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Payment and Settlement Systems Report 2017

2018. 6



THE BANK OF KOREA

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List of Abbreviations

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List of Abbreviations

BCBS	Basel Committee on Banking Supervision
BCP	Business Continuity Plan
BIS	Bank for International Settlements
BOK	Bank of Korea
CCP	Central Counterparty
CFIP	Committee on Financial Informatization Promotion
CLS	Continuous Linked Settlement
CPMI	Committee on Payment and Market Infrastructures
CSD	Central Securities Depository
DNS	Deferred Net Settlement
DLT	Distributed Ledger Technology
DvP	Delivery versus Payment
FMI	Financial Market Infrastructure
FoP	Free of Payment
FSAP	Financial Sector Assessment Program
FSB	Financial Stability Board
FSC	Financial Services Commission
FSS	Financial Supervisory Service
IOSCO	International Organization of Securities Commissions
KFTC	Korea Financial Telecommunications and Clearings Institute
KRX	Korea Exchange
KSD	Korea Securities Depository
MOSF	Ministry of Strategy and Finance
OTC	Over-the-counter
PFMIs	Principles for Financial Market Infrastructures
PvP	Payment versus Payment
RTGS	Real-time Gross Settlement
TR	Trade Repository

■ Overview

[Oversight of Payment and Settlement Systems and Policy Responses]

① The BOK conducted oversight of payment and settlement systems, including assessments of financial market infrastructures (FMIs), joint examinations of financial institutions participating in the payment and settlement systems, and international cooperative oversight activities.

In 2017, the BOK conducted assessments of systemically important payment and settlement systems operated by the Korea Securities Depository (KSD) (OTC bonds settlement system and inter-institution repo settlement system) and the Korea Exchange (KRX) (securities and derivatives market settlement systems). As the BOK also considered the need to enhance the cyber resilience of payment and settlement systems, the assessment was carried out with a focus on the operational risk management of the systems, in accordance with not only the *Principles for FMIs* (“PFMIs”) (enacted in April 2012) but also the *Guidance on Cyber Resilience for Financial Market Infrastructures* (released in June 2016), both of which were established by the Committee on Payments and Market Infrastructures (CPMI) of the Bank for International Settlements (BIS) and International Organization of Securities Commissions (IOSCO).

The assessment results showed that the two institutions had generally observed with most of the PFMIs. However, it was found that the KSD needed to clarify the time at which settlements are finalized in the regulation for the inter-institution repo settlement system and make some improvements to its operational risk management framework. In addition, the assessment indicated that the KRX needed to make some improvements in terms of its credit risk management and collateral margin management.

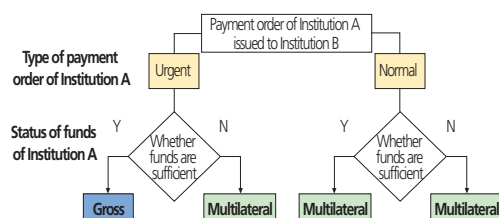
The BOK also conducted joint examinations of two banks, assessed the status of their payment and settlement businesses and IT-related tasks, and recommended that they come up with methods for reducing possible settlement risks. Furthermore, the BOK conducted joint examinations of four financial investment companies, based on which it recommended that the companies complement the execution of funds transfers and enhance settlement liquidity management. Meanwhile, the BOK also took part in the CLS Oversight Committee and SWIFT Oversight Forum, to share information with other members on major developments that could affect the system safety and efficiency, and to discuss various issues arising from policy changes made by the operators or the relevant regulators.

② The BOK made diverse efforts to enhance the safety and efficiency of payment and settlement systems.

The BOK reviewed the operational process of the next-generation BOK-Wire+, which is to enter operation in 2020, and

developed methods for improving its settlement mechanisms. While the current multi-lateral offsetting mechanism of the hybrid settlement system is to be maintained, the bilateral offsetting mechanism will be eliminated, thus helping streamline the settlement process. In addition, to expedite settlements, the netting interval of the next-generation BOK-Wire+ will be shortened from the current 30 minutes to 5 minutes.

Settlement Process of the Next-generation BOK-Wire+



Source: The Bank of Korea

In addition, during regular exercises conducted under the BOK's business continuity plan (BCP), the BOK practiced the manual execution of funds transfers and recommencement of work in the event of large-scale disaster, and tried to close loopholes identified in practical procedures. Moreover, the BOK extended the period for accepting mortgage-backed securities (MBS) issued by the Korea Housing Finance Corporation as collateral for net settlements, which had originally been valid until the end of 2017, by one year to the end of 2018, thus assisting financial institutions in their efforts to prepare for the growing demand for collateral securities.

To enhance the transparency of the operational status of BOK-Wire+ and promote observance of international standards, the

BOK prepared the Document on the Operational Status of BOK-Wire+, and posted the document on its website in July 2017. In 2018, the BOK plans to prepare and release an English version of the document.

Major Details of Document on the Operational Status of BOK-Wire+

Contents	Details
1. Overview	Contents of the document
2. Major changes	Major changes made after the previous announcement (No changes were made, as this is the first disclosure made in accordance with the PFMI.)
3. General information on a FMI	<ul style="list-style-type: none"> • Overview of BOK-Wire+ • Organization and governance • Legal and regulatory structure • System design and operation
4. Explanations by each principle of the PFMI	Explanations of the operational status of BOK-Wire+ in relation to 24 principles of the PFMI
5. Reference materials	List of relevant statutes and materials needed to gain an understanding of observance of each principle of the PFMI.

On the other hand, the Committee on Financial Informatization Promotion (chaired by the Senior Deputy Governor of the BOK) ("CFIP") decided to establish the "Joint Data Vaulting Center for the Financial Industry" to protect financial data from disasters, such as cyber-attacks, wars, and earthquakes that affect broad areas. This center replaced the originally conceived Joint Backup Center for the Financial Industry, and is expected to enhance the security of financial institutions' data management at a comparatively low cost.

③ The BOK supported the innovation and development of payment and settlement systems by carrying out the “Coinless Society” pilot project, researching distributed ledger technology, and participating in international discussions.

With the goal of freeing citizens from the inconvenience of using cash and reducing the social costs associated with minting and handling coins, the BOK implemented a pilot project called “Coinless Society” in April 2017. As of the end of 2017, six distributors (with 36,500 stores nationwide) and ten pre-paid electronic financial business operators have joined the project, attracting public attention to the idea of a coinless society and reducing some social costs.

In addition, the BOK worked to enhance research and development on distributed ledger technology and cryptocurrencies. In addition to holding conferences and seminars and participating in international consultation bodies, it conducted an experiment of distributed ledger technology-based funds transfers between banks, in cooperation with the CFIP. The test results showed that the experimental system had robust security and good expandability but lagged behind the current system in terms of processing speed and resilience.

On the other hand, as people are installing their IC cash cards on mobile devices, including smartphones, and using the cards for the payment of small amounts of money, the CFIP reviewed the need for establishing the “*Standard for the Settlement*

of Small Amounts Using IC Cash Cards on Mobile Devices” and plans to earnestly pursue the establishment of the standard in the first half of 2018. In addition, the committee revised the *CD/ATM Standard for those with disabilities* at the request of organizations for people with disabilities. In 2018, after reviewing the applicability of the opinions of these organizations, it expects to complete the revision work in consultation with financial institutions and CD/ATM manufacturers.

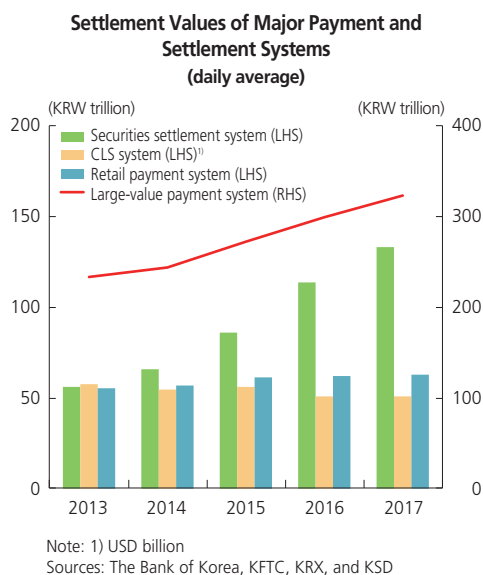
In its capacity as a chair of the Working Group on Payment and Settlement Systems (WGPSS) of the Executives’ Meeting of East Asia and Pacific Central Banks (EMEAP), the BOK led the discussions of regional central banks on payment and settlement systems. In particular, within the Working Group, the BOK organized the “Digital Innovation Study Group” and conducted joint research on digital innovations in payment and settlement systems, such as cryptocurrencies and distributed ledger technology, over the past year.

[Payment and Settlement Trends and Settlement Risk Management]

④ In 2017, the values of payments and settlements made via the systems showed continuous upward trends, driven mainly by securities settlements by financial institutions and electronic funds transfers by general customers and companies.

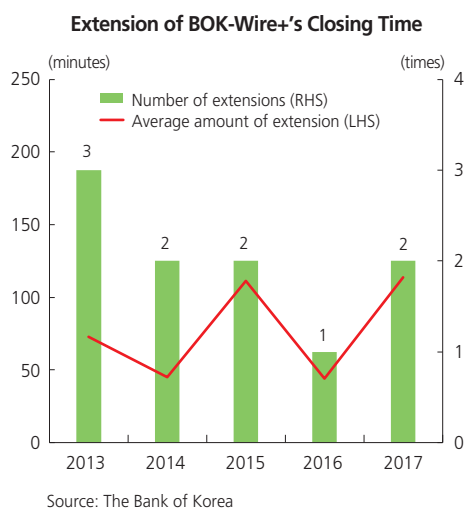
Due to increases in repurchase agreements(inter-institution repos), the value of amounts settled via the securities settlement system recorded a daily average of KRW 132.9 trillion, showing an increase of 16.9% year on year. The daily value of payments via retail payment systems averaged KRW 62.4 trillion, recording a 0.8% increase year on year, driven by increases in electronic funds transfers made via internet banking, mobile banking, and firm banking. The amounts of foreign exchange transactions settled via the CLS System recorded a daily average of USD 50.7 billion, increasing by 0.7% year on year.

The daily average value of amounts settled via BOK-Wire+, which conducts final settlements for transactions made among financial institutions through the securities settlement systems, foreign exchange settlement systems including CLS and retail payment systems, reached KRW 323.0 trillion, showing an increase of 7.8% year on year.



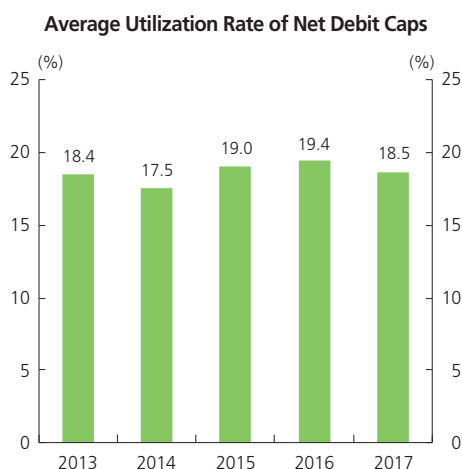
5 The settlement risks of major payment and settlement systems were managed in a stable manner.

Throughout the year 2017, BOK-Wire+ handled final settlements for funds transfers between BOK-Wire+ participants, retail and securities funds transfers, and CLS system in a smooth and consistent manner. The BOK-Wire+ closing time was extended twice: the first extension was in response to IT system problems at a BOK-Wire+ participant, and the second was a preemptive measure implemented by the BOK against the growing demand for settlements prior to the Chuseok holiday. The BOK recommended that the participant suffering the IT system failure revise its BCP, check its IT systems, and strengthen training for the employees responsible for its IT systems.



The retail payment systems operated by the KFTC were also operated stably. The average utilization rate of net debit caps of institutions participating in net settlements

stood at 18.5%, which was 0.9%p lower than in the previous year. The utilization rate exceeded the cautionary level (70%) 71 times, which was 20 more than the 51 times recorded in 2016.



Source: The Bank of Korea

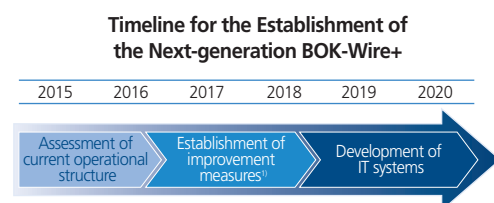
The securities settlement systems operated by the KRX and KSD were operated stably. All settlements were made prior to the settlement deadlines in the securities and treasury bond markets. The proportion of settlements made via a non-DvP mechanism in the OTC inter-institution repo settlement system decreased from 7.6% in 2016 to 6.6% in 2017.

[Future Policy Directions]

⑥ To enhance the safety and efficiency of payment and settlement systems, the BOK will continue expanding and improving payment and settlement infrastructures.

The BOK will work to ensure that the

next-generation BOK-Wire+ enters operation in 2020. In 2018, it will finalize the Comprehensive Plan for Establishing the Next-Generation BOK-Wire+, based on measures for improving the current operational structure and settlement processes of BOK-Wire+, and begin developing the IT systems for the next-generation BOK-Wire+ as well.



