DANMARKS NATIONALBANK
OVERSIGHT OF THE FINANCIAL INFRASTRUCTURE IN DENMARK 2015
OVERSIGHT OF THE FINANCIAL INFRASTRUCTURE IN DENMARK

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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. Danmarks Nationalbank does not supervise the individual firms within the infrastructure.

In the publication Oversight of the Financial Infrastructure in Denmark, 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.
SUMMARY

Danmarks Nationalbank's oversight comprises the payment systems Kronos, the Sumclearing, the Intradagclearing and the Straksclearing, the VP securities settlement system and the most important payment instruments.

Kronos operated without major incidents in 2014. However, several minor incidents meant that in two months Kronos system uptime was lower than the agreed service level. The system incidents have been followed up satisfactorily. Formalisation of the cooperation between Danmarks Nationalbank and BEC has made a positive contribution to both operational stability and follow-up of incidents. Sumclearing, Intradagclearing and Straksclearing operation was satisfactory. All the same, the number of system incidents has been higher than normal since the launch of the Straksclearing. Some of these incidents are attributable to start-up problems and the challenges of real-time settlement. VP settlement operation was stable in 2014. System uptime fell below 100 per cent in only one month. In general, the operational reliability of Nets' card platforms was high during the year. In January 2014, a network failure at IBM, which operates the Nets systems, meant that the Dankort could not be used online for more than 10 hours. This incident emphasises the importance of broad knowledge of the possibility of using offline procedures in retail transactions.

Overall, participants had ample liquidity for settlement of payments in the Danish systems. In the Sumclearing, Intradagclearing and Straksclearing, there was only one case in 2014 where a single participant had not reserved sufficient liquidity. This is a substantial reduction on previous years and is attributable to e.g. the automated liquidity tools introduced along with the Intradagclearing in October 2013. The postponed participant did not use these tools.

In the VP settlement system, there were several incidents where participants had not reserved sufficient liquidity in euro for settlement of securities denominated in euro. Combined with the transition to T+2 settlement, amended terms and conditions for holding euro liquidity in TARGET accounts have given VP participants shorter time to plan and manage euro liquidity for settlement purposes. Furthermore, the settlement ratio in VP fell slightly in 2014. But so far there are no indications that the transition to T+2 settlement has affected the timeliness of VP settlement to any significant degree.

Those responsible for Kronos, VP settlement and the retail payment systems have performed analyses of the extent to which the systems observe the CPMI-IOSCO principles and, on the basis of these analyses, taken steps to ensure compliance with the principles. In 2014 there was particular focus on adapting governance structures and risk management frameworks. Risk assessments in relation to Kronos were reviewed in the autumn of 2014, and work is underway to improve risk management when using external service providers. The Danish Bankers Association is planning to adjust and formalise risk management of the retail payment systems in connection with the transfer of a number of administrative tasks in relation to the systems to e-nettet. In the autumn of 2014, VP established a new risk management structure. A new risk and compliance function
has been created and a new risk management policy formulated. In addition, VP has performed a “self-assessment” of the VP settlement system’s compliance with the CPMI-IOSCO principles. In continuation of this, Danmarks Nationalbank and the Danish Financial Supervisory Authority have begun a joint assessment of whether the VP settlement system is compliant with the principles.

The process of modernising the Danish retail payments infrastructure was completed with the launch of the Straksclearing in November 2014. The Straksclearing enables real-time settlement of payments irrespective of the payment instrument used to initiate the payment. Following the modernisation project, Denmark has one of the world’s most advanced retail payments infrastructures.

Danmarks Nationalbank’s project to replace the systems that support Danmarks Nationalbank’s management of payment systems, collateralisation and monetary policy operations continued in 2014. The implementation of the new RTGS system, Kronos2, has been scheduled for the spring of 2017. In connection with the development of Kronos2, it is continuously assessed whether the new system is compliant with the CPMI-IOSCO principles.
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.

COMPLIANCE WITH THE CPMI-IOSCO PRINCIPLES
Those responsible for the Danish payment and settlement systems have performed analyses of the extent to which the systems comply with the CPMI-IOSCO principles, which in a number of areas impose tighter requirements on the systems compared with the previous principles. On the basis of these analyses, measures are being taken to adapt governance structures and risk management frameworks to the new principles. It is important that this process is completed and that those responsible for the systems also take any other necessary steps to ensure compliance with the CPMI-IOSCO principles.

COMPLIANCE WITH THE ECB’S STANDARDS FOR PAYMENT INSTRUMENTS
Oversight of the most important Danish payment instruments – the Dankort, Betalingsservice (direct debit) and credit transfers – takes place in accordance with the ECB’s oversight standards for payment instruments. It is important that Nets and the Danish Bankers Association, who are responsible for the instruments in question, perform analyses of the extent to which the instruments comply with the ECB’s standards and take any necessary steps to ensure compliance.

USE OF “TRANSFERS VIA DANMARKS NATIONALBANK”
In 2012, the “Transfers via Danmarks Nationalbank” function was implemented as part of the modernisation of the Danish retail payments infrastructure. This improves the opportunities for customers to transmit large payments directly via Kronos, where it is possible to let payments await the necessary liquidity. In Kronos, shortage of liquidity will delay only the individual payment, whereas in a net settlement system it will delay all payments from that participant – and in some cases also payments from other participants. Danmarks Nationalbank therefore recommends that Kronos participants promote the use of “Transfers via Danmarks Nationalbank”.

EURO LIQUIDITY FOR VP SETTLEMENT
The ECB’s introduction of a negative rate of interest means that participants can no longer hold overnight euro liquidity in TARGET accounts at zero interest. At the same time, trans-European steps have been taken to streamline securities trading, and as a result securities settlement time in VP has been reduced. The changed market conditions for VP participants have contributed to a higher number of overdrafts in VP settlement in euro. Hence there is a need for VP participants to focus on having sufficient euro liquidity for settlement of securities transactions in euro.
SECTOR READINESS FOR TARGET2-SECURITIES (T2S)
Danish securities settlement will join T2S – the trans-European securities settlement platform – for settlement in euro in 2016 and in Danish kroner in 2018. Particularly the latter will lead to major changes in securities settlement for market participants. It is important that the Danish participants already start preparing for the future changes so that they are ready to settle via T2S.
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:

- the Kronos interbank payment system
- the Sumclearing, Intradagclearing and Straks-clearing retail payment systems
- the VP securities settlement system
- the payment instruments Dankort, Betalings-service 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 and the payment flows between them are outlined in Box 1.

Oversight by Danmarks Nationalbank is based on international standards for safety and efficiency. This means that operational reliability must be high and risks limited, and the systems and instruments must be up-to-date and cost-effective.

There may be situations where socio-economic conditions prompt Danmarks Nationalbank to impose higher requirements for safety and efficiency than the owners of a system or instrument find optimum from a business perspective. Danmarks Nationalbank’s task is to lay down requirements that take the interests of society into account. Moreover, requirements may change over time due to e.g. a changed threat scenario, technological advances or new needs.

In practice, Danmarks Nationalbank conducts oversight by assessing whether the systems and instruments comply with the international standards. Development of the systems/instruments is monitored on an ongoing basis by collecting information and via dialogues with those responsible for the systems, and Danmarks Nationalbank instigates changes as required.

Danmarks Nationalbank also 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.\(^1\)

Danmarks Nationalbank’s oversight is described in detail in Danmarks Nationalbank’s policy for oversight.\(^2\) The overall results of Danmarks Nationalbank’s oversight are presented in this publication, which is issued annually. An overview of payments in Danish kroner and euro is presented at the end of this publication, cf. the section “Appendix of Tables”.

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1 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).

IMPLEMENTATION OF THE CPMI-IOSCO PRINCIPLES

Oversight of the core payment and settlement systems is based on the CPMI-IOSCO\(^3\) “Principles for Financial Market Infrastructures” and the related “Disclosure Framework and Assessment Methodology”. In several respects, the CPMI-IOSCO principles, which are from 2012, impose tighter requirements on the systems than the previous international principles.

Those responsible for Kronos, the VP settlement system and the retail payment systems, respectively, have performed analyses of the systems’ degree of compliance with the principles. The results have been discussed with Danmarks Nationalbank, and steps have been taken to ensure compliance with the new principles. In 2014 there was particular focus on adapting governance structures and risk management frameworks. It is important that this process is completed and that those responsible for the systems also take any other necessary steps to ensure compliance with the CPMI-IOSCO principles. During 2015, Danmarks Nationalbank will perform assessments of the systems’ compliance with the principles.

