VP expanded its opening hours so that it is now open on all days when settlement takes place in the trans-European RTGS system, Target2. This means that VP settles on certain days that are otherwise public holidays in Denmark. The launch of the new opening days

took effect on 24 December 2015 (Christmas Eve), when securities transactions in euro and free-of-payment, FOP, transactions were settled in VP. The same was the case on 31 December 2015 (New Year's Eve) and 24 March 2016 (Maundy Thursday).

TARGET2-SECURITIES

On 22 June 2015, the first securities transactions were settled in Target2-Securities, T2S, a trans-European securities settlement system. The purpose of T2S is for cross-border securities transactions to be handled as safely, inexpensively and efficiently as domestic transactions. A total of 21 central securities depositories, including all those in the euro area, have concluded agreements to connect to T2S. Of these, seven now settle via T2S.²⁴

VP will connect to T2S for settlement in euro on 12 September 2016 and in kroner in the autumn of 2018.²⁵ VP decided to maintain its euro connection date even though Euroclear ESES²⁶ in October 2015 announced a need for more time to prepare the migration to T2S than planned, which led to other changes in the T2S migration waves. VP is currently sector testing with participants in preparation for the euro connection. These tests run from February to June 2016. Participants can open T2S accounts at Danmarks Nationalbank, which is therefore also involved in the testing process.

The Danish national T2S user group discusses general issues in relation to the Danish market's connection to T2S. In 2015, the group, which comprises VP, market participants and Danmarks Nationalbank, discussed issues such as the terms and conditions for Danish participants' access to liquidity in euro in T2S. In this connection it was decided to discontinue Danmarks Nationalbank's

24 The seven CSDs already connected to T2S are from the following countries: Greece, Malta, Romania, Switzerland (from 22 June 2015), Italy (from 31 August 2015), Belgium and Portugal (from 29 March 2016). Until VP joins in kroner, only securities transactions in euro are settled via T2S.

25 The date when VP joins in kroner has not been finally determined, but the target is October 2018.

26 Euroclear ESES, which operates securities settlement systems and CSDs in Belgium, France and the Netherlands, had to postpone its migration date from 29 March to 12 September 2016. This means that VP and Euroclear ESES join T2S in the same migration wave.

euro facility, which was relatively expensive for participants to use, cf. the section “Interbank payments”. Participants who want direct access to liquidity in euro for settlement in T2S must therefore open an account with a central bank in the euro area via a branch in that member state.

CCP CLEARING

In Denmark, certain securities transactions are cleared via a central counterparty, CCP. A CCP positions itself between the parties to the transaction, assuming the risk for both the buyer and the seller from the transaction date until the transaction is finally completed. So if either of the parties to the transaction defaults within this period, the CCP still has an obligation to the other party. However, this entails that risk is concentrated in the CCP, and therefore the CCP is subject to a number of regulatory requirements to ensure the completion of the transaction.²⁷ Ongoing supervision to ensure that CCPs comply with the regulatory requirements is conducted by supervisory colleges, comprising representatives from both supervisory authorities and central banks.²⁸

Since 2009, EuroCCP, which in 2014 changed its name from EMCF²⁹, has been CCP for the most frequently traded equities at Nasdaq OMX Copenhagen. In June 2015, Nasdaq announced its decision to introduce free choice of three CCPs in the Nordic equity markets, including the Danish market. Nasdaq thus follows suit with a number of other European marketplaces offering “interoperable clearing”. This means that two CCPs may mutually exchange information on transactions, thereby enabling netting across systems.³⁰ The decision was implemented in November 2015 when LCH.Clearnet began to clear equities on Nasdaq. SIX x-clear is expected to begin clearing on Nasdaq later in 2016.

Besides CCP clearing of equities, Nasdaq OMX has established a CCP in the repo market for government bonds and the most frequently traded mortgage bonds in Denmark. The largest Danish banks participate, and CCP clearing contributes to reducing the risk in the repo market, e.g. because of collateral requirements.

27 Cf. Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories.

28 For instance, Danmarks Nationalbank participates as an observer in a supervisory college for the Dutch CCP EuroCCP. This college is headed by the Dutch central bank.

29 This change took place in January 2014, when Netherlands-based EMCF changed its name to EuroCCP in connection with a merger with UK-based EuroCCP.

30 Interoperable CCP clearing is described in more detail in Jacobsen (2016), Trends in clearing of equity transactions by a central counterparty, Danmarks Nationalbank, Monetary Review, 1st Quarter.

SETTLEMENT OF FOREIGN EXCHANGE TRANSACTIONS

A foreign exchange transaction consists of two opposite payments in two different currencies³¹. If the two payments are not settled simultaneously, the parties incur settlement risk, i.e. a risk that the transaction is not settled as expected. This may be the case if, say, one party to the transaction defaults after having received the currency purchased but without having supplied the currency sold. Factors such as different time zones can increase this risk, while also making simultaneous settlement of the two payments difficult.

CLS

The international system for settlement of foreign exchange transactions, CLS, eliminates the credit risk between the parties to a transaction as the two legs are settled simultaneously, i.e. Payment versus Payment, PvP. In addition, participants' liquidity requirements are reduced as payment obligations are netted. To ensure settlement finality and availability of funds, all payments to/from CLS are effected via central bank accounts in RTGS systems. Payments in Danish kroner to and from CLS are effected via Kronos.

CLS settles transactions in 18 currencies, including the Danish krone. The Hungarian forint joined CLS in November 2015.

USE

There are four settlement members that are direct participants in the CLS settlement of Danish kroner, while a large number of financial institutions and firms participate indirectly in the CLS settlement as third parties of one of the settlement members.