Note: 1) Operational and settlement methods and the need for acquiring ISO 20022

In addition, the BOK will continue its efforts to strengthen the resilience of BOK-Wire+ by improving its BCP and conducting mock drills with BOK-Wire+ participants. It will also cooperate with related institutions with the aim of enhancing the resilience of systemically important payment and settlement infrastructures in Korea.

In line with the PFMI, the BOK plans to gradually increase the collateral-to-net debit cap ratio. It will review measures for ameliorating the growing burden on banks to procure adequate collateral securities, including expanding the scope of collateral securities.

Furthermore, to enhance the security of important data management tasks of financial institutions, the CFIP will establish a detailed plan for building the Joint Data Vaulting Center for the Financial

Industry in a remote place that is an adequate distance from the Seoul Metropolitan Area. In addition, it will establish the *Guideline for Financial Institutions to Manage Data in Remote Places*, which will include the scope of data to be stored in remote facilities, security management measures, and distance-related regulations, thus allowing individual financial institutions to autonomously enhance the security of their data.

⑦ The BOK will enhance its oversight of payment and settlement systems based on the recommendations of the international standard setting bodies regarding the resilience of central counterparties(CCPs) and the recovery of FMIs.

The BOK will enhance its oversight framework to ensure that the recommendations of the international standard setting bodies, including the further guidance such as *Resilience of CCPs* and *Recovery of FMIs* released by the CPMI-IOSCO in July 2017, are applied to payment and settlement systems in Korea. Going forward, it will assess the CCPs with a focus on strengthening their resilience in accordance with the *Resilience of CCPs*. In addition, it will assess the FMIs in accordance with *Recovery of FMIs*, which provides for the allocation of losses caused by defaults of participating institutions, replenishment of financial resources, and other matters. Finally, it will make more active use of the *Cyber Resilience Assessment Methodology for Korean FMIs*, which was published in a bid

to promote cyber-resilience management framework of domestic FMIs, in assessing the systemically important payment and settlement systems, thus allowing for more systematic and objective assessment of the systems.

The BOK will also check whether financial investment companies are complying with the related regulations on new funds transfers services through joint examinations and enhanced monitoring.

⑧ The BOK will continue its efforts to facilitate the innovation and development of payment and settlement systems by continuing its research on cryptocurrencies and distributed ledger technology and expanding the Coinless Society pilot project.

In January 2018, in an effort to address issues related to cryptocurrencies, the BOK established a taskforce for conducting joint research on cryptocurrencies and central bank digital currency (CBDC) in which its related departments participated. The taskforce will examine the impacts of cryptocurrencies on payment and settlement systems and the entire financial system, closely monitor the discussions that central banks and the financial industries of major countries are having on cryptocurrencies and distributed ledger technology, and conduct research on CBDC. Moreover, it will actively participate in the discussions of international organizations on CBDC as well as the Korean government's discussions on the regulation of cryptocurrencies.

The BOK plans to expand the Coinless Society pilot project it carried out in 2017. Toward this end, it has been reviewing a plan to expand the means of funds accumulation to include mobile IC cash cards (IC cash cards installed on mobile devices). In addition, it will gradually expand its advertising campaign to enhance public awareness of the project and encourage store employees to participate.

I

Oversight and Policy Responses

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2. Payment and Settlement System Enhancements	10
3. Support for Innovation and Development	14
4. International Cooperation	17

1. Oversight of the Bank of Korea

Oversight of payment and settlement systems is a central bank function whereby the objectives of safety and efficiency are promoted by monitoring existing and planned systems, assessing them¹⁾ against these objectives and, where necessary, inducing change.²⁾ In 2017, the BOK conducted regular assessments of domestic payment and settlement systems, established a guideline on cyber resilience of the systems, monitored the local RMB clearing system, conducted joint examinations of banks and financial investment companies, and participated in international cooperation on oversight of the CLS System and the SWIFT.

A. Regular Assessments of Domestic Payment and Settlement Systems

In 2017, the BOK conducted assessments of systemically important payment and settlement systems operated by the KSD (OTC bonds settlement system and Inter-institution repo settlement system) and the KRX (securities and derivatives market settlement systems).

Korea Securities Depository(KSD)

The BOK assessed whether the OTC bonds settlement system and Inter-institution repo settlement system³⁾ operated by the KSD were in compliance with 18 principles⁴⁾ of among the total 24 principles of the PFMI, which were enacted by the BIS-CPMI and the IOSCO in April 2012. The assessments found that the systems were, in fact, in observance of most of the PFMI in most respects but needed to be improved in terms of legal and operational risks.

(Clarifying the time when settlement is finalized)

The PFMI recommends that FMIs clarify the time when settlement is finalized, after which funds transfer orders issued by payment and settlement systems cannot be cancelled by participants of the systems. The reason for this clarification is that if settlement finality is not guaranteed, the payments, clearings, and settlements made via the systems may be nullified afterward, thus causing turmoil in the financial system. The KSD specifies the time when settlement is finalized in its regulation on the operation of the OTC bonds settlement system, but it does not do so for the inter-institution repo settlement system. Accordingly, the BOK recommended the KSD to revise the related

1) The BOK applies different methods of oversight by dividing the payment and settlement systems into "systemically important payment and settlement systems" and "other payment and settlement systems," based on the settlement volumes and influences of the various systems. Systemically important payment and settlement systems are assessed regularly, every two years, and incidentally in response to material changes affecting the safety and efficiency of the systems. Other payment and settlement systems are assessed on an as-needed basis, especially after major changes affecting their safety and efficiency.

2) *Central Bank Oversight of Payment and Settlement Systems*, BIS CPMI, May 2005.

3) In addition, the BOK examined the risk management of the securities lending and borrowing system, which could have an impact on the financial soundness of the KSD, and offered the KSD recommendations related to credit and liquidity risk management and the investment risk management of cash collateral.

4) Central counterparty (CCP)- and trade repository (TR)-related principles for which the KSD is not responsible were excluded.

regulation in order to clearly guarantee settlement finality for participants of the systems.⁵⁾

(Enhancing Cyber Operational Risk Management)

The KSD has established and operates an organization-wide internal control system to reduce the operational risks of the OTC bonds settlement system and Inter-institution repo settlement system. It has also set the recovery time objective (RTO)⁶⁾ at three hours, and ensures that operations are resumed within the RTO, in accordance with the *Regulation on Supervision of Electronic Financial Transactions*. In addition, the KSD has made diverse efforts to ensure settlement stability; specifically, it has built and operates systems with the same operational environment and functions as the OTC bonds settlement system and Inter-institution repo settlement system in a disaster recovery center⁷⁾ located in a remote region, has established its business continuity plan (BCP)⁸⁾ with the aim of ensuring the prompt recovery and resumption of its critical operations in the event of a serious disaster, and has conducted regular mock drills based on the BCP.

However, it was found that the KSD needed to improve some aspects of its cyber operational risk management in order to enhance its capacity to deal with emergencies. It was managing cyber risk within its existing operational risk management framework but was requested to put in place a risk management framework designed specifically to address cyber operational risk, as required by international standards, so as to improve its cyber resilience.

Korea Exchange(KRX)

The BOK conducted assessments of the securities and derivatives settlement systems operated by the KRX, which functioned as central counterparties (CCPs). Based on 22 principles of the PFMI applicable to CCPs and further guidance on the PFMI such as *Guidance on Cyber Resilience for FMIs*,⁹⁾ the *Resilience of Central Counterparties*,¹⁰⁾ and *Recovery of Financial Market Infrastructures*¹¹⁾, the assessment found that the CCPs were in observance of most of the PFMI but needed to make some improvements to their credit risk management, collateral and margin management, and operational risk management.

5) The *Debtor Rehabilitation and Bankruptcy Act* is insufficient to guarantee settlement finality. In accordance with Article 120, Paragraph 2 of the Act, settlement finality shall take effect as set forth by the entity that operates the relevant clearing and settlement system.

6) RTO is the targeted length of time within which business should be restored to normal operations after a disaster or disruption.

7) The disaster recovery center is a facility that has been built in a remote location so that it can take over the operations of the information technology (IT) systems in the event of a disaster or disruption.

8) A BCP refers to the organizational, technological, and human recovery plan for the prompt resumption of operations in the case of a disaster or disruption.

9) *Guidance on Cyber Resilience for FMIs*, released by the CPMI-IOSCO in June 2016.

10) *Resilience of Central Counterparties (CCPs): Further Guidance on the PFMI*, released by the CPMI-IOSCO in July 2017.

11) *Recovery of Financial Market Infrastructures*, released by the CPMI-IOSCO in July 2017.

B. Establishment of Cyber Resilience Assessment Methodology

In June 2016, the CPMI and the IOSCO released the *Guidance on Cyber Resilience for FMIs*, as it had perceived the wide occurrence of cyberattacks, such as distributed denial of service (DDoS) attacks, advanced persistent threats (APTs), and ransomware as factors causing serious operational risks for financial institutions. Cyber resilience refers to the capacity to promptly normalize and resume critical operations after the occurrence of a cyberattack. It is distinct from cyber-security, which focuses on the prevention of and defense against cyber-attacks.

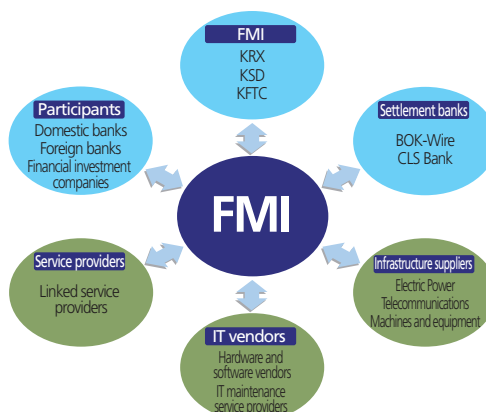
To keep up with these international moves, the BOK established the Measures for Enhancing Cyber Resilience for Domestic FMIs in June 2016 and the *Cyber Resilience Assessment Methodology for Korean FMIs*¹²⁾, which adapted the Guidance on Cyber Resilience for FMIs to domestic situations, in August 2017. The Assessment Methodology consists of 59 questions that allow FMIs to self-assess their cyber risk management framework. It was used as additional standards for the regular assessment of systemically important payment and settlement systems operated by the KSD and the KRX in 2017.

<Table I- 1> Structure of Assessment Guideline (Example)

International standards	CPMI-IOSCO Guidance		Key Considerations of the PFMI	\$8.2 \$17.6
	Detailed assessment item	Assessment results (prepared by assessor)	Ratings	Reference
Details of Assessment Guideline	Q.6.2.2A Does an FMI set two-hour RTO in its BCP to complete settlement before the end of the day of a disruption?		<input checked="" type="checkbox"/> Observed <input type="checkbox"/> Broadly observed <input type="checkbox"/> Partly observed <input type="checkbox"/> Not Observed	Domestic statutes [Article 23, Paragraph 9 of the Regulation on Supervision of Electronic Financial Transactions] - A financial company shall select core business, and the restoration time for core business shall be less than three hours.
				Standards for Information Security Management System (ISMS) Certification - A company shall define a recovery time objective and a recovery point objective.

On the other hand, the Assessment Methodology recommends that the RTO be shortened from three hours to two hours, in accordance with international standards, and requires that measures for identifying and addressing cyber-risks caused by ecosystems¹³⁾ should be assessed as well.

<Figure I- 1> Ecosystem of an FMI (Example)



12) It listed detailed assessment items and the related domestic statutes for each principle of the CPMI-IOSCO Guidance.

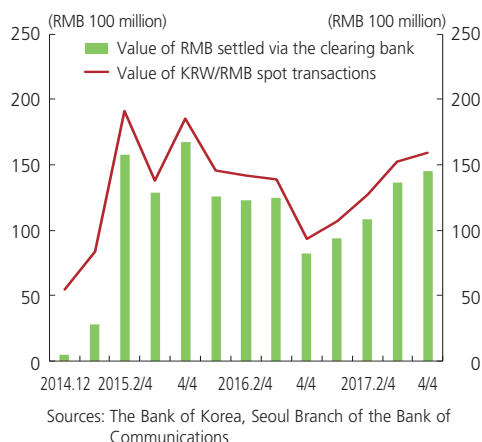
13) This refers to a system or group of entities that are highly interconnected to an FMI. It includes participants, linked FMIs, settlement banks, IT equipment vendors, IT maintenance service providers, and other linked service providers

C. Monitoring of the Local RMB Clearing System

The Seoul Branch of the Bank of Communications was designated by the People's Bank of China (PBOC) as the “Chinese Renminbi (RMB) Clearing Bank” in Korea and has been operating an RMB clearing system for KRW/RMB spot transactions since November 2014.¹⁴⁾ By monitoring the local RMB clearing system's operational status and issuing recommendations for improvements when deemed necessary, the BOK has been working continuously to ensure the stable operation of the system.