Danmarks Nationalbank’s regular collection of information from the systems subject to oversight has been adapted to the CPMI-IOSCO principles. Danmarks Nationalbank now receives quarterly reporting, which ensures that Danmarks Nationalbank is kept informed of important changes concerning the relevant systems’ legal basis, organisation and strategy, risk management and emergency procedures, use and operation, as well as results of internal and external audits. Moreover, it has been agreed that Danmarks Nationalbank annually receives the systems’ updated frameworks for risk management, stress testing plans and emergency plans.

ENHANCED OVERSIGHT OF PAYMENT INSTRUMENTS

Danish consumers and firms increasingly use electronic payment instruments when they buy goods and services. In 2014, Danmarks Nationalbank decided to enhance oversight of the most important payment instruments, and this work has now commenced. Danmarks Nationalbank’s assessment of the importance of a payment instrument is based on the following criteria:

- Transaction volume in terms of the number and value of transactions
- Whether there are few or no substitution options
- Scope of the instrument
- Whether errors and system failures affect the general public
- Whether errors and system failures may affect other instruments or systems

The enhanced oversight comprises the Dankort, Betalingsservice and credit transfers. Oversight of the Dankort and Betalingsservice is aimed at Nets, the owner of these products. Oversight of credit transfers is aimed at the Danish Bankers Association, which lays down the framework for use of credit transfers on behalf of the Danish banks.

The Dankort is comprised by enhanced oversight because the daily number of transactions is high and system failure may be significant to consumers. In addition, the systems behind the Dankort are used for other payment instruments such as international cards and MobilePay. Credit transfers are comprised by the enhanced oversight because the aggregate daily value of transactions is high and the infrastructure for credit transfers is used for other payment instruments, including inpayment forms, Swipp and MobilePay. As regards Betalingsservice, failure of this instrument would affect the payments of many firms and could also affect VP settlement if homeowners’ mortgage payments are not received by the mortgage banks on time. Consequently, Betalingsservice is also comprised by the enhanced oversight.

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\(^3\) 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.
Oversight of the most important payment instruments takes place in accordance with the ECB’s general standards for payment instruments from 2009. The ECB standards require:

1. a sound legal basis under all relevant jurisdictions
2. access to comprehensive information for all actors, including appropriate information on financial risks
3. an adequate degree of security, operational reliability and business continuity
4. effective, accountable and transparent governance arrangements
5. management and containment of financial risks in relation to the clearing and settlement process

The ECB standards have been implemented into specific frameworks for oversight of payment cards, credit transfers and direct debit, respectively. The standards have been updated to include relevant SecuRe Pay recommendations for the security of internet payments.

It is important that Nets and the Danish Bankers Association, who are responsible for the instruments in question, perform analyses of the extent to which the instruments comply with the ECB standards and subsequently take any necessary steps to ensure compliance.

Oversight of the most important payment instruments will be conducted in the same way as oversight of the core payment and settlement systems.

CSDR – NEW REGULATION OF CENTRAL SECURITIES DEPOSITORIES

In September 2014, a new EU regulation on central securities depositories (CSDs) and securities settlement systems, the CSDR regulation, entered into force. The new regulation is of major significance to Danish legislation in this area and will affect cooperation between authorities.

The background to the CSDR is that the European Commission wishes to harmonise the market for securities trading, thereby strengthening cross-border trading in securities and enhancing competition between CSDs. Harmonisation is also a prerequisite for effective settlement on the trans-European T2S securities settlement platform, which will be in operation from June 2015. In addition, regulation is to contribute to increased security by introducing statutory requirements for the operation, organisation and risk management of CSDs. Finally, the rules on settlement cycles and settlement discipline are harmonised with a view to e.g. limiting risks between market participants.

The ESMA is currently preparing the technical standards for implementing the CSDR provisions in practice. The standards have been submitted for public consultation among market participants and central banks, etc. and will enter into force when adopted by the European Commission. This is expected to be in the summer of 2015.

In a Danish context, the CSDR means that VP Securities A/S (VP) must be authorised to carry out its core functions, i.e. deposit and settlement of securities. This authorisation is granted by the Danish Financial Supervisory Authority, which is the competent authority of VP, cf. the CSDR and the Danish Securities Trading Act. The Danish Financial Supervisory Authority will also supervise VP’s compliance with the CSDR and rules issued pursuant to the CSDR, including the Commission’s delegated regulations.

The CSDR will affect Danmarks Nationalbank’s oversight of VP. This is because there is considerable overlap between the CSDR provisions, for which the Danish Financial Supervisory Authority is the supervisory authority, and the CPMI-IOSCO principles, for which Danmarks Nationalbank is the oversight authority. Hence, cooperation between Danmarks Nationalbank and the Danish Financial Supervisory Authority must be adjusted so as to avoid overlap of the work of the two authorities.

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4 ECB (2009), Harmonised Oversight Approach and Oversight Standards for Payment Instruments (link).
5 SecuRe Pay is a European forum for discussion of issues related to the security of retail payments. The mandate, composition and published recommendations of SecuRe Pay can be found at Danmarks Nationalbank’s website (link). ECB (2013), Recommendations for the security of internet payments – final version after public consultation (link).
7 European Securities and Market Authority.
The CSDR will also affect cross-border cooperation between authorities. As previously mentioned, the CSDR is aimed at enhancing competition between CSDs. In the longer term, this could lead to consolidation of the market, one reason being that securities settlement is characterised by substantial economies of scale. The CSDR lays down the framework for cooperation between national authorities if settlement of securities in one EU member state moves to a CSD in another member state.

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**Payment and settlement systems in Denmark**

**Kronos** is Danmarks Nationalbank’s real-time gross settlement (RTGS) system for payments in Danish kroner. It is used mainly for settlement of large, time-critical payments between banks. BEC is the system operator, while technical operation is undertaken by JN Data. Kronos is subject to oversight by Danmarks Nationalbank.

**TARGET2** is the Eurosystem’s RTGS system for euro payments. The ECB is the primary oversight authority, 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 final 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 operates the systems. 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 and the Netherlands Authority for the Financial Markets head a CCP college of which the Danish Financial Supervisory Authority is a member with voting rights. Danmarks Nationalbank participates as an observer.

**CLS**, which is owned by large international banks, is a multilateral clearing and settlement system for foreign exchange transactions in 17 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 and Norwegian kroner and Swedish kronor. 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 of another country. SCP is subject to oversight by Danmarks Nationalbank as an element of its oversight of Kronos.

The chart shows payment flows in 2014 in the Danish infrastructure for krone payments. The participants’ net payment obligations in the settlement of retail payments, foreign exchange and securities transactions, respectively, are settled via accounts in Kronos. For example, it is seen that foreign exchange transactions totalled kr. 231 billion (gross) in 2014, and that the net obligation settled via Kronos was kr. 7 billion. TARGET2 is not included in the chart as it handles payments in euro.

Note: Securities transactions stated as the value of transactions. Securities transactions in euro that are settled in Danish kroner first are included in the chart.

Source: Danmarks Nationalbank, CLS Bank, Danish Bankers Association, Nets, VP and EuroCCP.
Payment flows, billion kroner, daily averages, 2014

- Interbank payments: 92
- Monetary policy operations: 25
- SCP: 13
- Retail payments: 35
- FX transactions: 231
- Securities transactions: 176
- Sumclearing, Intradagclearing and Straksclearing: 7
- CLS: 7
- EuroCCP: 2
- VP: 12
- Kronos

Continued...
Interbank payments in Danish kroner are settled in Danmarks Nationalbank’s real-time gross settlement (RTGS) system Kronos. Monetary policy operations and transfers for settlement in other payment and settlement systems are also settled in Kronos.

Denmark is also 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.

**KRONOS**

**USE**

Kronos currently has 94 participants: 71 Danish banks, 6 mortgage banks, 9 branches of foreign banks and 8 other participants.¹

In 2014, interbank payments totalling just over kr. 92 billion per day were settled in Kronos, representing a small decline on 2013. The volume of monetary policy operations also fell from 2013 to 2014. But overall, the Kronos transaction volume has risen considerably. This is because the participants’ daily transfers to settlement systems increased by almost kr. 130 billion, cf. below.

The considerable increases in transfers for settlement seen in both 2013 and 2014 are mainly attributable to the introduction in September 2013 of new, automated liquidity management tools for the Sumclearing and the Intradagclearing. The new liquidity management tools entail that participants transfer considerably more liquidity for night-time settlement. This is an efficient use of the participants’ liquidity as it cannot be used for other payments outside the Kronos opening hours.