The value of transactions remains stable, while the number of transactions is rising slightly, cf. Chart 9. In the first four months of 2015, the average daily value of transactions and the number of transactions were both a little higher than in the rest of the year; this may be attributable to the pressure on the krone during this period.

In average terms, April 2015 was the month with the highest number of transactions and the largest value of daily transactions since the krone joined CLS in 2003. On 7 April 2015, foreign exchange transactions in Danish kroner in CLS reached kr. 468 billion, the largest value in a single day since the krone joined CLS. The largest number of trading instructions was settled on 20 January 2015 (5,447), on which date the value was also relatively high (kr. 407 billion).³²

OPERATIONAL RELIABILITY AND LIQUIDITY

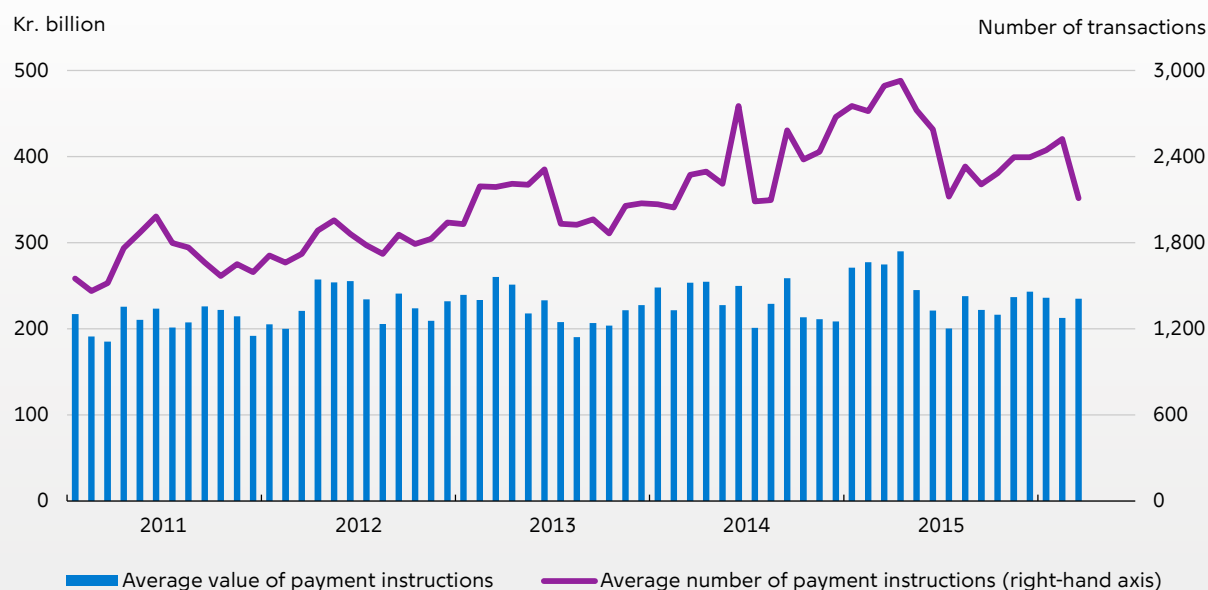
Pay-ins to CLS takes place via the national RTGS systems; in the case of Danish kroner via Kronos. Hence the operational stability of CLS depends on the stability of the RTGS systems. In 2015 there

31 For example, trading kroner against euro entails a payment in kroner by one party to the other and an opposite payment in euro.

32 Transaction volume and value in CLS is typically large on days following closing days in the European or US market. 7 April was the day after Easter Monday, while 20 January was the day after Martin Luther King Day, which was on 19 January in 2015.

Foreign exchange transactions in CLS, Danish kroner, daily average

Chart 9



Note: Daily average calculated on a monthly basis.
Source: VP Securities A/S.

were no Kronos incidents that affected CLS operations.

CLS is operationally stable. The incidents occurring in the system are typically attributable to delayed pay-ins from participants. The Danish participants reserve sufficient liquidity for CLS settlement.

INTERNATIONAL STANDARDS

Oversight of CLS is based on the CPMI-IOSCO principles for financial market infrastructures. The central banks of the participating currencies have established the CLS Oversight Committee as a co-operative oversight arrangement that enables the central banks to perform their respective national oversight duties. The Federal Reserve System, Fed, accepts primary responsibility for the oversight of CLS. In 2015, the oversight protocol was updated to reflect the CPMI-IOSCO principles, which have been implemented in US regulation³³.

SYSTEM UPDATES

In cooperation with TriOptima, CLS has offered its participants the possibility of a compression

service of foreign exchange transactions since September 2015. Compression entails that FX transactions are off-set so that existing trades are terminated and replaced by new transactions corresponding to the net position after set-off. This reduces the participants' outstanding notional value, thereby also reducing the counterparty risk. Compression may be an element of the participants' compliance with the requirements of existing and future financial regulation, e.g. in relation to leverage ratios³⁴.

Together with Markit, CLS has offered to settle cross currency swaps (CCS) since November 2015. Markit operates a CCS trading platform that can now send trades for settlement in CLS. A CCS is a combined interest rate and foreign exchange swap, whereby two parties conclude an agreement to exchange both principals and interest payments for loans in two different currencies.

Furthermore, in July 2015 CLS entered into co-operation with LCH.Clearnet to develop a service that can settle CCP-cleared products. This new service is expected to be implemented in 2016.

³³ Federal Reserve System, Regulation HH (Financial Market Utilities) ([link](#)) and Federal Reserve System, Protocol for Cooperative Oversight Arrangement of CLS ([link](#)).

³⁴ The leverage ratio refers to the relationship between a credit institution's equity in the numerator and its non-weighted exposures in the denominator.