The daily average value of RMB settled through the Seoul Branch of the Bank of Communications reached a record high of RMB 16.78 billion in the fourth quarter of 2015 but dropped to RMB 8.33 billion in the fourth quarter of 2016. It then showed a continuous upward trend in 2017, recording RMB 14.57 billion in the fourth quarter of 2017. This increase was attributable to the rise in the volume of KRW/RMB spot transactions, which was mainly caused by the measure implemented by the government to reduce Macro-prudential Stability Levies imposed on spot market makers.¹⁵⁾

<Figure 1- 2> Values of KRW/RMB Spot Transactions and RMB Settled via the Clearing Bank (daily average)



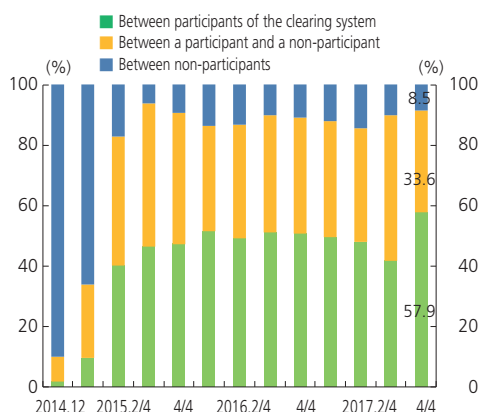
The proportion of KRW/RMB spot transactions not settled through the RMB clearing bank continued its fall, reaching 8.5% in the fourth quarter of 2017. Meanwhile, the proportion of the spot transactions between participants of the RMB clearing system showed a downward trend until the third quarter of 2017 but jumped to 57.9% in the fourth quarter. In addition, in the settlement of KRW/RMB spot transactions, participants showed much less dependence on the intraday overdrafts offered by the RMB clearing bank.¹⁶⁾

14) When KRW/RMB spot transactions are made, the RMB is settled through the Seoul Branch of the Bank of Communications, while the KRW is settled through BOK-Wire+ via account transfers.

15) In accordance with Article 21-4 of the *Enforcement Decree of the Foreign Exchange Transactions Act*, KRW/RMB spot market makers are exempt from paying levies on non-deposit RMB-denominated liabilities in 2017-18.

16) In the fourth quarter of 2016, intraday overdrafts accounted for 26.5% of the daily average value of RMB settled via the clearing bank. Afterward, this figure continued its downward trend, falling to 14.8% in the fourth quarter of 2017.

<Figure I- 3> Composition of KRW/RMB Spot Transactions by Counterparty Type



Sources: The Bank of Korea, Seoul Branch of the Bank of Communications

<Table I- 2> Joint Examination of the Payment and Settlement Systems of Banks in 2017

Bank	Examination period		Areas subject to examination
	Payment and settlement	IT	
Korea Development Bank	Apr. 6-11 (4 business days)	Apr. 4-5 (2 business days)	- Intraday liquidity management - Foreign exchange, securities, and net settlement risk management
KEB Hana Bank	Oct. 23-26 (4 business days)	-	- BCP arrangements - Observance of regulations related to payment and settlement - IT system management

Source: The Bank of Korea

D. Joint Examination of Banks and Financial Investment Companies

Joint Examination of Banks

In 2017, the BOK and the Financial Supervisory Service (“the FSS”) conducted joint examinations of the payment and settlement systems of two domestic banks. The areas subject to examination included intraday liquidity management; foreign exchange, securities, and net settlement risk management; BCP arrangements; observance of related regulations; and management of IT systems related to payments and settlements.

The results of the examinations showed that both banks were managing their intraday liquidity appropriately by monitoring liquidity shortages and establishing contingency fund plans and asset management plans in preparation for possible liquidity shortages. They were also found to be properly managing other settlement risks, as well as their BCPs and IT systems, and were in observance of regulations related to payment and settlement.

However, as the two banks were found not to be in strict observance of the guidelines on the proportion of normal payment instructions and the proportion of payment instructions related to foreign exchange settlement during recommended input times into BOK-Wire+, which were established by the BOK to reduce settlement liquidity for BOK-Wire+ participants, they were advised to take steps to ensure their complete observance of the guidelines.

Joint Examination of Financial Investment Companies

In 2017, the BOK and the FSS also conducted joint examinations of four financial investment companies to assess adequacy of their execution of funds transfer business and the current status of their settlement liquidity management.

<Table I- 3> Joint Examination of Financial Investment Companies in 2017

Financial investment company	Examination period	Areas subject to examination
Hi Investment Securities	Mar. 13-22 (8 business days)	
Samsung Securities	June. 12-23 (10 business days)	- Adequacy of execution of funds transfer
Eugene Investment Securities	Sept. 4-13 (8 business days)	- Settlement liquidity management - Impacts on monetary policy
Shinhan Financial Investment	Nov. 27 - Dec. 8 (10 business days)	

Source: The Bank of Korea

Based on the results of the examinations, some financial investment companies whose BCPs were found to be insufficient were advised to incorporate funds transfer system-related disruption and disaster scenarios into their BCPs and conduct mock drills based on their updated BCPs. In addition, as some financial investment companies were found to be in violation of the KFTC's *Regulation of Businesses via the Electronic Banking System*¹⁷⁾ by providing funds transfer services for their corporate clients, they were advised

to revise their operational procedures to ensure that the funds of their corporate clients are not transferred via retail payment systems in the future. Providing funds transfer services for clients of other financial institutions with which they had partnerships, Some financial investment companies were using funds that are not the customers' deposits, only sources for the funds transfers. The BOK thus recommended that they cease engaging in such business practice. Furthermore, the financial investment companies were advised to establish a system for reporting to the BOK in the event of emergencies, such as IT system failures, as per the relevant regulations.

To mitigate the growing operational risk of BOK-Wire+ caused by the concentration of securities settlements around BOK-Wire+'s closing time, the BOK also examined how these companies were using the intraday settlement liquidity that it supplies to them through repos. Based on the results of the examination, the BOK recommended that financial investment companies with high proportions of securities settlements around BOK-Wire+'s closing time apply for and receive intraday settlement liquidity prior to BOK-Wire+'s closing time and pay for their securities settlement transactions as early as possible.

17) Article 4, Paragraph 5 of the *Regulation of Businesses via the Electronic Banking System* stipulates that financial investment companies that specially participate in the electronic banking business shall not permit their corporate clients(meaning corporations under Article 3, Subparagraph 2 of the *Enforcement Decree of the Act on Real Name Financial Transactions and Confidentiality*) to engage in the electronic banking business.

E. Cooperative Oversight Arrangement

The BOK, as a member of cooperative oversight arrangements¹⁸⁾ for SWIFT and the CLS, conducts oversights of these cross-border FMIs, through information sharing among participating central banks. In 2017, the BOK took part in the CLS Oversight Committee¹⁹⁾ and SWIFT Oversight Forum,²⁰⁾ to share information with other members on major developments that could affect the system safety and efficiency, and to discuss various issues arising from policy changes made by the operators or the relevant regulators.

18) As for the cross-border payment systems and the critical service provider, central bank oversight is normally conducted through a cooperative oversight arrangement where relevant central banks participate and share critical information.

19) Oversight of the CLS System, which provides PvP settlements for eligible currencies through the RTGSs, is carried out jointly through the CLS Oversight Committee where 23 central banks participate, including Federal Reserve Bank of New York serving as the lead overseer.

20) Oversight of the SWIFT, a cross-border financial messaging network, is conducted through the SWIFT Oversight Forum, with the National Bank of Belgium serving as the lead overseer.

2. Payment and Settlement System Enhancements

In 2017, the BOK prepared measures for improving the settlement methods of the next-generation BOK-Wire+, established the BOK-Wire+ BCP in preparation for natural disasters and IT system failures, and conducted mock drills based on the BCP, while the Committee on Financial Informatization Promotion (chaired by the Senior Deputy Governor of the BOK, “the CFIP”²¹⁾) decided to build the Joint Data Vaulting Center for the Financial Industry.

Establishment of Measures for Improving the Settlement Methods of the Next-Generation BOK-Wire+

The BOK is pursuing a project to establish the next-generation BOK-Wire+, which is expected to start operation in 2020, with the aim of enhancing the convenience with which financial companies can transfer funds and strengthening the system’s interlinking with foreign settlement systems. In 2017, the BOK evaluated and analyzed the problems of the current operational process of BOK-Wire+ and, based on the results, established a measure for improving the settlement methods of the BOK-Wire+. The improved

settlement methods are based on three principles: simplification, consistency, and promptness.

First, the BOK plans to simplify the complicated net settlement algorithm. While the current multilateral offsetting mechanism of the hybrid settlement system is to be maintained, the bilateral offsetting mechanism will be eliminated. Second, the settlement structure will be made consistent, ensuring that the same settlement algorithm is applied to the same settlement accounts, regardless of the types of funds transfers made. Third, to increase the speed of settlements, the net settlement period of the system will be shortened from the current 30 minutes to 5 minutes. This shortening of the net settlement cycle is expected to significantly alleviate the burden on the system caused by increases in the number of payment instructions in the queue and the amount of time when the system holds the payment instruction in the queue.

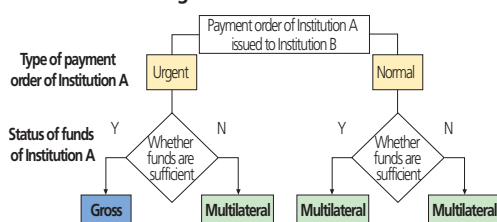
<Table I- 4> Measures for Improving the Settlement Mechanism of Next-Generation BOK-Wire+

	Current	Improved
Settlement mechanism	Gross, bilateral, and multilateral	Gross and multilateral
Net settlement algorithm ¹⁾	16 types	4 types
Net settlement cycle	30 minutes	5 minutes

Note: 1) Based on a payment order issued by Institution A to Institution B
Source: The Bank of Korea

21) Organized in September 1984, the Committee on Financial Computerization (chaired by the Governor of the BOK) spearheaded the establishment of major financial shared systems, including the CD Shared Networks and Interbank Funds Shared Network. In November 2009, it was reorganized as the CFIP (chaired by the Senior Deputy Governor of the BOK). As of the end of 2017, 28 financial institutions and related organizations are participating in the CFIP, which comprises the Working Committee, Standardization Committee, Safety Countermeasures Committee, and Working Group on Fintech & Financial Informatization as well as the Working Group on Coinless Society.

<Figure I- 4> Settlement Process of the Next-generation BOK-Wire+



Source: The Bank of Korea

Extension of Period During Which Mortgage-Backed Securities Are Accepted as Collateral

In December 2017, the BOK decided to implement a one-year extension, until the end of 2018 (originally until the end of 2017), for the period during which MBS issued by the Korea Housing Finance Corporation may be accepted as eligible securities for collateral to guarantee net settlements. The BOK made this decision based on the prediction that banks would continue to bear the burden of the MBS owned by them as a result of the conversion of short-term mortgage loans with floating interest rates and lump-sum repayment conditions to long-term loans with fixed interest rates and installment repayment conditions.

Announcement of Operational Status of BOK-Wire+ in Accordance with International Standards

In July 2017, to enhance the transparency of the operational status of BOK-Wire+ and comply with international standards,²²⁾ the BOK prepared the Document on the Operational Status of BOK-Wire+ and posted the document on its website.²³⁾ In 2018, it plans to prepare and release an English version of the document as well.

<Table I- 5> Major Details of the Document on the Operational Status of BOK-Wire+

Contents	Details
1. Overview	Contents of the document
2. Major changes	Major changes made after the previous announcement (No changes were made, as this was the first disclosure made in accordance with the PFMI.)
3. General information on a FMI	<ul style="list-style-type: none"> Overview of BOK-Wire+ Organization and governance Legal and regulatory structure System design and operation
4. Explanations by each principle of the PFMI	Explanations of the operational status of BOK-Wire+ in relation to 24 principles of the PFMI
5. Reference materials	List of relevant statutes and materials needed to gain an understanding of compliance with each principle of the PFMI.

Source: The Bank of Korea

22) This refers to the *PFMI Disclosure Framework and Assessment Methodology* released by CPMI-IOSCO in December 2012.

23) The BOK had previously announced important matters related to BOK-Wire+, such as participation standards, the structure of the system, related regulations, and the current status of payments and settlements, on its website. This announcement, however, was meaningful in that it used templates required by related detailed guidelines to enhance consistency with international standards.

Establishment of a Measure for Pursuing a Joint Data Vaulting Center to Replace the Joint Backup Center for the Financial Industry

Starting in 2013, the CFIP pursued a project to build a joint backup system (or disaster recovery center) for the financial industry in a remote location as part of its efforts to protect the financial system from disasters, such as wars and earthquakes, that affect broad areas.

However, after discovering that the construction of the joint backup center would involve significant costs, the CFIP instead decided to build the Joint Data Vaulting Center for the Financial Industry,²⁴⁾ which could enhance the security of the data management of financial institutions at a low cost than that of building the joint backup center. This new plan is expected to eliminate the risk of the joint backup center serving as a single point of failure, reduce the costs for participating institutions, prevent overlapping investments, and reduce the concentration of data backup centers of financial institutions in the Seoul Metropolitan Area.

Measures taken to Enhance Safety and Efficiency of FMIs

(KRX)

In 2017, the KRX introduced a margin system in the securities market to enhance the settlement risk management of the market. This step was taken in response to the expansion of daily price limits²⁵⁾ and increasing strictness of international standards such as the PFMI. The KRX also improved the collateral management arrangement, which included the introduction of collateral eligibility criteria and concentration limit.