The value and number of interbank payments (excluding customer payments) was stable in 2014, cf. Chart 1. However, there were strong fluctuations month on month; for example, there are typically many interbank payments in December, while the value is high in January.

In November 2012, the “Transfers via Danmarks Nationalbank” function was implemented as part of the modernisation of the Danish retail payments infrastructure. This gives customers better options to transmit large payments directly via Kronos. The number of customer payments effected via Kronos has increased since the implementation of this function, while their total value remains unchanged, cf. Table 1. A customer payment is a large direct payment between two banks initiated by a customer of one of the banks.

Large customer payments should always be settled individually in Kronos, where it is possible to let payments await the necessary liquidity. In Kronos, shortage of liquidity will delay only the individual payment, whereas in a net settlement system it will delay all payments from that participant – and in some cases also payments from other participants. Therefore, Danmarks Nationalbank still recommends that Kronos participants

¹ Other participants can be e.g. settlement systems or investment firms.
increase their use of “Transfers via Danmarks Nationalbank”.

Participants’ use of Kronos varies with their size, the 20 largest participants accounting for practically all interbank payments, cf. the analysis in the “Small Kronos participants” special topic. However, the smaller participants are to a large extent active in the settlement systems and use Kronos for reserving liquidity for settlement.

It is an advantage for settlement of payments and financial stability in Denmark that most banks choose to be direct Kronos participants. Consequently, the Kronos fee structure is designed to make it relatively inexpensive for small banks to

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**Payments in Kronos, daily averages**

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interbank payments</td>
<td>108.4</td>
<td>101.7</td>
<td>109.5</td>
<td>96.5</td>
<td>92.3</td>
</tr>
<tr>
<td>– Of which customer payments¹</td>
<td>12.0</td>
<td>13.1</td>
<td>11.9</td>
<td>10.3</td>
<td>11.1</td>
</tr>
<tr>
<td>Monetary policy operations</td>
<td>29.6</td>
<td>22.6</td>
<td>36.1</td>
<td>32.8</td>
<td>24.9</td>
</tr>
<tr>
<td>Transfers to settlement systems</td>
<td>100.0</td>
<td>85.8</td>
<td>87.2</td>
<td>156.8</td>
<td>285.7</td>
</tr>
<tr>
<td>Other transactions</td>
<td>2.3</td>
<td>3.4</td>
<td>2.6</td>
<td>4.2</td>
<td>2.7</td>
</tr>
</tbody>
</table>

**Note:** Transfers to settlement systems cover transfers to settlement accounts in which liquidity is reserved for settlement of securities transactions, etc. in VP, settlement of retail payments in the Sumclearing, Intradagclearing and Straksclearing, settlement of foreign exchange transactions in Danish kroner in CLS, transfers in SCP and cover of credit under the automatic collateralisation arrangement from current accounts. Transactions have been stated as amounts debited from current accounts at Danmarks Nationalbank. This means that transfers to other settlement systems are exclusive of use of automatic collateralisation, which is debited from separate accounts. Transfers to the settlement systems are considerably higher than the amounts actually drawn.

**Source:** Danmarks Nationalbank.

¹ A customer payment is a large direct payment between two banks initiated by a customer of one of the banks. Customer payments are typically effected by corporate customers directly via the customer’s online banking solution.

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**Customer and interbank payments in Kronos, value and number, daily averages**

<table>
<thead>
<tr>
<th></th>
<th>Value of interbank payments</th>
<th>Number of interbank payments (right-hand axis)</th>
<th>Value of customer payments</th>
<th>Number of customer payments (right-hand axis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kr. billion</td>
<td>Value of interbank payments</td>
<td>Number of interbank payments (right-hand axis)</td>
<td>Value of customer payments</td>
<td>Number of customer payments (right-hand axis)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2010</td>
<td>12.0</td>
<td>12.0</td>
<td>12.0</td>
<td>12.0</td>
</tr>
<tr>
<td>2011</td>
<td>13.1</td>
<td>13.1</td>
<td>13.1</td>
<td>13.1</td>
</tr>
<tr>
<td>2012</td>
<td>11.9</td>
<td>11.9</td>
<td>11.9</td>
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<td>2013</td>
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<tr>
<td>2015</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
</tr>
</tbody>
</table>

**Note:** The value and number of interbank payments are exclusive of customer payments, which are stated separately in the chart.

**Source:** Danmarks Nationalbank.
participants directly. But ultimately, participation is a business decision, based on a trade-off of pros and cons for the individual bank.

LIQUIDITY
Kronos participants overall have ample liquidity for settlement of payments, cf. Chart 2, which shows the participants’ excess liquidity coverage. Traditionally, the liquidity requirement is particularly high on days when auctions of adjustable rate mortgage bonds are settled, i.e. typically at the start of the year and at the end of the quarterly settlement periods.

The ample liquidity among Kronos participants contributes to the smooth settlement of payments. Moreover, incidents and system failures that prevent the settlement of individual participants’ payments generally have a limited impact on the settlement of other participants’ payments in Kronos.

In February 2015, the participants’ disposable liquidity rose considerably. This was related to a period of upward pressure on the Danish krone. Due to the fixed exchange rate policy, Danmarks Nationalbank intervened by purchasing foreign currency and selling kroner. The kroner are deposited in accounts with the banks that hold accounts at Danmarks Nationalbank.

OPERATIONAL RELIABILITY
Kronos uptime² was 99.7 per cent in 2014, which is an improvement on 2013. However, several minor incidents meant that in two months system uptime was lower than the agreed service level.

In 2014 the uptime was affected by several incidents. On both 1 April and 1 July, extraordinarily high loads on BEC’s systems led to delays in Kronos.³ The first incident was attributable to a large volume of e-Boks communications, the second incident to a bug in a program. A high system load on the first day of a quarter is normal and should not cause delays. In 2014 Kronos’

² The uptime is the technical uptime provided by Kronos’ IT service provider. Operational disruptions caused by other sources are not included. Downtime means episodes where ordinary planned operation becomes impossible for one or more participants.

³ Bankernes EDB Central, BEC, is a data centre that, inter alia, operates Kronos on behalf of Danmarks Nationalbank.
uptime was also affected by a number of minor incidents.

The follow-up on the incidents is assessed to be satisfactory. Furthermore, it is assessed that the formalisation of cooperation between Danmarks Nationalbank and BEC, e.g. by preparing a joint risk assessment and overview of incidents, has made a positive contribution to both operational reliability and follow-up on incidents.

INTERNATIONAL STANDARDS
In 2014, oversight of Kronos focused particularly on risk management, and in the autumn all risk assessments of Kronos were reviewed. As a result, five recommendations were formulated for improving Kronos risk management. The most important recommendation concerns documentation and management of risks related to external contractors, in particular BEC’s sub-contractors. The CPMI-IOSCO principles state that when e.g. IT operations are outsourced to external contractors, system requirements must also be complied with by these suppliers. Going forward, risk assessments and contingency plans for Kronos will be reviewed on an annual basis.

In 2012, Kronos was assessed against the international standards applying at the time.4 Following testing of the new contingency plan and contingency measures for Kronos, the last recommendation from this assessment has been closed. It is assessed that all recommendations have been considered and followed up in a satisfactory manner. Testing of contingency procedures for settlement of payments in Kronos via fax forms was carried out in the 2nd half of 2014, with a substantially better result than previously.

SYSTEM UPDATES
The Straksclearing was implemented in November 2014, cf. the “Retail payments” section. The Straksclearing has led to a number of adaptations of the Kronos user interface. In addition, the definition of “current account liquidity” has been adjusted so that deposits in both current accounts and settlement accounts accrue interest at the end of the monetary policy day at 3:30 pm.

The project to replace the systems that support Danmarks Nationalbank’s management of payment systems, collateralisation and monetary policy operations continued in 2014. An important element of the project is to replace Kronos with a new RTGS system named Kronos2. This system will be based on a standard system also used by e.g. Sveriges Riksbank and Norges Bank.

The first version of Kronos2 is expected to be implemented in the spring of 2017. Existing Kronos participants and other stakeholders in the market are involved in the planning, implementation and testing of the transition to the new system on an ongoing basis.

In the development of Kronos2, it is regularly assessed whether the new system is compliant with the CPMI-IOSCO principles.

TARGET2
There are currently 32 Danish participants in TARGET2. In 2014, the Danish participants completed interbank payments for a daily average of 11.2 billion euro, which represents a decline of approximately 2 billion euro on 2013 and is in line with the 2012 average. The Danish participants exchange euro mostly with counterparties in Germany, Finland, France and the Netherlands.