(KSD)

In July 2017, the KSD upgraded “Korean-style General Collateral Financing (GCF) Repo²⁶⁾ System” in an effort to stimulate term repo transactions. The duration of repo transactions, which was previously fixed at one day, was extended to two or more days under the new GCF Repo System, and specialized bank-issued bonds and government-guaranteed bonds were permitted to be put up as collateral along with existing types of collateral, such as Korean government bonds and monetary stability bonds.

(KFTC)

In 2017, the KFTC expanded the integrated online management service for bank accounts that had been launched in

24) For details, refer to “Establishing the Guideline for Financial Institutions to Manage Data stored in Remote Places” in Section 1, Chapter III.

25) In 2015, the upper and lower price limits for products of the securities and derivatives markets were expanded from $\pm 15\%$ to $\pm 30\%$.

26) “GCF Repo” refers to a repo transaction in which the collateral is not limited to a specific security but may be any of certain types of securities at the time the transaction are contracted. It was first introduced in June 2013.

December 2016. This service allows customers to find all accounts they have opened with all domestic banks and immediately terminate inactive accounts or transfer balances from inactive accounts online. In April 2017, the service, which had been available only via Internet-connected PCs, was made available on mobile devices and at bank counters, and the remaining account balance, which serves as a criterion for allowing the immediate termination of accounts or transfer of funds, was raised from KRW 300,000 to KRW 500,000. In December 2017, the information provided by the service was expanded from bank accounts to mutual finance association accounts, policies taken out at insurance companies, and credit cards issued.

In October 2017, the KFTC added a feature that verifies the information sent by a sender to a Joint Fintech Open Platform for banks, which was due to launch in January 2018, to support the cross-border transfer of small amounts of funds by Fintech companies.

3. Support for the Innovation and Development

In 2017, the BOK made efforts to support the innovation and development of payment and settlement systems by carrying out the Coinless Society pilot project, researching and developing cryptocurrencies and distributed ledger technology(DLT), and engaging in the financial informatization project.

Conducting the Coinless Society Pilot Project

To reduce the inconvenience of using cash and the social costs associated with minting and handling coins, the BOK implemented a pilot project called “Coinless Society” in April 2017. The project enables customers to deposit the remaining coins(change) after making cash payments for goods at participating offline stores, such as supermarkets and convenient stores, into pre-paid electronic payment instruments accepted by such stores.

Initially, the pilot project began with the participation of five distributors (23,050 stores nationwide) and seven pre-paid electronic financial business operators, as of the end of 2017, and was later expanded to six distributors (36,500 stores nationwide) and

ten pre-paid electronic financial business operators.²⁷⁾

<Table I- 6> Current Status of the Participants of the Coinless Society Pilot Project (as of the end of 2017)

Stores at which change may be deposited	Pre-paid electronic payment instruments into which change is deposited
Lotte (department stores, shopping malls, supermarkets)	L.POINT
Seven-Eleven	Naver Pay Point, Cashbee
Emart 24, Emart	SSG Money
CU	Cashbee, T-Money, and Hana Money
GS25	Cashbee, T-Money, Hana Money, Han Pay, and DGB UPay

Source: The Bank of Korea

In 2017, the number of transactions and value of deposits at the stores participating in the pilot project reached 34,000 deposits and KRW 6 million on daily basis, respectively. Although the project failed to induce large-scale use, it did succeed in attracting public attention to issues surrounding the use of coins, thus reducing the social costs to some extent.²⁸⁾

<Table I- 7> Volume and Value of Change Deposits in 2017 (daily average)

	(number of transactions, KRW 1,000)			
	2Q ¹⁾	3Q	4Q	Annual ¹⁾
Volume	34,449	34,324	32,962	33,870
Value	5,804	5,997	6,088	5,975

Note: 1) Subsequent to the launch of the pilot project on April 20
Source: The Bank of Korea

27) The BOK recruits private business operators that are both pre-paid electronic financial business operators registered under the *Electronic Banking Transactions Act* and associated with offline stores where change is deposited. (For details, refer to the BOK's press release titled “Additional Recruitment of Business Operators to Engage in the Coinless Society Pilot Project.” (Released on July 10, 2017, Korean version only)

28) In 2017, the net issuance of coins (amount issued - amount returned) reached a record low of KRW 12.2 billion after hitting KRW - 68.3 billion in 1998, falling far below the annual average net issuance amount of KRW 84.2 billion from 2000 to 2016.

Enhancing Research on Payment and Settlement Systems

With social interest in cryptocurrencies being fueled by the high applicability of distributed ledger technology to payment and settlement systems, the BOK enhanced related research and studies and actively engaged in domestic and overseas discussions by holding conferences and seminars and participating in international consultative bodies.

To examine the applicability of distributed ledger technology to payment and settlement systems and its limitations, the BOK conducted an experimental test of distributed ledger technology-based inter-bank funds transfer system as one of the project conducted by the CFIP from September 2017 to January 2018. In the test, funds transfers between banks that are normally done via BOK-Wire+ were simulated in a experimental system based on the distributed ledger environment, and actual data on funds transfers between banks were used for the test. The test results were evaluated based on four criteria (efficiency, resilience, security, and expandability) to see whether the experimental system handled funds transfers between banks in a secure and efficient manner.

The test results showed that the experimental system had good security and expandability but lagged behind the current system in terms of processing speed and resilience. Considering the rapid pace at which distributed ledger-related technology has been developing, the BOK needs to

carefully monitor the trends of related industries and continue conducting research on the applicability of the technology to payment and settlement services.

In January 2018, to examine the effects of cryptocurrencies on payment and settlement systems and the overall financial system, the BOK established a taskforce for conducting a joint research on cryptocurrencies and CBDC in which its related departments participated. Moreover, it also made up a team that organizes the research and carries out a study on digital finance innovations as well.

Furthermore, in January 2017, the BOK produced a publication, titled “Digital Innovation and the Future of Financial Services: Tasks and Challenges”, which analyzes the effects of innovative digital technologies such as, distributed ledger technology, wireless telecommunication technology, the Internet of Things, bio authentication, and artificial intelligence, on financial services. Furthermore, concerning that discussions on Fintech, in particular related to the payment systems mainly revolved on technology aspect, the BOK published a paper in July 2017 titled “The Role of Payment and Settlement in the Early Development of Central Banks” to renew the awareness of the nature and role of the payment systems by reviewing the finance history.

Moreover, the BOK provided venues for various discussions on such as cryptocurrencies, legal issues arising from the operation of DLT-based securities platforms and authentication services, with financial institutions, academia, and people working in the

related industries in the forms of seminar(July 2017), conference(November 2017), forum(August and December of 2017). The BOK also actively participated in joint research on DLT and cryptocurrencies with other central banks through the CPMI-IOSCO's Digital Innovation Working Group and shared the contents of relevant discussions and the latest research with the government and supervisory authorities in Korea.

Pursuit of Financial Informatization Project

Since July 2017, the CFIP has been reviewing the need to implement the *Standard for Payment of Cash Cards on Mobile Devices*. The move to establish this standard is part of an effort to promote the use of Cash Cards, which incur comparatively low costs in the domestic payment card market, of which credit cards occupy an overwhelmingly large proportion.²⁹⁾ This is based on the model of installing Cash Cards on mobile devices, such as smartphones, to pay small amounts of money. In 2017, the CFIP's Standardization Committee completed its review of the feasibility of the standard, and the CFIP plans to earnestly promote the development of the standard in the first half of 2018.

In addition, the BOK pursued the revision of the *CD/ATM Standard for those with disabilities*. Although it had been reviewing the need to revise the standard every five years,³⁰⁾ this revision was initiated at the request of organizations for people with disabilities through the Financial Services Commission. The organizations made several suggestions regarding the unification of CD/ATM interfaces and improvement of CD/ATM accessibility, such as expanding the space for the knees at the bottom of the ATMs. In 2018, the BOK plans to complete the revision after reviewing the applicability of the suggestions made by the organizations and consulting with financial institutions and CD/ATM manufacturers.

On the other hand, in 2017, a growing number of financial institutions began introducing biometrics in customer authentication services, following the enactment of the *Standard for the Distributed Management of Biometric Information*³¹⁾ in November 2016. As of the end of 2017, a total of 69 institutions, including 17 domestic banks and 20 financial investment companies, have applied the standard to their account inquiry and funds transfer services.³²⁾

29) In 2017, credit cards accounted for 78.9% of the total value of payments made by all types of payment cards, including credit, check, pre-paid, and debit cards. (Please refer to "payment and settlement trends 2017", English version is scheduled to be uploaded on June, 2018.)

30) Article 20, Paragraph 4 of the *Detailed Rules of the CFIP* states that the Standardization Committee shall review the appropriateness of the standard every five years.

31) The standard sets forth the method for dividing customers' biometric information into several parts and storing the parts separately as a means of mitigating the risk of hacking and privacy infringement.

32) As of the end of 2017, the total number of users amounted to 600,761 and the cumulative number of authentications reached 12,983,323.

4. International Cooperation

Participation in the Activities of Regional Forums

Since 2016, the BOK has chaired the EMEAP WGPSS. During its tenure, the BOK has undertaken a series of notable activities, including a joint research on digital innovation, and administrative changes such as those of WG name³³⁾ and sub-group structure. Furthermore, the BOK continuously monitored progress status of pan-regional infrastructure development by participating in the discussion taking place in the ASEAN+3.

Participation in CPMI Activities

As a member of the BIS CPMI, an international standard setting body in the area of payments and market infrastructures, the BOK participated in diverse activities of the body, including analytical work on digital innovations and wholesale payment systems as well as the development of an end-point security guidance. Furthermore, the BOK took part in the PFMI implementation monitoring programme where authorities in the CPMI jurisdictions conducted a peer review of 19 CCPs' implementation status of selected PFMI Principles.

Hosting International Events

The BOK hosted the EMEAP WGPSS meeting, the CPMI meeting and the CPMI-BOK conference successively for three days in a row from 27 February until 1 March, 2018, in Busan. Mr. Benoit Coeure, the CPMI Chair and ECB executive board member, and 70 other executives, department heads and senior officials from 32 central banks around the world attended the events to discuss a wide range of policy issues including digital innovations and challenges for central banks. All meetings were held behind closed doors in accordance with the protocols of each meeting.

33) WGPMI (Working Group on Payments and Market Infrastructures) will be a new name of the WG from the second half of 2018 upon the revised terms of reference going into effect.

II

Payment and Settlement Trends and Risk Management

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1. Large-value Payment System

A. Settlement Trends

Korean Won Funds

Korean won funds transfers processed through BOK-Wire+ in 2017 amounted to a daily average of KRW 323 trillion, exceeding that of the previous year by 7.8%.³⁴⁾ This increase was attributable mainly to large increases in the amounts of securities settlement funds transfers and fund transfers of customers.

<Table II- 1> Settlement Values via BOK-Wire+ by Type (daily average)

	(trillions of KRW, %)			
	2015	2016	2017	% change
Total of Korean won funds transfers	272.3	299.8	323.0	7.8
Transfers between participants	257.4	285.2	307.7	7.9
Call transaction funds	31.4	27.7	27.2	-1.6
Securities settlement funds	115.6	143.2	167.3	16.9
Foreign exchange settlement funds	18.4	19.3	19.3	0.1
Customer payments ¹⁾	41.5	37.1	42.5	14.7
Net settlement funds ²⁾	16.9	16.8	16.9	0.2
Others	33.6	41.2	34.5	-16.2
Transfers between BOK and participants ³⁾	14.8	14.5	15.3	5.4
Total of foreign currency-denominated funds transfers (billions of USD) ⁴⁾	0.5	0.5	0.5	2.0

Notes: 1) Large-value transfers made by individuals or companies to beneficiaries via BOK-Wire+

2) Values of funds for which settlements between participants of the retail payment systems, are carried out on a deferred net settlement (DNS) basis

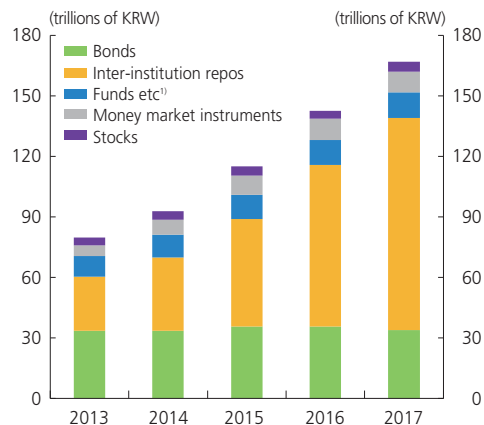
3) Includes payments on government and public bond transactions, payments to and from the Treasury, BOK loans, etc.

4) Includes deposits and withdrawals

Source: The Bank of Korea

Call transaction funds transfers declined slightly by 1.6% compared to 2016. Meanwhile, securities settlement funds transfers³⁵⁾ jumped by 16.9% compared to the previous year, driven mainly by inter-institution repos. Recently, inter-institution repo transactions have been one of the major drivers of the growth of securities settlement funds. This trend was primarily attributable to the expansion of repo³⁶⁾ by asset management companies for arbitrage transactions of spot and futures, which has been occurring amid the robust growth momentum of the use of repos by financial investment companies that have been restricted from participating in the call market.

<Figure II- 1> Securities Settlement Funds Transferred through BOK-Wire+ (daily average)



Note: 1) Collective investment securities under the Financial Investment Services and Capital Markets Act

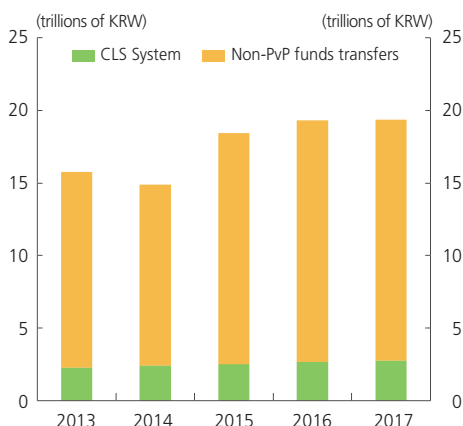
Source: The Bank of Korea

34) The number of Korean won funds transfers settled through BOK-Wire+ amounted to a daily average of 16,521, up 7.6% from the 15,347 transfers recorded in 2016.

35) In addition to transactions settled on a DvP basis, these also include incidental transactions, such as free-of-payment (FOP) and bond redemption transactions. Regarding redemptions of bank bonds, municipal bonds, and corporate bonds at maturity, the KSD forwards the bond principal and interest redemption receipts for clearing, receives the sums of the interest and principal on the maturity dates, and distributes the funds to individual investors through BOK-Wire+ and the Electronic Banking System.

Foreign exchange funds transfers³⁷⁾ recorded a 0.1% year on year increase, in line with the slight 0.5% decrease in non-PvP funds transfers through the interbank correspondent banking network, despite a 4.1% jump in funds transfers via the CLS System.

<Figure II- 2> Foreign Exchange Settlement Funds Transferred through BOK-Wire+¹⁾ (daily average)

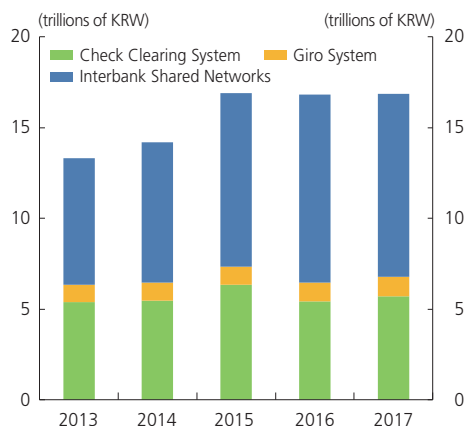


Notes: 1) CLS System (net basis) and non-PvP funds transfers (gross basis)
Source: The Bank of Korea

The daily average of net settlements among BOK-Wire+ participants reached KRW 16.9 trillion, showing a 0.2% increase from the previous year. This modest rise was attributable largely to the 5.1% increase in payments made through the Check Clearing System,³⁸⁾ despite a contraction of 2.8% in

funds transfers through the Interbank Shared Networks.

<Figure II- 3> Net Settlement Funds Transferred through BOK-Wire+ (daily average)



Source: The Bank of Korea

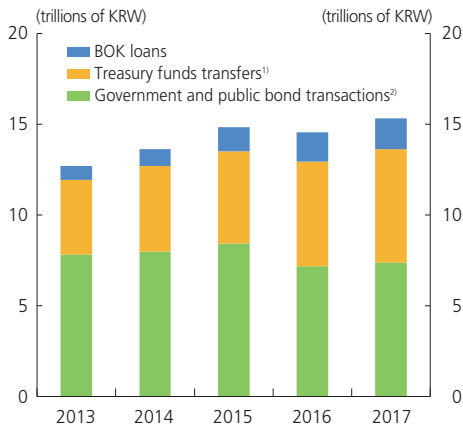
Meanwhile, the daily average value of funds transferred between the BOK and BOK-Wire+ participants, accompanying government and public bond transactions, treasury funds transfers, and loans from the BOK, totaled KRW 15.3 trillion, showing a 5.4% year on year increase. This increase was driven primarily by the 8.3% rise in treasury funds transfers that occurred following increases in both the government's revenue and expenditure.

36) From 2016 onward, as funds were rapidly moved into private equity funds and hedge funds (concerning which asset management companies exercise great discretion), more asset management companies began engaging in the practice of raising funds by putting up their securities as collateral and then investing the funds in arbitrage transactions. Through this process, as the companies relied on the highly liquid repo market, their sales of repo surged. This trend continued in 2017 as well. (Please refer to the 2016 Money Markets Review, released in April 2017, Korean version only.)

37) Korean won funds transfers for foreign exchange settlements conducted through the correspondent banking networks and the CLS System are processed by BOK-Wire+. In particular, the CLS System processes the payments for the currencies sold and the receipts of the currencies bought on a PvP basis based on connections between the payment system of CLS Bank International and those of the central banks issuing the currencies concerned without time gap between countries.

38) While the total amount cleared via the Check Clearing System significantly decreased by 9.4% year on year, the amount of net settlements through that system rather increased. This increase was attributable mainly to a jump in the redemption amount of corporate bonds that was processed via the Check Clearing System, following the request of a certain bank, which conducts the clearing of the principal and interest of securities on behalf of companies. Corporate bonds are processed via a non-DVP settlement mechanism through which the redemption funds are settled on a net basis via the Check Clearing System, while the receipts for the principle and interest of bonds are issued and the clearing of the bonds is requested via the system.

<Figure II- 4> Funds Transfers between the BOK and BOK-Wire+ Participants (daily average)



Notes: 1) Includes transactions with participants using the Treasury Network

2) Issuances and redemptions of Government bonds and Monetary Stabilization Bonds, sales and purchases of repos, coupon payments, etc.

Source: The Bank of Korea

Foreign Currency Funds

The BOK provides foreign exchange banks with transfer, deposit, and withdrawal services for U.S. dollar and Japanese yen funds, all through BOK-Wire+ via foreign currency deposit accounts with the BOK that were opened by these banks to meet their foreign currency reserve requirements. In 2017, the total value of foreign currency funds transfers (including deposits and withdrawals) made through this system averaged USD 530 million per day, exceeding that of the previous year by 2.0%. This growth was attributable primarily to the increase in deposits made to the accounts opened with the BOK, which was in turn caused by the increased foreign currency reserve requirements implemented following the increase in

foreign currency-denominated deposits by Korean residents.

<Table II- 2> Foreign Currency Funds Transferred through BOK-Wire+ (daily average)

	2014	2015	2016	2017	% change
Transfers	2.4	2.6	0.8	0.1	-90.3
Deposits	174.0	266.1	243.8	258.2	5.9
Withdrawals	180.3	260.5	275.8	272.7	-1.1
Total	356.7	529.2	520.3	530.9	2.0

Source: The Bank of Korea

B. Supply of Intraday Liquidity

To prevent risks to overall settlement via BOK-Wire+ resulting from settlement delays and gridlocks caused by temporary intraday liquidity shortages among BOK-Wire+ participants, the BOK provides participants with liquidity support to cover such shortages. In 2017, the intraday liquidity provided to BOK-Wire+ participants recorded a daily average of KRW 2,374.1 billion, showing a decline of 16.1% from the previous year.

<Table II- 3> Supply of Intraday Liquidity (daily average)

	2015	2016	2017	% change
Intraday overdrafts¹)	394.5	380.2	318.2	-16.3
Intraday repos	2,613.7	2,449.8	2,055.9	-16.1
Total	3,008.2	2,830.0	2,374.1	-16.1

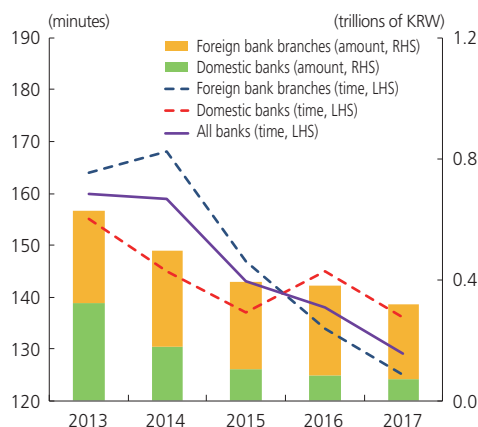
Note: 1) Based on average net intraday overdraft balance obtained after subtracting the balances of the deposit accounts used exclusively for settlement from the daily overdraft amounts

Source: The Bank of Korea

The daily average value of intraday overdrafts³⁹⁾ totaled KRW 318.2 billion in 2017, having fallen by 16.3% year on year. The daily average value of intraday overdrafts of domestic banks declined by KRW 9.0 billion to KRW 73.8 billion, while that of intraday overdrafts of foreign bank branches fell by KRW 53.0 billion to KRW 244.4 billion.

Since 2013, the average duration of daily net intraday overdraft use declined continuously, falling to 129 minutes in 2017. By bank type, intraday overdrafts were repaid within 136 minutes by domestic banks, 9 minutes faster than in the previous year, and within 125 minutes by foreign bank branches, which was also 9 minutes faster.

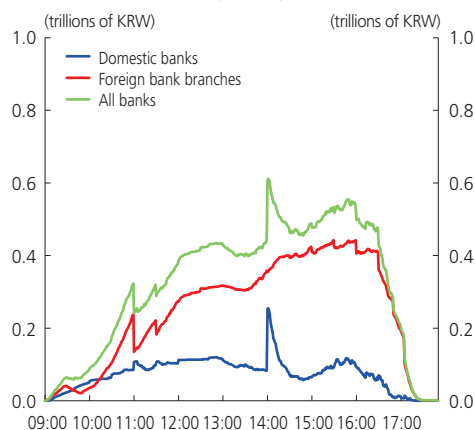
<Figure II- 5> Amounts¹⁾ and Durations of Net Intraday Overdraft Use (daily average)



Note: 1) Based on average net intraday overdraft balance obtained after subtracting the balances of deposit accounts used exclusively for settlement from the intraday overdraft amounts
Source: The Bank of Korea

The daily intraday overdraft balance rose between 11:00 and 12:00, the time window dedicated to net settlement and foreign exchange transaction settlement. The balance also surged again later in the day, reaching its daily high (KRW 608.6 billion) at around 14:00, when the BOK begins collecting the funds of the Treasury receipt. It then fell before climbing again until around 16:00, due to the concentration of funds transfer settlements. After 16:00, it started falling sharply.

<Figure II- 6> Daily Net Intraday Overdraft Balances, by Time Slot¹⁾ (daily average)



Note: 1) Based on average net intraday overdraft balances obtained after subtracting the balances of deposit accounts used exclusively for settlement from the intraday overdraft amounts

Source: The Bank of Korea

Meanwhile, in 2017, the value of intraday liquidity supplied through repos⁴⁰⁾ plunged by 16.1% year on year, recording a daily

39) The BOK provides participants with liquidity support so that they can cover temporary funds shortages during the day, on the condition that they repay this support within the same day.

40) Since February 20, 2012, the BOK has been supplying the KRX and financial investment companies with repos to cover their temporary settlement shortages and encourage financial investment companies to conduct their funds settlements with each other through BOK-Wire+ at earlier times, thereby alleviating the concentration of securities settlements at around the BOK-Wire+ closing time. This measure is in accordance with Article 81.2 of the *Bank of Korea Act*, which prescribes the BOK's provision of support for financial institutions experiencing temporary settlement fund shortages.

average of KRW 2,055.9 billion, owing to the decrease in transactions of bond which is subject to intraday repos by financial investment companies,⁴¹⁾ which was caused by an overall decline in exchange-traded and OTC government bond transactions.⁴²⁾

<Table II- 4> Supply of Intraday Liquidity through Repo Transactions (daily average)

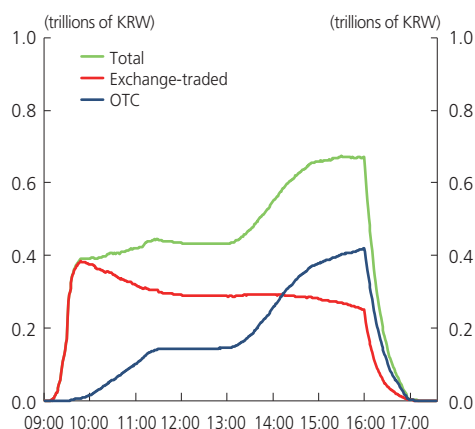
(billions of KRW, %)

	2016			2017			% change
	Exchange-traded	OTC	Total	Exchange-traded	OTC	Total	
Korea Exchange	1,185.2	-	1,185.2	1,091.0	-	1,091.0	-8.0
Financial investment companies	378.9	885.6	1,264.5	311.2	653.8	964.9	-23.7
Total	1,564.2	885.6	2,449.8	1,402.1	653.8	2,055.9	-16.1

Source: The Bank of Korea

The balance of intraday liquidity provided through repos rose sharply at around 10:00, as more than half of all daily settlement obligations in the exchange-traded government bond market are completed by noon. It then remained stable until 13:00, when securities companies' use of intraday repo transactions began to increase steadily as a result of OTC bond settlement; the balance hit its daily high (KRW 672.7 billion) at 15:29. From 16:00, which is the closing time for intraday repo purchases by the BOK, the balance of liquidity supplied through intraday repos declined rapidly, with the repurchases of all repos being completed by the repurchase deadline of 17:15.