In 2014, TARGET2 payments were distributed as follows: approximately 40 per cent of all payments were intra-group payments to foreign branches, approximately 41 per cent were payments to other foreign participants, only approximately 2 per cent were payments to other Danish participants, and the remaining 17 per cent or so were transfers to settlement systems, cf. Chart 3.

There were no major incidents in the local Danish TARGET2 components in 2014, but in December 2014 one major incident on the TARGET2 platform itself led to extended opening hours. The ECB is following up on this incident.

The risk assessment of the local Danish TARGET2 components was reviewed in 2014. This has resulted in recommendations for more formalised risk management in relation to the local components.

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4 Danmarks Nationalbank, Assessment of Kronos according to Core Principles for Systemically Important Payment Systems, April 2012 (link).
Payments in TARGET2-Denmark by type, daily averages

Chart 3

Note: The sum of outgoing payments among Danish participants in TARGET2 is not necessarily equal to the sum of incoming payments, as is the case in Kronos, as there are many other participants besides the Danish ones. This chart shows the sum of outgoing payments from Danish TARGET2 participants. The breakdown and the aggregate value of payments are virtually the same for incoming payments.

Source: Danmarks Nationalbank.
Payments between citizens, firms and public authorities can be made using banknotes and coins or various payment instruments such as the Dankort, inpayment forms and Betalingsservice. A payment instrument is used to initiate a payment, which is then settled in a retail payment system. There are three retail payment systems in Denmark: the Sumclearing, the Intradagclearing and the Straksclearing.

The launch of the Straksclearing in November 2014 was the last step in an extensive process to modernise the Danish retail payments infrastructure. The Straksclearing makes it possible to settle payments of up to kr. 500,000 within a few seconds on a 24/7/365 basis. This means that Denmark now has one of the world’s most advanced retail payments infrastructures.

PAYMENT INSTRUMENTS

Every day, the Danes 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 has enhanced its oversight of the three most important payment instruments, which are currently the Dankort, Betalingsservice and credit transfers. Danmarks Nationalbank monitors developments in the payments area, including the introduction of new functions or brand new payment instruments.

USE

In value terms, the most widely used payment instruments in 2014 were credit transfers and inpayment forms, cf. Chart 4 (left). Credit transfers made up more than 61 per cent of the total settlement value in the retail payment systems, while Dankort transactions accounted for only 5 per cent, corresponding to just over kr. 1 billion per day. But measured by the number of transactions, the Dankort was the most popular payment instruments in 2014, cf. Chart 4 (right). Dankort transactions accounted for almost 57 per cent of the total number of transactions, meaning that the Dankort was used 3.3 million times a day on average. Credit transfers accounted for approximately 10 per cent of the total number of payments settled. The Dankort is used for payments online and in shops and is often a substitute for cash when making small purchases from e.g. a baker’s shop or a kiosk. Consequently, the number of transactions is high, while the value is low compared with that of credit transfers.

OPERATIONAL RELIABILITY

The availability of Nets’ card systems was generally high in 2014. However, there was one major incident and a few minor problems with the card systems during the year. On 20 January, a network failure at IBM meant that the Dankort could not be used online for just over 10 hours. In its follow-up of the incident, Danmarks Nationalbank has discussed with Nets how Nets can increase awareness of the offline procedure among retailers and their customers cf. Oversight of the Finan-
cial infrastructure in Denmark 2014. This incident emphasises the importance of broad knowledge of the possibility of using offline procedures in retail transactions.

**FRAUD AND FRAUDULENT USE**

In 2014, fraudulent use of the Dankort totalled kr. 65.4 million. This is an increase of almost 38 per cent on 2013. The increase was seen primarily in the 2nd half of 2014. There has been a particularly strong increase in the number of cases related to lost or stolen cards, where somebody has watched the owner entering the PIN in a physical store and then steals the card. This is an international tendency. Relative to the aggregate value of Dankort transactions, fraudulent use accounts for 0.02 per cent. Fraudulent use remains low in an international comparison.

Fraudulent use in card-not-present transactions (CNP), i.e. in connection with online trading, mail orders or vending machines where PINs are not used, rose by 14 per cent from 2013 to 2014.

SecuRe Pay\(^2\) has made a number of recommendations for improving the security of online payments. These recommendations include preparation of specific risk assessments for the respective payment instruments, strong customer authentication when initiating payments, limiting access to information that may be used for fraudulent payments and increased focus on customer awareness of the issue. Subsequently, the European Banking Authority, EBA, has published guidelines based on the SecuRe Pay recommendations. From 1 August 2015 these guidelines will be part of the Danish Financial Supervisory Authority’s supervision of providers of payment services. The ECB has incorporated relevant sections of the above recommendations into its oversight standards for payment instruments.

The Danish Bankers Association publishes quarterly statistics of online bank theft in Denmark. In 2014, there were 10 incidents of online bank theft that led to losses; these losses totalled just under kr. 321,000. This is a considerable fall compared with previous years and reflects several years’ targeted efforts on the part of the banks. Presumably, the decrease is also attributable to greater consumer awareness of phishing emails, false websites, etc.

**INTERNATIONAL STANDARDS**

Oversight of the most important payment instruments takes place in accordance with the ECB’s standards for payment instruments. Nets and the Danish Bankers Association must prepare self-assessments of the Dankort/Betalingsservice and

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1 Danmarks Nationalbank (2014), Oversight of the Financial Infrastructure in Denmark 2014 (link).

2 SecuRe Pay is a European forum for discussion of issues related to the security of retail payments. The mandate, composition and published recommendations of SecuRe Pay can be found at Danmarks Nationalbank’s website (link). ECB (2015), Recommendations for the security of internet payments – final version after public consultation (link).
credit transfers, respectively, relative to the ECB standards. Against that background, Danmarks Nationalbank will assess compliance with the standards.

NEW INITIATIVES
Two mobile payment services, MobilePay and Swipp, were introduced in 2013. So far both services are used primarily for payments between private individuals, but they are expected increasingly to be used for other purposes. Consumers have embraced the new mobile payment services. Swipp and MobilePay are outlined in Box 2.

Since November 2014 it has also been possible to execute credit transfers in real time via the Straksclearing. Both MobilePay and Swipp are settled via the Straksclearing.

From the 3rd quarter of 2015, contactless technology will be introduced on the Dankort. The shift to Dankort cards with contactless technology will be effected gradually as the existing cards are replaced. The new functionality will be available for payments of up to kr. 200 without the use of PINs.

SETTLEMENT OF RETAIL PAYMENTS

In Denmark, retail payments are settled via three payment systems: the Sumclearing, the Intradagclearing and the Straksclearing. See Box 3 for a more detailed description of the systems, including the payment instruments settled via the systems.

USE
Currently, the Sumclearing and the Intradagclearing have 51 direct and 43 indirect participants. Five banks do not participate in the Straksclearing, which has 46 direct and 43 indirect participants.3

The largest number of payments is settled in the Sumclearing, where e.g. Dankort payments are settled. In value terms, the Sumclearing and the Intradagclearing, where e.g. credit transfers are settled, are almost equal in size, cf. the charts in Box 3. Overall, payments averaging kr. 35 billion are settled on a daily basis in the three systems, which is about 5 per cent higher than 2013.

LIQUIDITY

With the launch of the Intradagclearing in October 2013, a number of new, automated tools were introduced for participants’ liquidity management in connection with the settlement of retail payments.4 These tools are widely used and helped

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3 In general, participation in the Straksclearing is mandatory for participants in the two other clearing systems, but the Danish Bankers Association can grant dispensation from this requirement.

4 For more information on liquidity tools, see Jensen, Lars Egeberg, Tommy Meng Gladv and Majbrit Nyaagaard Christensen (2013), Liquidity management in connection with settlement of retail payments, Danmarks Nationalbank, Monetary Review, 3rd Quarter, Part 1(link).
Retail payment systems

The **Sumclearing** is a net settlement system. Settlement between banks takes place at night after banking days, and, for selected transactions, in the morning after non-banking days. 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:

- Cheques
- Inpayment forms
- Dankort
- Betalingsservice (Danish direct debit product)
- Leverandørservice
- International credit and debit cards
- Other minor payment instruments

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. In the Intradagclearing, it may take anything from a couple of hours to several days before the amount is credited to the recipient’s account. The following payment instruments are settled in the Intradagclearing:

- Credit transfers made as intraday transfers or standard transfers
- Overførselsservice (transfer service)

The **Straksclearing** is a real-time settlement system in which participants fund transfers in advance, i.e. participants at all times hold liquidity for clearing and therefore transfers can be settled instantly. In the Straksclearing, the amount is credited to the recipient’s account instantly, and the system operates 24/7/365. The following payment instruments are settled in the Straksclearing:

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

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**The Sumclearing, the Intradagclearing and the Straksclearing, value and number, average per day, 2014**

<table>
<thead>
<tr>
<th></th>
<th>Kr. billion</th>
<th>Million transactions</th>
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<tbody>
<tr>
<td>The Sumclearing</td>
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<td><img src="image" alt="Graph" /></td>
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<tr>
<td>The Intradagclearing</td>
<td><img src="image" alt="Graph" /></td>
<td><img src="image" alt="Graph" /></td>
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<tr>
<td>The Straksclearing</td>
<td><img src="image" alt="Graph" /></td>
<td><img src="image" alt="Graph" /></td>
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**Note:** Averages are calculated using data for the full year 2014 for the Sumclearing, while data for the Intradagclearing and the Straksclearing start on 1 February 2014 and 21 November 2014, respectively, and go to the end of the year. The number of transactions in the Sumclearing is calculated only for the payments instruments specified above. Therefore, the actual number is slightly higher. Daily averages are calculated for days on which the system is active, i.e. Monday to Friday for the Sumclearing and Intradagclearing and all days of the week for the Straksclearing.  

**Source:** Nets and Danish Bankers Association.
The netting effect is the liquidity-saving effect achieved by participants when opposite payments between participants are netted before settlement. The fewer payments settled in a settlement cycle, the smaller the expected netting effect. However, the introduction of several settlement cycles has not led to a reduction in the netting effect in the night-time settlement. In 2014, the average netting effect was 83 per cent in the night-time settlement against 81 per cent in 2012, at which time the Sumclearing was the only settlement system.

**OPERATIONAL RELIABILITY**

Technical problems have only in a couple of instances led to delays in the settlement of payments during 2014 and early 2015, and the operational reliability of the Danish retail payment systems has generally been high. That said, the number of system incidents has been higher than normal since the launch of the Straksclearing. Some of these incidents are attributable to start-up problems. However, the incidents in the Straksclearing illustrate the challenges of real-time settlement and highlight the importance for the system owner and operator of maintaining a constant focus on the new challenges and swiftly finding permanent solutions to any problems.

An incident in April 2014, when a participant tried to settle a very large payment in the night-time settlement cycle of the retail payment systems, called attention to the participants’ individual limits in the systems. Now, the Danish Bankers Association regularly assesses the limits of each participant, and Danmarks Nationalbank is notified of any changes. As mentioned in the “Interbank payments” section, Danmarks Nationalbank recommends that large payments are settled via Kronos. In Kronos, shortage of liquidity will delay only the individual payment. In a net settlement system, shortage of liquidity will delay all payments from that participant – which may have implications for the payments of other participants.

**INTERNATIONAL STANDARDS**

The Danish Bankers Association has performed an analysis of retail payment systems’ compliance with the CPMI-IOSCO principles, which tighten requirements on the systems in several respects. Some of the areas where deficiencies were identified were the governance structures and formalised risk management frameworks. The importance of a clear governance structure for the systems has been highlighted by the Danish Bankers Association’s wish to transfer a number of tasks in relation to the retail payment systems to the e-nettet. The e-nettet is a sector-owned company commissioned to undertake major infrastructure projects in the financial sector as well as a number of administrative tasks related e.g. to clearing. An important task for the e-nettet in relation to clearing will be to ensure risk management in accordance with the CPMI-IOSCO principles. From the outset, the allocation of tasks and responsibilities in connection with risk management will be incorporated into the governance and administration model between the Danish Bankers Association and the e-nettet.

**SYSTEM UPDATES**

In 2014, the key change for Danish payment systems was the launch of the Straksclearing in November, marking the culmination of the extensive process to modernise the Danish retail payments infrastructure commenced in 2012. The Straksclearing performs real-time settlement of payments irrespective of the payment instrument used to initiate the payment. This makes Denmark one of the leading countries in real-time settlement of retail payments.

The Straksclearing presents a number of challenges. Maintaining high operational reliability in a system operating 24/7/365 makes greater demands on the system owner and operator. Demands on participants’ liquidity management have also increased. It is essential that all parties involved continue their awareness of the challenges of real-time settlement.

The Danish Bankers Association, Nets and the e-nettet are involved in the project of replacing Danmarks Nationalbank’s central bank systems where the settlement systems and Danmarks Nationalbank’s new systems will interact.
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 the central counterparty (CCP) EuroCCP. After clearing at EuroCCP, transactions are settled in VP. VP and VP Lux1 will be connected to TARGET2-Securities (T2S), a European settlement system for cross-border securities transactions.

USE

VP currently has 136 clearing and settlement participants, 67 of which are non-resident market participants. In 2014, securities transactions with an average daily value of kr. 178 billion were settled, a small increase on the previous year, cf. Chart 5. The rise is attributable to increased trade in equities and investment fund shares, while bond trading declined slightly. Overall, equities and investment fund shares accounted for about one-fifth of the value of the total VP settlement, representing a near doubling of the percentage two years earlier, in 2012.

SETTLEMENT RATIO

The overall settlement ratio, i.e. the percentage of securities transactions settled on the agreed settlement day, was 98.9 per cent in VP in 2014 relative to 99.2 per cent in 2013. The slight decline may be due to various factors. As mentioned above, equities and investment fund shares accounted for a larger percentage of the settlement in VP. This reduces the overall settlement ratio, since these types of securities are settled at a lower settlement ratio than bonds, cf. Chart 6. Moreover, VP, along with most markets for securities settlement in Europe, transitioned from T+3 to T+2 settlement in October 2014, cf. Box 4. This transition entails that, for a period of time, VP’s participants must adapt to the shorter settlement cycle, which could have a spillover effect on the settlement ratio. So far there are no indications that the shorter settlement cycle has affected the timeliness of VP settlement to any significant degree.

LIQUIDITY

Danmarks Nationalbank has previously recommended VP’s participants to tighten their focus on reserving sufficient liquidity for the Payment-versus-Payment (PvP) settlement batch, VP33, and for the periodic payments batch, VP35, to avoid delays. 2014 saw fewer overdrafts in these set-

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1 VP Lux is VP Securities’ subsidiary, which operates as a central securities depository in Luxembourg and is overseen by Banque Centrale du Luxembourg. VP Lux has outsourced its operations to VP Securities. Danmarks Nationalbank and Banque Centrale du Luxembourg have signed an MoU on cooperation in relation to oversight of VP Lux (link).
tlement batches than the previous year. But a stronger focus on the reservation of euro liquidity for the PvP settlement is still needed, as changed market conditions have contributed to a higher number of overdrafts. Thus, the ECB’s introduction of a negative rate of interest means that participants can no longer hold overnight euro liquidity in TARGET accounts at zero interest. At the same

2 In 2014, Danmarks Nationalbank recorded a total of 10 overdrafts in VP33 and VP35, relative to 19 overdrafts in the corresponding settlement cycles in 2013.
In 2014, VP, along with most other markets for securities settlement in the EU, transitioned to T+2 settlement. This entails that the planned settlement day of a securities transaction must be on the second banking day, at the latest, after the transaction is concluded. Previously, the market practice in most markets was for securities to be settled T+3.

Settlement of a securities transaction is effected by the buyer and the seller reporting the transaction to a central securities depository (CSD), typically immediately after the transaction is concluded. When the reporting has been validated, the transaction is ready for settlement on an agreed settlement day. It is the period from the conclusion of the transaction until settlement which is now standardised and shortened. The shorter settlement cycle applies to all transactions concluded on marketplaces, for instance stock exchanges.

The background to the changes is new trans-European regulation of CSDs (the CSDR). The regulation is implemented to harmonise the market, thereby strengthening cross-border trading in securities and enhancing competition between CSDs in the EU. Harmonisation is also a prerequisite for effective settlement on the trans-European securities settlement platform TARGET2-Securities (T2S), which will be in operation from June 2015. Finally, longer settlement cycles cause uncertainty and increased counterparty risk for participants in securities settlement systems. T+2 settlement, which was the market practice e.g. in the German market prior to the adoption of the regulation, has been chosen as the common standard, since the European Commission wished to use best practice in the area as target for the regulation.