<Figure II- 7> Intraday Repo Balances, by Time Slot¹⁾ (daily average)



Note: 1) Net supply per minute (intraday cumulative supply - intraday cumulative repayment)

Source: The Bank of Korea

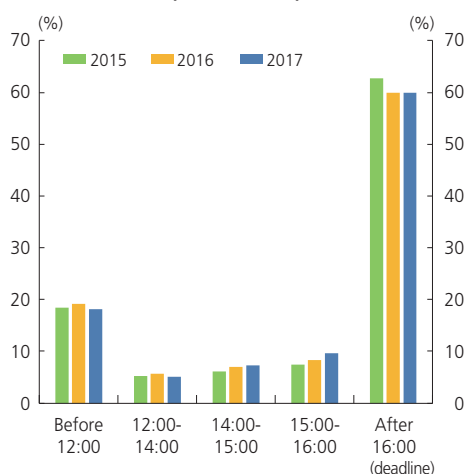
C. Risk Management Status

In 2017, the proportion, by value, of settlements carried out after 16:00, which is near the closing time of BOK-Wire+, stood at 59.9%, showing little change from the 60.0% recorded in the previous year.

41) The daily average value of settlements of bonds subject to intraday repo transactions made by financial investment companies via BOK-Wire+ fell from KRW 6 trillion in 2016 to KRW 5.6 trillion in 2017, showing a decrease of 7%.

42) The daily average value of exchange-traded and OTC government bonds decreased by 22.0%(from KRW 12.6 trillion in 2016 to KRW 9.8 trillion in 2017) and 8.9%(from KRW 10.2 trillion in 2016 to KRW 9.3 trillion in 2017) respectively.

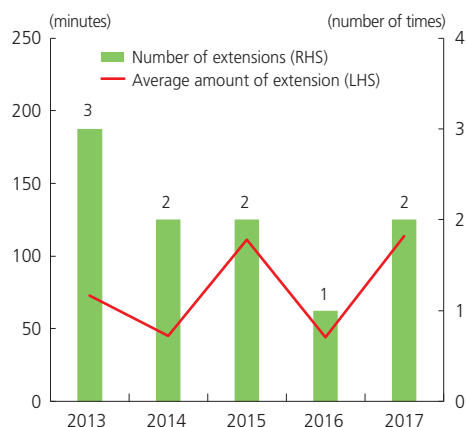
<Figure II- 8> Proportions of Settlements through BOK-Wire+, by Time Slot¹⁾
(based on value)



Note: 1) Settlement amount in each time slot / total settlement amount
Source: The Bank of Korea

The BOK-Wire+ closing time was extended twice, compared to the one extension made in the previous year, and the extensions lasted an average of 114 minutes, exceeding that of the previous year (44 minutes). The first extension was in response to IT system problems at a BOK-Wire+ participant in January 2017, while the second was a preemptive measure implemented by the BOK against the growing demand for settlements prior to the Chuseok holiday in September 2017. The BOK recommended that the participant that suffered the IT system failure revise its Business Continuity Plan (BCP) for the early resumption of its operations, strengthen training for the employees responsible for its IT systems, and establish measures to prevent the recurrence of such failure in the future.

<Figure II- 9> Extensions of the BOK-Wire+ Operation hours



Source: The Bank of Korea

The proportion of queued payment instructions for settlement and the rate of maximum intraday overdraft cap utilization, both of which are monitored as indicators of the settlement liquidity of BOK-Wire+ participants, indicated that the operation of BOK-Wire+ remained stable. The former indicator (proportion of payment instructions queued for settlement due to insufficient account balances) was 4.1%, remaining unchanged from the previous year, while the latter (maximum intraday overdraft cap utilization rate) stood at 19.4%, showing a decrease of 1.3%p from the 20.7% recorded in 2016, as a result of the reduced use of intraday overdrafts by some banks.

<Table II- 5> Proportion of Payment Instructions in Queue for Settlement and the Maximum Intraday Overdraft Cap Utilization Rate
(based on value)

	(%)				
	2013	2014	2015	2016	2017
Proportion of payment instructions in queue for settlement ¹⁾	4.3	4.7	4.5	4.1	4.1
Maximum intraday overdraft cap utilization rate ²⁾	29.7	25.0	23.7	20.7	19.4

Notes: 1) Proportion of amount of payment instructions in queue for settlement among the total amount of funds transfers (excluding payment instructions in queue for liquidity savings)
2) Ratio of the daily maximum intraday net overdraft amount to the intraday overdraft cap

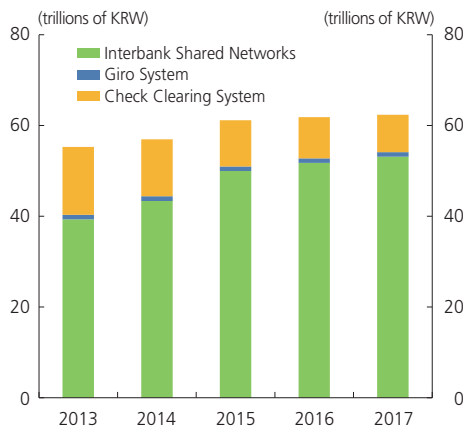
Source: The Bank of Korea

2. Retail Payment Systems

A. Payment Trends

In 2017, the retail payment systems operated by the KFTC⁴³⁾ processed a daily average of 21.3 million transactions, valued at KRW 62.4 trillion, showing increases of 3.1% and 0.8% year on year, respectively, largely as a result of the increase in funds transferred through the Interbank Shared Networks, despite the decline in funds cleared via the Check Clearing System.

<Figure II-10> Value of Payments through Retail Payment Systems (daily average)



Note: 1) Based on checks presented for clearing through the Check Clearing System
Source: KFTC

The daily average volume and value of funds transfers through the Interbank Shared Networks totaled 16.21 million transactions and KRW 53.1 trillion, up by 7.5% and 2.6% year on year, respectively. This

was attributable to the continuous upward trend in the volume and value of funds transferred via the Electronic Banking System, including Internet, mobile, and firm banking.

<Table II- 6> Amounts of Funds Transferred via Interbank Shared Networks, Check Clearing System, and Giro System (daily average)

(thousands of transactions, billions of KRW, %)

		2015	2016	2017	% change
Volume	Interbank Shared Networks	14,012	15,075	16,206	7.5
	(Electronic Banking System)	8,420	9,164	10,289	12.3
	(Interbank Funds Transfer System)	375	354	333	-5.9
	(CD/ATM System)	1,925	1,883	1,796	-4.6
	Check Clearing System	662	524	421	-19.7
	(Cashier's checks)	650	513	412	-19.8
	(Promissory notes) ¹⁾	9	7	7	-12.1
	Giro System	5,288	5,060	4,675	-7.6
	(Credit transfers)	1,070	1,005	943	-6.2
	(Direct debits)	3,717	3,626	3,337	-8.0
(Standing orders)	210	136	97	-28.9	
Value	Interbank Shared Networks	49,989	51,792	53,146	2.6
	(Electronic Banking System)	43,944	45,621	46,933	2.9
	(Interbank Funds Transfer System)	4,683	4,794	4,822	0.6
	(CD/ATM System)	953	932	923	-0.9
	Check Clearing System	10,166	9,075	8,220	-9.4
	(Cashier's checks)	1,860	1,539	1,413	-8.2
	(Promissory notes) ¹⁾	5,959	5,192	4,036	-22.3
	Giro System	996	991	1,009	1.8
	(Credit transfers)	380	381	392	2.9
	(Direct debits)	359	365	368	0.6
(Standing orders)	56	33	22	-33.8	

Note: 1) Includes current account checks, household checks, bills of exchange, etc.

Sources: The Bank of Korea and KFTC

On the other hand, the daily average volume and value of checks and bills processed through the Check Clearing System fell by 19.7% and 9.4% year on year, respectively, to 420,000 transactions valued at KRW 8.2

43) The value of retail payments processed refers to the value of funds transferred through the Interbank Shared Networks and Giro System as well as the value of checks and bills cleared through the Check Clearing System.

trillion. These declines were driven mainly by the continuously decreasing use of cashier's checks following the issuance of KRW 50,000-denominated banknotes and the growing replacement of promissory notes by electronic payment instruments.

The volume of transfers through the Giro System fell to a daily average of 4.68 million transactions, which is 7.6% fewer than in the previous year. However, the daily average value of the transfers reached KRW 1 trillion, edging above that of the previous year by 1.8%. This was attributed to declines in the numbers of credit transfers and direct debits, caused by the increased usage of other transfer services, such as CMS and firm banking, and the continuous reduction in the volume of standing orders with the interbank direct debit service, which was launched in February 2015.⁴⁴⁾ In contrast, the values of credit transfers and direct debits rose moderately, as bulk transfers of large amounts of national and local taxes grew.

B. Risk Management Status

As the number of funds transfers between customers of financial institutions conducted through the retail payment systems is quite high and the value per transaction quite small, only the net amounts among financial

institutions are settled via BOK-Wire+ after their debits and credits are offset. To facilitate this practice, participants set and manage net debit caps. As of the end of 2017, the sum of the net debit caps⁴⁵⁾ set by retail payment system participants stood at KRW 45.3 trillion, showing a 7.2% increase from the end of 2016. This increase was driven largely by the fact that two Internet-only banks were permitted to participate in net settlements in 2017.

<Table II- 7> Net Debit Caps,¹⁾ by Participant Type
(year-end basis)

	(trillions of KRW, %)			
	2015	2016	2017	% change
Direct participants	43.7	38.6	41.6	7.9
Indirect participants	3.7	3.7	3.7	-0.3
Financial investment companies	2.0	2.0	2.0	-3.0
Others ²⁾	1.7	1.7	1.7	3.0
Total	47.4	42.2	45.3	7.2

Notes: 1) Ceiling on the unsettled net obligation that a retail payment system participant is allowed to incur (i.e., total amount of payment orders transmitted to other banks - total amount of payment orders received from other banks)

2) Korea Federation of Community Credit Cooperatives, National Forestry Cooperative Federation, Korea Federation of Savings Banks, National Credit Union Federation of Korea, and National Agricultural Cooperative Federation

Source: The Bank of Korea

The daily average maximum utilization rate of net debit caps of institutions participating in net settlements stood at 18.5%, showing a decline of 0.9%p from the previous year. The utilization rate exceeded the cautionary level (70%) 71 times, which was

44) The previous standing order service withdrew funds one business day prior to the designated transfer date, causing financial consumers to lose one day's interest. To give consumers more options, the interbank direct debit system service, which debits and credits funds on the same day, was launched in February 2015.

45) Net debit caps are set freely by participants and apply to payment instructions between participants of the Electronic Banking System and Interbank Funds Transfer System, which are processed in real time. Participants of the DNS system must deposit eligible securities with the BOK to guarantee settlement. For transactions requiring the use of a net debit cap, collateral equal to 50% of that cap must be put up, while for transactions that do not require such a cap, collateral equal to 50% of the average net clearing amount must be provided.

20 more than the 51 times recorded in 2016.

<Table II- 8> **Status of Net Debit Cap Utilization**

(% , number of instances)

	2013	2014	2015	2016	2017
Average maximum net debit cap utilization rate ¹⁾	18.4	17.5	19.0	19.4	18.5
Number of instances where net debit positions exceeded cautionary level	41	50	62	51	71

Note: 1) Average of daily maximum net debit cap utilization rates of all participants

Source: The Bank of Korea

Meanwhile, to cover their net settlement exposure, participants are required to provide the BOK with collateral securities equivalent to a fixed percentage (collateral-to-net debit cap ratio) of their net debit caps. At the end of 2017, the total value of such collateral was KRW 23.1 trillion, having decreased by KRW 0.9 trillion from the previous year (KRW 24.0 trillion).

BOX

Usage Trends for Non-cash Payment Instruments

Checks and Bills

In 2017, the daily average volume and value of checks and bills cleared fell by 19.4% and 4.6% year on year, respectively, in line with the declining use of promissory notes and KRW 100,000-denominated cashier's checks. In addition, the value of cashier's checks cleared declined, owing to the growing use of credit cards and KRW 50,000-denominated banknotes, and the value of promissory notes cleared fell as well, with the expanded use of electronic payment instruments.

Checks and bills¹⁾ (daily average)

(thousands of transactions, billions of KRW, %)

		2015	2016	2017	% change
Volume	Cashier's checks	1,000	793	637	-19.7
	Preset value	926	728	577	-20.6
	(KRW 100,000 denominated)	730	562	431	-23.4
	Non-preset value	74	65	59	-9.4
	Promissory notes, etc. ²⁾	19	17	16	-5.1
	Electronic bills	8.8	8.5	8.7	2.5
	Others ³⁾	3.3	2.8	2.5	-12.3
	Total	1,021	813	655	-19.4
Value	Cashier's checks	2,497	2,107	1,926	-8.6
	Preset value	267	220	189	-14.3
	(KRW 100,000 denominated)	73	56	43	-23.4
	Non-preset value	2,230	1,886	1,737	-7.9
	Promissory notes, etc. ²⁾	17,975	17,154	15,924	-7.2
	Electronic bills	1,093	1,211	1,366	12.8
	Others ³⁾	2,347	2,343	2,770	18.2
	Total	22,818	21,604	20,620	-4.6

Notes: 1) Includes checks and bills cleared via the Check Clearing System and presented directly at bank windows as well as electronic bills

2) Includes current account checks, household checks, bills of exchange, and electronic bills

3) Includes postal money orders, receipts of principal and interest payments on securities, etc.