On 6 October 2014, practically all markets in the EU transitioned to T+2 settlement in a “big bang” solution. One reason was that settlement of cross-border securities transactions via links between different CSDs would be impeded if the markets migrated on different days. Prior to the transition to T+2, concerns were raised that the shorter settlement cycle could affect the settlement behaviour of participants in the securities settlement systems, since participants have shorter time to procure the securities needed for settlement.

The chart below shows the deviation from the average annual settlement ratio in VP in the months before and after the transition to T+2 settlement. It shows that the settlement ratio hovers around the same average value in the months before and after the transition to shorter settlement time.

Note: The bars in the chart show the settlement ratio in VP in terms of value for all types of securities. The 12-month average is calculated as the average settlement ratio in the current year up to the transition to T+2.
Source: VP and own calculations.

2. A few markets still have not transitioned to T+2. They have until the end of 2015 to comply with the regulation requirement.
In 2014, VP focused on the capacity of its settlement system. One reason was an incident that occurred on 26 May when a very large number of transactions was submitted for settlement within a short space of time. This caused the VP settlement to be executed more slowly than usual due to peak load of the system. Moreover, longer response times caused delays in the communication with other systems, which had implications e.g. for the use of automatic collateralisation in the settlement of retail payments. VP subsequently expanded capacity from its service provider. In addition, VP optimised the capacity of its systems by reducing the average processing time of transactions and optimised the queuing system by enabling processing of multiple transactions at the same time.

**LINKS**

VP offers cross-border securities settlement via links to the international securities market, cf. Box 5. VP participants can also use links to transfer securities to and from other central securities depositories (CSDs). In 2014, the ECB’s rules were amended to the effect that securities issued in euro in VP can now be pledged as collateral in Eurosystem lending transactions if the securities are transferred to a CSD in the euro area. This is, however, conditioned on the securities in question meeting ECB eligibility requirements, and the link used for the transfer of the securities complying with ECB user standards.

In its capacity as VP overseer, Danmarks Nationalbank has participated in an assessment of a link from Clearstream Bank Frankfurt (CSD) to VP against the ECB user standards. On the basis of this assessment, the ECB Governing Council approved the link. Thus, relevant securities issued by VP may now be pledged as collateral in the euro area if the securities are transferred to Clearstream Bank Frankfurt via the link.

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3 This incident also affected the night-time settlement procedure of the following settlement day.

4 Automatic collateralisation is a system for pledging of collateral in which participants in the Danish financial infrastructure can pledge securities in custody accounts in VP as collateral for the krone settlement of securities, retail payments and foreign exchange transactions.

INTERNATIONAL STANDARDS

Oversight of VP settlement is based on the CPMI-IOSCO principles, setting out requirements e.g. for the operation, organisation and risk management by CSDs. On the basis of a gap analysis against the tighter CPMI-IOSCO requirements, VP established a new risk management structure during the year, entailing, for instance, that a new risk and compliance function was created in VP and a new risk management policy formulated.

In 2014, VP followed up Danmarks Nationalbank’s recommendation to launch a stress testing programme. VP performed a number of stress tests, including tests of scenarios in which the largest net-liquidity provider was eliminated from the settlement on days with large liquidity requirements. Tests were also performed in which direct participants, settling transactions on behalf of many indirect participants, were eliminated from the settlement. The results show that – in the given scenarios – there is currently sufficient liquidity among the participants to prevent a spillover effect on the rest of the settlement. In future, VP will perform semi-annual stress tests to continually monitor developments in participants’ liquidity for VP settlement.

Moreover, VP performed a self-assessment of the VP settlement system against the CPMI-IOSCO principles. In continuation of this, Danmarks Nationalbank and the Danish Financial Supervisory Authority have initiated an assessment of whether the VP settlement system is compliant with the international principles.

SYSTEM UPDATES

There were no major system updates of the VP settlement system in 2014.

In 2014, VP worked on two major projects of significance to VP settlement. The first project is the connection to TARGET2-Securities, the trans-European securities settlement system, cf. below. VP is also part of the project to replace central bank systems at Danmarks Nationalbank. VP and Danmarks Nationalbank are engaged in close bilateral cooperation concerning the central bank systems of significance to the interaction between VP and Danmarks Nationalbank’s payment and collateral systems.

TARGET2-SECURITIES

In 2014, European central banks, CSDs and market participants continued their preparations for 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. T2S will be in operation from June 2015 when the first migration wave to the settlement platform has been completed.

VP will join T2S for settlement in euro in 2016 and in kroner in 2018. In cooperation with market participants, VP has been working on the transition to T2S settlement, which is an extensive project. Most of the development work in VP has been completed, and the project is progressing according to plan. VP has met its deadlines and milestones within the stipulated time frame. Recently, VP was certified for maintaining master data on the T2S platform, and VP will thus be responsible for maintaining information related to securities issued by VP.

Danmarks Nationalbank contributes to the development of T2S through participation in various domestic and foreign forums, including day-to-day management of the project, which is undertaken by the T2S Board under the management of the ECB. Danmarks Nationalbank also heads the Danish national user group, comprising the Danish market participants. The user group addresses overall issues prior to their consideration by the VP Board and ahead of T2S Advisory Group meetings.6

In 2014, one of the topics addressed by the user group was Danish participants’ conditions for access to euro liquidity in T2S. With the approval of the link from Clearstream Bank Frankfurt to VP, Danish market participants may pledge relevant securities registered in VP as collateral for credit facilities in euro with a central bank in the euro area. These credit facilities may be used in T2S for euro settlement.7

6 The T2S Advisory Group (AG) provides advice to the Eurosystem on T2S-related issues. The Group is chaired by the ECB and is made up of representatives from market participants, CSDs and central banks involved in the T2S project.

7 If a participant complies with the requirements for opening an account with, say, Deutsche Bundesbank, this participant will be able to use the Eurosystem auto-collateralisation facility to raise euro liquidity for the T2S night-time settlement.
The connection to T2S settlement, and particularly the connection in Danish kroner, will lead to major changes in securities settlement – both for large and small participants in the Danish financial sector. Therefore, it is important that participants start preparing for the future changes so that they are ready to settle via T2S. The task of monitoring participants’ technical readiness for T2S will be undertaken by the national user group, which is to report the status of the Danish participants to those responsible for the T2S project.

CCP CLEARING

A central counterparty (CCP) is an intermediary in securities transactions by acting as the seller to all buyers and the buyer to all sellers. In this way, the CCP ensures that the transactions are completed as long as the CCP is able to meet its obligations. Since 2009, EuroCCP, which changed its name from EMCF 8 in 2014, has been acting as CCP for the most frequently traded equities on Nasdaq OMX Copenhagen. The actual settlement of transactions is done in VP.

Operations were satisfactory in 2014. The EuroCCP settlement ratio in VP is relatively high compared with EuroCCP’s other markets of operation. Initiatives such as an enhanced opportunity for partial settlement of CCP transactions9 and extension of the time frame for the CCP settlement10 had a positive impact on the settlement ratio. Moreover, VP’s new sanctioning system had a disciplinary effect.

In March 2014, EuroCCP was authorised to operate as a CCP under the EMIR Regulation, which regulates CCPs in the EU.11 The authorisation was granted by the EMIR college, which is responsible for the oversight of EuroCCP. Danmarks Nationalbank has observer status in the college, which is headed by the Dutch central bank and the Netherlands Authority for the Financial Markets.

In addition to CCP clearing of equities, in March 2014, Nasdaq OMX Copenhagen 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 the CCP clearing helps to reduce risk in the repo market, inter alia due to netting and collateral requirements.

8 This took place in January 2014 when the Dutch CCP EMCF changed its name to EuroCCP as part of a merger with UK-based EuroCCP.
9 Partial settlement means that CCP transactions can be cancelled by VP and be replaced by two new transactions if, during the settlement process, it turns out that there are insufficient funds to cover the settlement amount. In April 2012, partial settlement of CCP transactions was extended to include CCP transactions entered into by private professionals and not just transactions entered into by clearing participants.
10 As from February 2013, CCP transactions were extended to be settled also in VP’s latest krone settlement batch, VP60, which is initiated at 12:00 noon.
SETTLEMENT OF
FOREIGN EXCHANGE
TRANSACTIONS

The international foreign exchange settlement system CLS settles transactions in the 17 participating currencies, including Danish kroner. To ensure the finality and availability of funding, all payments are effected via central bank accounts and systems. Payments in Danish kroner to and from CLS are effected via Kronos.

Settlement via CLS eliminates the settlement 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 multilaterally netted.

CLS

USE
There are four direct participants in the CLS settlement service in Danish kroner, while a large number of Danish financial institutions and firms participate indirectly in the CLS settlement service as third parties of one of the settlement members. Approximately 70 per cent of all foreign exchange transactions in Danish kroner are settled in CLS.

Since 2008, the number of krone transactions in CLS has surged, but their value has remained fairly stable, cf. Chart 7. The average number of daily transactions in kroner more than doubled in the period 2008-2014. The average daily value of krone transactions was kr. 231 billion in 2014, corresponding to an increase of 6 per cent since 2008. In other words, there are now more, but smaller krone transactions in CLS, which is in line with the evolution of CLS.

LIQUIDITY
Payments to CLS take place via Kronos. Danish participants can reserve liquidity for CLS settlement via either manual transfers or standing orders from their current accounts or via automatic collateralisation.

Using automatic collateralisation reduces the operational risk relative to use of manual transfers, while also making it possible to use current account liquidity for other purposes, including interbank payments.

OPERATIONAL STABILITY
Settlement of krone transactions in CLS depends on the operational reliability of Kronos. Given the criticality of CLS payments, contingency procedures for settlement of payments in Kronos will always be applied in the event of failures.

In 2014, one incident in Kronos on 1 July affected the CLS settlement service. Due to the failure of Kronos, payments to CLS had to be effected via a contingency procedure. Payments from CLS could be effected in the normal way once Kronos was up and running again.

ASSESSMENT
Oversight of CLS is based on the international CPMI/IOSCO principles for financial market infrastructures. The Federal Reserve System (Fed) is the primary oversight authority, while Danmarks Nationalbank has joint oversight powers of CLS. The focus of Danmarks Nationalbank’s oversight
is on issues of relevance to settlement in Danish kroner.

The central banks of the participating currencies have established the CLS Oversight Committee as a cooperative oversight arrangement that enables the central banks’ to perform their national oversight duties.

At the end of 2014, CLS published a Disclosure Framework\(^1\) in relation to the international principles. In its disclosure, CLS provides an account of its approach to observing each relevant principle.

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SPECIAL TOPIC
Kronos is characterised by a high degree of direct participation by Danish banks. In general, direct participation is desirable, as it eliminates the risks that may be incurred by indirect participation. An indirect participant assumes credit risk by placing liquidity with another bank and liquidity risk by using a correspondent bank to settle payments. On the other hand, operational requirements imposed on participants could make it inexpedient for small banks to participate directly. This special topic article considers whether the degree of direct Kronos participation is expedient.

PARTICIPANTS IN KRONOS

At the end of 2014, Kronos had 93 direct participants. Of these participants, 70 have less than 10 daily interbank payments on average, 12 have between 10 and 50 daily interbank payments on average, while 11 have more than 50 daily interbank payments on average, cf. Chart 8.

Since 2010, the number of direct Kronos participants has declined from 122 participants to 93, cf. Chart 8. Participants exiting Kronos have mainly been small participants, typically as a result of mergers with other participants. The number of medium-sized and large participants has been fairly stable during the period.

The number of direct participants is relatively high. 71 of the 93 participants are Danish banks, representing about 86 per cent of all Danish banks under the supervision of the Danish Financial Supervisory Authority.1 By way of comparison, the UK had 20 direct participants in its RTGS system, CHAPS, in 2013, equivalent to just under 13 per cent of all UK banks. Sweden had 27 direct participants in its system, RIX, which is approximately 30 per cent of all Swedish banks under supervision, while all Norwegian banks and savings banks are direct participants in Norges Bank’s RTGS system, NBO.2

A number of special participants, such as settlement systems, investment firms, etc., were included among the direct Kronos participants in 2014. Such participants are disregarded below.

THE INTERBANK MARKET

Direct Kronos access allows participants to send and receive interbank payments without incurring the credit and liquidity risk of indirect participation. An indirect participant incurs credit risk by placing liquidity with another bank and liquidity risk when payments are settled through a correspondent bank. However, this risk is limited for very small participants, since their activity is limited.

There is a high degree of heterogeneity in the level of activity among Kronos participants. Kronos has a large number of very small participants, some medium-sized participants and a few very large participants. As such, the 10 largest participants between them accounted for more than 95 per cent of the overall Kronos activity in 2014 in terms of the number of interbank payments, cf.

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1 Currently, 83 Danish banks are supervised by the Danish Financial Supervisory Authority, cf. Danish Financial Supervisory Authority (link).

2 BIS (2014), Statistics on payment, clearing and settlement systems in the CPMI countries, September (link), Norges Bank (link), the Swedish financial supervisory authority, Finansinspektionen (link), Bank of England (link) and the Norwegian financial supervisory authority, Finanstilsynet (link).
Table 2. The 20 largest participants accounted for just over 98 per cent of the overall activity, while the remaining participants accounted for just under 2 per cent of the overall activity. In terms of the value of payments in Kronos, the distribution is almost the same.
The high degree of heterogeneity in the use of Kronos for interbank payments is also reflected when the active links of the participants are examined. An active link is the connection established between two participants when one participant sends a payment to the other or vice versa. Thus, participants sending payments to many other participants or receiving payments from many other participants have many active links.

The largest Kronos participants constitute a closely linked network, while the smallest participants constitute a sparsely linked network. As such, the 10 largest participants have a very active network in which all possible links were used each month in 2014, cf. Table 2. The more participants included in the network, the sparser the network becomes. When all participants are included, only 12 per cent of the possible links are used. This illustrates that, on average, the smallest participants use only a few connections to other participants.

**OTHER USE OF KRONOS**

In addition to interbank payments, Kronos is used to settle net positions from connected settlement systems and for monetary policy operations with monetary policy counterparties. Direct participation in Kronos is a requirement for participating in the settlement systems and for access to monetary policy operations.

In 2014, 62 per cent of all Kronos participants participated in VP settlement, 61 per cent participated in the Sumclearing, the Intradagclearing and the Straksclearing, while 39 per cent of all Kronos participants participated in monetary policy operations, cf. Table 3. Monetary policy operations are participants’ placement of excess liquidity with Danmarks Nationalbank (by purchasing certificates of deposits) and Danmarks Nationalbank’s lending facility.

Almost all of the largest participants are direct participants in both settlement systems and monetary policy operations, but small banks also participate in the settlement systems. Among the 25 per cent smallest Kronos participants, 29 per cent participated in VP settlement, while 21 per cent participated in the Sumclearing, the Intradagclearing and the Straksclearing.

**COSTS FOR KRONOS PARTICIPANTS**

Participation in Kronos is subject to costs. Participants pay a fixed monthly fee on the basis of a distribution key based on their working

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### Percentage of Kronos participants in settlement systems and monetary policy operations in 2014

<table>
<thead>
<tr>
<th>Per cent</th>
<th>Participants in VP settlement</th>
<th>Participants in the Sumclearing, Intradagclearing and Straksclearing</th>
<th>Participants in monetary policy operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th quartile</td>
<td>87</td>
<td>83</td>
<td>65</td>
</tr>
<tr>
<td>3rd quartile</td>
<td>74</td>
<td>83</td>
<td>39</td>
</tr>
<tr>
<td>2nd quartile</td>
<td>61</td>
<td>61</td>
<td>35</td>
</tr>
<tr>
<td>1st quartile</td>
<td>29</td>
<td>21</td>
<td>17</td>
</tr>
<tr>
<td>All participants</td>
<td>62</td>
<td>61</td>
<td>39</td>
</tr>
</tbody>
</table>

**Note:** The table indicates the percentage of participants in VP settlement, the Sumclearing, the Intradagclearing and the Straksclearing and in monetary policy operations, grouped by quartiles, based on the size of participants in terms of the value of interbank payments in Kronos, entailing that the 25 per cent largest participants are in the 4th quartile, etc. A participant is regarded as a participant in a settlement system or in monetary operations if, at some point in 2014, the participant transferred liquidity for settlement or participated in monetary policy operations.

**Source:** Danmarks Nationalbank.

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3 A number of mortgage banks and branches of foreign banks are included among the large participants; they participate in settlement systems and monetary policy operations to a smaller extent.
capital and a fee for each transaction they settle in Kronos. The transaction fee depends on the number of transactions settled by the participant per month, entailing that participants with many transactions pay a lower fee per transaction than participants with few transactions.

With the chosen cost model, large participants pay a large portion of the overall re-invoiced costs, while small participants pay a very small portion, cf. Chart 9. On the other hand, large participants pay a relatively low price per transaction when the fixed fee is included, while small participants pay a relatively high price per transaction.