Source: KFTC

Account Transfers

In 2017, the daily average volume and value of account transfers between financial institutions, excluding those processed via BOK-Wire+, increased by 4.1% and 2.6%, respectively, from 2016. The volume and value of account transfers routed through the Electronic Banking System jumped as well, by 12.3% and 2.9%, respectively, as a consequence of the growing use of electronic payment instruments, such as Internet, mobile, and firm banking services.

Account transfers (daily average)

(thousands of transactions, billions of KRW, %)

		2015	2016	2017	% change
Volume	Credit transfers ¹⁾	11,616	12,176	13,128	7.8
	Electronic Banking System	8,420	9,164	10,289	12.3
	(Internet banking ²⁾)	4,181	4,517	4,903	8.6
	(Firm banking ³⁾)	2,850	3,143	3,645	16.0
	(Mobile banking ²⁾)	310	412	651	58.2
	Interbank Funds Transfer System	375	354	333	-5.9
	Debit transfers	6,864	7,172	7,010	-2.3
	Total	18,480	19,348	20,138	4.1
Value	Credit transfers ¹⁾	50,082	51,847	53,204	2.6
	Electronic Banking System	43,944	45,621	46,933	2.9
	(Internet banking ²⁾)	20,255	21,002	21,831	3.9
	(Firm banking ³⁾)	19,272	19,808	19,276	-2.7
	(Mobile banking ²⁾)	254	348	534	53.7
	Interbank Funds Transfer System	4,683	4,794	4,822	0.6
	Debit transfers	722	759	778	2.4
	Total	50,805	52,606	53,982	2.6

Notes: 1) Excluding account transfers processed via BOK-Wire+

2) Based on funds transferred to other banks

3) Corporate financial transaction system provided by financial institutions

Sources: The Bank of Korea, KFTC

Payment Cards

In 2017, the daily average volume and value of payments made using payment cards was 52.99 million transactions valued at KRW 2.4 trillion, showing increases of 13.5% and 5.4%, respectively, from 2016.

During 2017, the daily average volume and value of payments made using credit cards increased by 12.5% and 4.3% year on year, respectively, driven mainly by the increased purchases of goods and services. Payments made via check cards continued to show a steep upward trend, recording increases in their daily average volume and value of 15.2% and 10.0%, respectively, from the previous year, due to the effects of the expansion of tax deduction benefits for the use of check cards and their provision of incidental services similar to those of credit cards. While the downward trend of the daily average volume of payments made using prepaid cards persisted, the daily average volume and value of payments made using other payment cards, such as IC Cash cards, soared by 45.5% and 22.5% year on year, respectively.

Payment card usage (daily average)

(thousands of transactions, billions of KRW, %)

		2015	2016	2017	% change
Volume	Credit cards	26,900	29,136	32,782	12.5
	Purchases of goods and services	26,629	28,885	32,548	12.7
	Cash advances	271	251	234	-6.8
	Check cards ¹⁾	14,798	17,474	20,127	15.2
	Prepaid cards	77	76	68	-10.2
	Others ²⁾	6.7	11.3	16.4	45.5
	Total ¹⁾	41,781	46,697	52,994	13.5
Value	Credit cards	1,683	1,846	1,926	4.3
	Purchases of goods and services	1,512	1,677	1,760	4.9
	Cash advances	171	169	166	-1.7
	Check cards	368	424	466	10.0
	Prepaid cards	2.3	2.2	2.1	-6.3
	Others ²⁾	0.6	0.9	1.1	22.5
	Total	2,053	2,273	2,395	5.4

Notes: 1) The figure related to check cards issued by securities companies and others was revised and retroactively applied in 2015 and 2016.

2) IC cash cards and debit cards

Sources: stand-alone payment card companies, banks and bank subsidiaries issuing payment cards, and KFTC

3. CLS System

In 2017, the daily average value of foreign exchange settlement conducted through the CLS System reached USD 50.7 billion, an increase of 0.7% year on year.

<Table II- 9> Value of settlements through the CLS System¹⁾
(daily average)

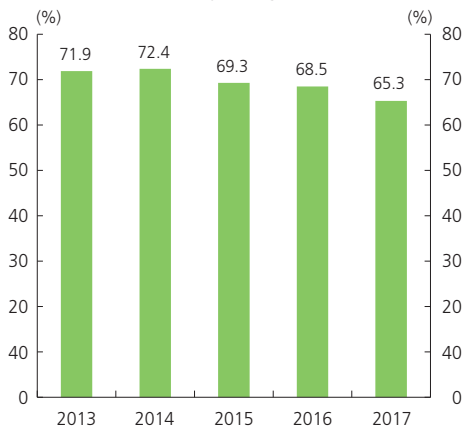
	2013	2014	2015	2016	2017
Value	57.4	54.4	55.7	50.4	50.7
% change	-7.2	-5.3	2.4	-9.5	0.7

Note: 1) Based on the sum of the amounts reported by financial institutions in relation to foreign exchange spot, forward, and swap transactions (before multilateral payment netting)

Source: The Bank of Korea

However, the proportion of foreign exchange transactions conducted through the CLS System among CLS-eligible transactions, including FX spot, forward, and swap transactions, decreased by 3.2%p to 65.3%.

<Figure II-11> Proportion of FX Settlements through the CLS System¹⁾
(daily average)

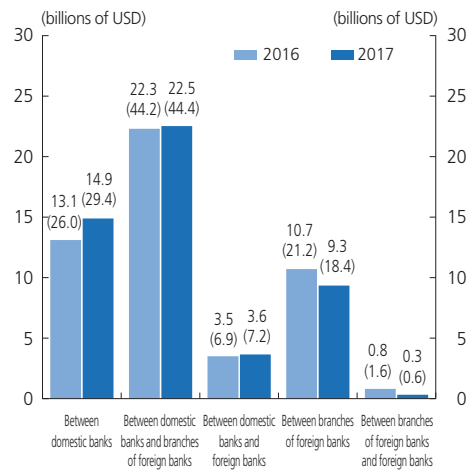


Note: 1) Proportion of foreign exchange transactions settled through the CLS System among CLS-eligible foreign exchange transactions (spot, forward, and swap)

Source: The Bank of Korea

By transaction counterparty, settlements between domestic banks and Korean branches of foreign banks (foreign bank branches) accounted for 44.4% of all foreign exchange settlements processed through the CLS System, followed by settlements between domestic banks at 29.4% and settlements between branches of foreign banks at 18.4%.

<Figure II-12> Settlements through the CLS System, by Transaction Counterparty¹⁾²⁾
(daily average)



Notes: 1) Based on the sum of figures reported by financial institutions regarding foreign exchange spot, forward, and swap transactions

2) Figures in () indicate weights.

Source: The Bank of Korea

As of the end of December 2017, around 24,000 financial institutions from 18 countries around the world joined the CLS System. In Korea, 40 domestic financial institutions (17 domestic banks, 3 domestic financial investment companies, 19 branches of foreign banks, and 1 foreign financial investment company) were participating in the CLS System.

<Table II-10> Local Participants of the CLS System
(as of December 31, 2017)

Classification		Participatory institutions
Domestic	Banks (17)	Kookmin Bank, Nonghyup Bank, Gwangju Bank, Daegu Bank, KEB-Hana Bank, Suhyup Bank, Export-Import Bank, Busan Bank, Jeonbuk Bank, Gyeongnam Bank, Korea Development Bank, Industrial Bank of Korea, Woori Bank, Shinhan Bank, Jeju Bank, Standard Chartered Bank Korea, and Citibank Korea
	Financial investment companies (3)	Samsung Securities, Mirae Asset Daewoo, and NH Investment & Securities
Foreign	Banks (19)	HSBC, BOA, BNP Paribas, SMBC, UBS, ING, Morgan Stanley, Credit Agricole, JP Morgan Chase, Mitsubishi Tokyo UFJ, Credit Suisse, Deutsche Bank, DBS, New York Mellon, State Street, Macquarie, Societe Generale, United Overseas Bank, and Bank of China
	Financial investment companies (1)	Nomura Financial Investment

Source: The Bank of Korea

4. Securities Settlement Systems

A. Settlement Trends

In 2017, the daily average value of securities settlements via the systems operated by the KRX and KSD amounted to KRW 132.9 trillion, up 16.9% year on year. The daily average settlement value of exchange-traded securities transactions reached KRW 2 trillion, falling by 2.4% from the previous year, led by exchange-traded bonds. The daily average settlement value of OTC securities transactions recorded KRW 130.9 trillion, showing an increase of 17.3% over the previous year. This was attributed to the strong growth of settlement value in inter-institution repos and stocks, which jumped by 22.4% and 13.2% over the preceding year, respectively, despite the 5.6% year on year decrease in OTC bonds settlement.

<Table II-11> Value of Settlements through Securities Settlement Systems
(daily average)

(billions of KRW, %)

Type		2015	2016	2017	% change
Exchange markets	Stocks	463	454	497	9.4
	Bonds ¹⁾	1,505	1,545	1,454	-5.9
	Derivatives	73	79	77	-2.4
	Subtotal	2,042	2,079	2,029	-2.4
OTC markets	Stocks ²⁾	678	639	723	13.2
	Bonds ³⁾	11,327	11,038	10,416	-5.6
	Inter-institution repos	58,009	85,168	104,260	22.4
	Other money market instruments ⁴⁾	8,267	8,516	8,819	3.6
	Collective investment securities ⁵⁾	5,469	6,227	6,677	7.2
	Derivatives ⁶⁾	10	15	18	20.4
Subtotal		83,759	111,602	130,913	17.3
Total		85,801	113,681	132,942	16.9

Notes: 1) Value of settlements of government (including repos) and corporate bonds

2) Value of settlements between financial investment companies and institutional investors

3) Value of final settlement after netting of payables and receivables in chain settlement

4) Value of final settlement of certificates of deposit(CDs), commercial paper(CP), and electronic short-term bond transactions after netting of payables and receivables in chain settlement

5) Value includes both subscription and redemption transactions of collective investment securities

6) Eligible IRS value settled through the KRX after the beginning of the mandatory clearing of derivatives on June 30, 2014

Source: KSD and KRX

B. Risk Management Status

Settlement risk in the securities settlement systems refers to the risks associated with the failure to deliver securities and make payments within the set deadlines or to exchange securities and funds simultaneously. In 2017, the settlement risks of the securities settlement systems remained stable, as the majority of participants delivered and made payments for securities before the settlement deadlines and the proportion of

free-of-payment (FOP) settlements remained low.

With the penalties for settlement delay having been firmly established, the delivery of and payment for securities in the exchange-traded stock and bond markets were all completed before the penalty deadlines. However, the proportions of settlements made after the penalty deadlines in the inter-institution settlement system for OTC stocks rose slightly from the previous year.⁴⁶⁾

<Table II-12> Proportions of Securities Settlement Completed after the Deadline

Type	Payment deadline ¹⁾	Penalty deadline ²⁾	2015	2016	2017
Exchange-traded stocks	16:00	16:00	0	0	0
Exchange-traded government bonds	16:00	17:00	0.01	0.003	0
Institutional investors for OTC stocks	16:50	16:50	0.003	0.001	0.009

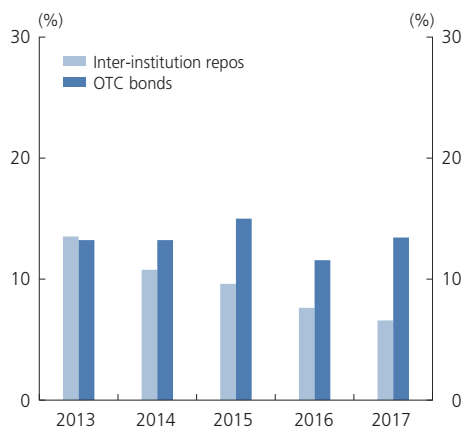
Notes: 1) Settlement deadline under system operating rules

2) Deadline after which penalty for settlement delay is imposed
Source: The Bank of Korea

Meanwhile, the proportion of FOP in OTC inter-institution repo settlements continued its downward trend, falling from 7.6% in 2016 to 6.6% in 2017. The proportions of FOP in OTC bonds, CDs, and CP settled via the OTC bonds settlement system⁴⁷⁾ also dropped, declining by 0.1%p,

21.2%p, and 0.1%p, respectively, from the previous year. However, the proportion of FOP in electronic short-term bonds increased by 7.2%p, from 37.0% in 2016 to 44.1% in 2017.⁴⁸⁾

<Figure II-13> Proportion of FOP in OTC Transactions¹⁾²⁾



Notes: 1) Proportion of settlement value not made through BOK-Wire+ (DvP) among the total settlement value

2) OTC bonds include bonds, CDs, CP, and electronic short-term bonds (based on final settlement after chain netting)

Source: KSD

46) Transactions of exchange-traded securities (stocks, government bonds, other bonds, and repos) are settled through the settlement systems of securities market like the KOSPI and KOSDAQ, jointly operated by the KRX (clearing) and KSD (settlement), while transactions of OTC stocks are cleared and settled via the Inter-institution stock settlement system, which is operated by the KSD.

47) As per KSD regulations, the OTC bonds settlement system can process government bonds, monetary stabilization bonds, corporate bonds, CP, CDs, electronic short-term bonds, and foreign currency-denominated bonds.