The overall fee for participating in Kronos is a significant factor in the business decision of whether to participate directly or indirectly through a correspondent bank.

Direct Kronos participation involves other costs besides the fee. The technical connection to Kronos is subject to fixed costs and there are staffing costs during the Kronos opening hours. Since these costs are the same regardless of the number of transactions settled per day, they may constitute an excessive burden for small participants.

POSSIBLE OPERATIONAL RISKS RELATED TO SMALL PARTICIPANTS

Technical failures and incidents at a direct Kronos participant could potentially have a great impact on the settlement of payments in the system as a whole. Small Kronos participants outsource their IT operations to large data centres that are specialized in Kronos connectivity. Thus, experience shows that small participants do not tend to be affected by technical failures and incidents more often than other participants.

It is important that all Kronos participants are available throughout the system opening hours, for instance in case of a contingency procedure or overdraft at the close of the day. In practice, small participants are not responsible for more handling errors than other participants, and Danmarks Nationalbank’s ServiceDesk does not receive more inquiries from small participants than from other participants.
SUMMARY
It is an advantage in terms of the settlement of payments and financial stability in Denmark that most banks choose to be direct Kronos participants.

It is generally an advantage for small participants to have direct access to Kronos to enable them to settle payments directly in Kronos, thereby reducing the credit risk associated with having to place liquidity with another bank. However, in practice, the activity of small participants in the interbank market is limited, and they have very few active links/connections to other participants. But several small banks participate directly in both VP settlement and the Sumclearing, the Intradagclearing and the Straksclearing.

On the other hand, having to be available throughout the Kronos opening hours and maintaining the necessary system knowledge of a sufficient number of staff may be an excessive burden for small participants.

Today, the Kronos participation fee is designed to make it relatively inexpensive for small banks to participate directly in relation to total expenses. However, the final decision on whether or not to participate in Kronos must be based on the pros and cons of participation for the individual bank.
APPENDIX OF TABLES
<table>
<thead>
<tr>
<th>Year</th>
<th>Kronos Number, thousands</th>
<th>Value, kr. billion</th>
<th>The Sumclearing, Intradagclearing and Straksclearing Number, thousands</th>
<th>Value, kr. billion</th>
<th>VP settlement Number, thousands</th>
<th>Value, kr. billion</th>
<th>CLS Number, thousands</th>
<th>Value, kr. billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>664</td>
<td>60,633</td>
<td>1,120,807</td>
<td>5,027</td>
<td>9,319*</td>
<td>30,924*</td>
<td>129</td>
<td>31,333</td>
</tr>
<tr>
<td>2006</td>
<td>680</td>
<td>66,089</td>
<td>1,244,542</td>
<td>5,349</td>
<td>11,645</td>
<td>28,769</td>
<td>176</td>
<td>47,596</td>
</tr>
<tr>
<td>2007</td>
<td>737</td>
<td>70,273</td>
<td>1,347,182</td>
<td>5,750</td>
<td>15,515</td>
<td>28,502</td>
<td>222</td>
<td>50,446</td>
</tr>
<tr>
<td>2008</td>
<td>794</td>
<td>78,799</td>
<td>1,447,251</td>
<td>5,876</td>
<td>16,409</td>
<td>30,703</td>
<td>275</td>
<td>54,357</td>
</tr>
<tr>
<td>2009</td>
<td>753</td>
<td>70,254</td>
<td>1,502,764</td>
<td>5,405</td>
<td>15,431</td>
<td>35,473</td>
<td>300</td>
<td>52,396</td>
</tr>
<tr>
<td>2010</td>
<td>779</td>
<td>61,492</td>
<td>1,607,450</td>
<td>5,527</td>
<td>11,541</td>
<td>40,052</td>
<td>354</td>
<td>52,452</td>
</tr>
<tr>
<td>2011</td>
<td>833</td>
<td>55,151</td>
<td>1,710,368</td>
<td>5,718</td>
<td>10,799</td>
<td>39,710</td>
<td>423</td>
<td>52,743</td>
</tr>
<tr>
<td>2012</td>
<td>896</td>
<td>60,037</td>
<td>1,823,610</td>
<td>5,302</td>
<td>9,980</td>
<td>48,238</td>
<td>449</td>
<td>56,530</td>
</tr>
<tr>
<td>2013</td>
<td>1,038</td>
<td>73,720</td>
<td>1,988,056</td>
<td>6,059</td>
<td>12,760</td>
<td>42,645</td>
<td>511</td>
<td>55,422</td>
</tr>
<tr>
<td>2014</td>
<td>1,118</td>
<td>102,006</td>
<td>2,153,881</td>
<td>6,946</td>
<td>15,149</td>
<td>44,205</td>
<td>575</td>
<td>57,334</td>
</tr>
</tbody>
</table>

Note: The figures from 2005 for VP settlement are based on an old calculation method. Figures for the Sumclearing, the Intradagclearing and the Straksclearing comprise Dankort and VisaDankort payments, international cards, cash cards, credit transfers, Betalingsservice (direct debit), Leverandørservice, inpayment forms and cheques.

Source: Danish Bankers Association, Nets, VP, CLS Bank and own calculations.
## Payments in euro

<table>
<thead>
<tr>
<th>Year</th>
<th>TARGET – all participating member states</th>
<th>Sumclearing1</th>
<th>VP settlement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Of which Danish participants</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number, thousands</td>
<td>Value, billion euro</td>
<td>Number, thousands</td>
</tr>
<tr>
<td>2005</td>
<td>76,151</td>
<td>488,901</td>
<td>106</td>
</tr>
<tr>
<td>2006</td>
<td>83,180</td>
<td>533,541</td>
<td>116</td>
</tr>
<tr>
<td>2007</td>
<td>93,376</td>
<td>616,731</td>
<td>131</td>
</tr>
<tr>
<td>2008</td>
<td>94,711</td>
<td>682,780</td>
<td>179</td>
</tr>
<tr>
<td>2009</td>
<td>88,517</td>
<td>551,174</td>
<td>188</td>
</tr>
<tr>
<td>2010</td>
<td>88,592</td>
<td>593,194</td>
<td>202</td>
</tr>
<tr>
<td>2011</td>
<td>89,566</td>
<td>612,558</td>
<td>197</td>
</tr>
<tr>
<td>2012</td>
<td>90,671</td>
<td>634,132</td>
<td>200</td>
</tr>
<tr>
<td>2013</td>
<td>92,590</td>
<td>493,442</td>
<td>196</td>
</tr>
<tr>
<td>2014</td>
<td>90,337</td>
<td>492,432</td>
<td>165</td>
</tr>
</tbody>
</table>

Source: ECB, Nets and VP.

1. The last settlement date for the Sumclearing in euro was 30 November 2012.

## Use of payment instruments

<table>
<thead>
<tr>
<th>Year</th>
<th>Dankort</th>
<th>International cards</th>
<th>Betalingsservice (Danish direct debit product)</th>
<th>Credit transfers1</th>
<th>Inpayment forms1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number, million</td>
<td>Value, kr. billion</td>
<td>Number, million</td>
<td>Value, kr. billion</td>
<td>Number, million</td>
</tr>
<tr>
<td>2009</td>
<td>869.4</td>
<td>291.4</td>
<td>103.3</td>
<td>43.0</td>
<td>174.6</td>
</tr>
<tr>
<td>2010</td>
<td>916.1</td>
<td>307.9</td>
<td>156.7</td>
<td>56.3</td>
<td>184.2</td>
</tr>
<tr>
<td>2011</td>
<td>968.7</td>
<td>317.4</td>
<td>206.7</td>
<td>68.5</td>
<td>190.1</td>
</tr>
<tr>
<td>2012</td>
<td>1,031.7</td>
<td>331.4</td>
<td>254.9</td>
<td>79.4</td>
<td>194.6</td>
</tr>
<tr>
<td>2013</td>
<td>1,105.2</td>
<td>342.7</td>
<td>300.3</td>
<td>88.6</td>
<td>199.3</td>
</tr>
<tr>
<td>2014</td>
<td>1,197.6</td>
<td>359.9</td>
<td>368.8</td>
<td>101.5</td>
<td>202.5</td>
</tr>
</tbody>
</table>

Note: Card transactions comprise transactions with Danish-issued cards in Denmark and abroad and transactions with foreign-issued cards in Denmark.

Source: Payments statistics (in Danish only), Danish Payments Council [link].

1. Covers only transactions where the payer and the recipient bank with different banks.