48) This increase was attributable to the use of electronic short-term bonds as an alternative to call funds in order to eliminate the mismatch between funding and the operation of funds by securities companies following the reform of the money market. It was also influenced by the fact that the KSD did not strictly require DvP for the settlement of said electronic short-term bonds, allowing participants to choose settlement methods freely.



Future Policy Directions

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1. Expanding and Enhancing the Stability of Payment and Settlement Infrastructures

Comprehensive Plan for Building the Next-generation BOK-Wire+

The BOK has been working on establishing the next-generation BOK-Wire+ with the aim of putting the system into operation in 2020. The project has been divided into two phases: finalizing the plan for improving the operational procedures and settlement methods of BOK-Wire+ (Phase I), and, based on the plan, developing an IT system by 2020 (Phase II).

Currently, the BOK is focusing on reviewing the current operational procedures and settlement process of BOK-Wire+ and drawing up measures for improving the system's operational and settlement mechanisms for application to the next-generation BOK-Wire+. The BOK is also reviewing the application of ISO 20022, an international standard on electronic message format between financial institutions, to BOK-Wire+ in order to enhance the efficiency of the system's settlement process in a way that expands the system through various methods, including laying a foundation for establishing linkages to payment infrastructures across jurisdictions. However, as the application of ISO 20022 would force the partici-

pants of BOK-Wire+, including the BOK, to adapt their systems to a new financial message format, the BOK needs to decide the scope of and application methods for ISO 20022 after thoroughly taking into account the impacts of such an application including risk factors as well as convenience.

The BOK has undertaken Phase I of the project in order to draw up measures for improving BOK-Wire+ without delay, and is due to launch Phase II for the development of the IT system in 2018.

<Table III- 1> Timeline for the Establishment of the Next-generation BOK-Wire+



Note: 1) Operational and settlement methods and the need for acquiring ISO 20022

Seeking to Enhance the Resilience of Payment and Settlement Infrastructures

In 2017, the operational risks that emerged in the wake of cyberattacks and the occurrence of natural disasters raised public concern regarding the cyber-resilience of payment and settlement infrastructures. Having recognized this, the BOK is committed to continuing its efforts to enhance the resilience of BOK-Wire+. It will also continue improving its BCP to tackle domestic and foreign threats while making continuous efforts to conduct substantial mock tests with BOK-Wire+ participants. It will also cooperate with related institutions with the aim

of enhancing the resilience of important payment and settlement infrastructures in Korea.

Adjustments to the Net Settlement Risk Management System

Korea's retail payment systems, including the Electronic Banking System, pay out funds immediately upon the receipt of funds transfer and cash withdrawal requests from customers on a 24/7 basis, which is very convenient for customers.⁴⁹⁾ However, as final settlement (net settlement) is done only once on the following business day (11:00 a.m.), institutions that make such immediate payments to customers are exposed to credit risk for quite a long time.

Considering this shortcoming of the system, the BOK addresses net settlement risks via the following methods: setting different net debit caps for each bank participating in the retail payment systems, requiring the institutions to place collateral securities prior to settlements, and having the institutions jointly cover settlement fund shortages. In August 2016, in line with the stricter PFMI, the collateral-to-net debit cap ratio for guaranteeing net settlements was increased from 30% of the net debit cap to 50%, and will likely be gradually raised further going forward, in consideration of the circumstances

of the financial market after 2018.⁵⁰⁾ Under such circumstances, the BOK plans to review measures for ameliorating the growing burden on banks that are obligated to procure adequate collateral securities; such measures may include expanding the types of securities eligible to be used as collateral.

Establishing the Guideline for Financial Institutions to Manage Data Stored in Remote Places

To induce individual financial institutions to enhance the security of their data, the CFIP is planning to establish the *Guideline for Financial Institutions to Manage Data Stored in Remote Places* by 2018. This guideline will include the scope of data to be distributed (decentralized) and stored in remote facilities, security management measures, and distance-related regulations. The establishment of the guideline is expected to help financial institutions in their efforts to autonomously enhance the security of their data vaulting centers. Specifically, the Joint Data Vaulting Center for the Financial Industry will be built in such a way that it meets the requirements specified in the guideline. This data vaulting center will be able to withstand disasters that affect broad areas, which the Joint Backup Center for the Financial Industry was initially intended to achieve, and meet all necessary security requirements.

49) According to *Fast Payments: Enhancing the Speed and Availability of Retail Payments*, released in November 2016 by the CPMI, the Electronic Banking System that South Korea launched in 2001 is evaluated to be the world's first retail payment system that is operated on a 24/7 basis and conducts funds transfers in real time.

50) The BOK considered raising the ratio again in 2017 but decided to postpone the implementation of its plan, in consideration of the growing burden on banks to procure securities as collateral following the enforcement of a stricter liquidity coverage ratio by the financial supervisory authorities in July 2017.

2. Strengthening Oversight of Payment and Settlement Systems

Enhanced Oversight of CCP Resilience and FMI's Recovery Planning

The BOK will enhance its oversight mechanisms to ensure that the recommendations of the international community, including the *Resilience of central counterparties (CCPs): Further Guidance on the PFMI* and *Recovery of financial market infrastructures* (both released by CPMI-IOSCO in July 2017), are applied to payment and settlement systems in Korea.

To ensure that CCPs retain sufficient resilience in the event of a default of their settlement members or other stress-causing situations, *Resilience of CCPs* divides financial risk-related principles⁵¹⁾ under the PFMI into five sections⁵²⁾ and suggests detailed implementation methods. Going forward, the BOK will assess CCPs with a focus on strengthening their resilience in accordance with the guidance.

Recovery of FMIs lists detailed guidelines on FMIs' establishment of recovery plans that ensure that FMIs⁵³⁾ will be able to maintain their core operations in the event they sustain losses caused by defaults or general

business risks of FMI participants. The guidance stipulates that FMIs shall establish and implement plans that address the allocation of losses caused by defaults of their participating institutions, replenishment of depleted financial resources, and other matters. Furthermore, the FMIs should maintain comprehensive and effective recovery plans, which have been approved by their boards of directors, and regularly reassess those plans. The BOK plans to use this guidance in addition to the PFMI in assessing FMIs in the future.

Enhanced Oversight of the Cyber-Resilience Framework

Finally, the BOK will make more active use of the *Cyber Resilience Assessment Methodology for Korean FMIs*, which is established in 2017 to enhance the cyber-resilience management of domestic FMIs. In 2017, the BOK used this assessment methodology (and plans to continue using it in the future) primarily to assess the cyber-resilience frameworks of systemically important payment and settlement systems that are operated by the KSD and the KRX, thus allowing for more systematic and objective assessment of the systems.

51) This refers to: Principle 2 (governance), Principle 4 (credit risk), Principle 5 (collateral), Principle 6 (margin), Principle 7 (liquidity risk), Principle 13 (participant-default rules and procedures), and Principle 15 (general business risk).

52) This refers to FMIs' governance, stress testing, coverage, margin, and CCP contributions to losses.

53) This guidance is focused primarily on CCPs.

Enhanced Oversight of New Funds Transfer Services

Recently, some financial investment companies have been actively launching their funds transfer services. Their business strategy is to generate synergy between their businesses by providing convenient services to their clients, but this may cause friction with banks, the core business of which is funds transfers. The BOK will conduct joint examinations and enhanced monitoring to determine whether financial investment companies are complying with the regulations related to new funds transfer services while also taking steps to ensure the stability of the financial system in consultation with the financial supervisory authorities.

3. Facilitating the Innovation and Development of Payment and Settlement Systems

Continuing Research on Cryptocurrencies and DLT

In January 2018, in an effort to more actively address issues related to cryptocurrencies, the BOK established a taskforce that will conduct joint research on cryptocurrencies and central bank digital currency (CBDC). The taskforce will examine issues such as the impacts of cryptocurrencies on payment and settlement systems and the financial system, and plan to release its study results in the first half year of 2018. It will also conduct research on CBDC-related issues that have been actively discussed by international organizations, such as the BIS, and some central banks.

The BOK also established a team that will be dedicated to do research on digital financial innovations including cryptocurrencies. This team will be in charge of the operation of the Joint Research Taskforce and cooperative work on cryptocurrencies with the related government ministries and other institutes outside as well. Meanwhile, the BOK plans to continue conducting research on the application of DLT to areas other than funds transfers between banks, including technological tests on CBDC issuance and tests on the application of DLT to secu-

rities settlement or foreign exchange transaction systems.

The BOK will also closely monitor the trends of discussions on cryptocurrencies and DLT that have been held by the central banks of major countries and the financial industry, and actively participate in discussions on CBDC held by international organizations, such as the CPML.

Participating in Discussions on the Regulation of Cryptocurrencies

The government has been holding meetings of a taskforce comprised of related government ministries in order to have discussions on government-wide measures for addressing overheated investments in and crimes related to cryptocurrencies. In particular, since the cryptocurrency market has become overheated since the second half of 2017, thus increasing the potential for social and economic problems such as major losses to investors in the event of a drastic change in the market, the government has been establishing multifaceted measures related to taxation and the enhancement of the transparency of related transactions and so on.

Regarding this, the BOK has been expressing the opinion that, under the current circumstances in which the legal nature of cryptocurrencies has not yet been clearly defined, the regulation of cryptocurrencies should focus mainly on customer protection, fair taxation, and prevention of illegal acts. Going forward, based on the findings of

research on cryptocurrencies and DLT, the BOK plans to participate in discussions on the government's regulation of these technologies.

Expanding the Coinless Society Pilot Project

In 2018, the BOK plans to expand its Coinless Society pilot project, which will include implementing Phase 2 of the project and gradually strengthening its advertising campaign targeting Korean citizens. To stimulate the pilot project, it was found that the BOK should expand the types of accumulation means. In a questionnaire-based survey of Korean citizens that was conducted as an interim evaluation of the pilot project in the latter half of 2017,⁵⁴⁾ most respondents (85.7%) replied that if it was possible to accumulate coins in their bank accounts, they would opt to do that. 52.8% of respondents favored cash cards and 29.0% favored mobile apps. Based on this finding, the BOK is reviewing a plan to introduce a mobile cash card-based deposit as the additional means of accumulation in Phase 2 of the project.

Meanwhile, the BOK will gradually expand its advertising campaign to keep pace with the launch of Phase 2 of the pilot project, in order to raise citizens' awareness of the project and encourage store employ-

ees to participate actively, while it plans to continue informing the employees of participating stores about the pilot project. And the BOK consistently invites participating stores. The BOK also expects to resolve the operational problems that have been discovered in the implementation of the pilot project.

54) The survey was participated in by 2,511 adult citizens aged 19 and over all across the country from September to November of 2017. The survey results showed that a mere 35.0% of respondents were aware of the pilot project. In particular, it was found that most respondents (92.0%) were not using the service for accumulating coins and 75.8% cited a lack of awareness of how to accumulate coins as their primary reason for not doing so. 61.6% indicated that they were not using the service as the employees of the stores participating in the project were unfamiliar with how to deposit coins.

Annex

1. Payment and Settlement Systems Designated by the BOK as Subject to Settlement Finality Guarantee

- a. Payment and settlement systems subject to settlement finality, as designated by the Governor of the BOK after consultation with the FSC under Articles 120 (1) and 336 of the *Debtor Rehabilitation and Bankruptcy Act*

Operator	System	Operation rules	Date and time went into effect
BOK	BOK-Wire+	Regulation, Working Regulations, and Sub-regulations for Operation and Management of Payment and Settlement Systems	Aug.21, 2006. 09:30
KFTC	Electronic Banking System	Regulation and Working Rules of the Electronic Banking System	Aug.21, 2006. 07:00
	Interbank Funds Transfer System	Regulation and Working Rules of the Interbank Funds Transfer System	Aug.21,2006. 09:30
	CD/ATM System	Regulation and Working Rules of the CD/ATM System	Aug.21,2006. 07:00
	Check Clearing System	Regulation of Check Clearing, Regulation of Cashier's Check Real-time Information Sharing, Regulation of Electronic Bills, Regulation of Local L/C Bills Clearing, ¹⁾ Regulation and Working Rules of Business Purchase Loan Bills Information Sharing, Regulation of Emergency Measures for Check Clearing in the Event of Bank Emergency, Regulation of Special Measures for Check Clearing in the Event of Disaster	Jan.10,2014 00:00
	Giro System	Regulation and Working Rules of the Giro System	
	Cash Management Service (CMS) System	Regulation and Working Rules of the Cash Management Service System	
CLS Bank	CLS System	CLS Bank International Rules, Settlement Member Agreement	Aug.21,2006 09:30

Note: 1) Limited to transactions denominated in KRW and USD

- b. Clearing and settlement systems operated by entities that perform clearing and settlement tasks for securities and derivatives transactions pursuant to the *Financial Investment Services and Capital Markets Act* or other statutes and by other entities designated by Presidential Decree, in accordance with Articles 120 (2) and 336 of the *Debtor Rehabilitation and Bankruptcy Act*

- Clearing and settlement systems operated by the KRX and KSD

2. Statistics

A. Volume of Settlements, by Payment System

(daily average, thousands of transactions, %)

	2014	2015	2016	2017	% change
BOK-Wire+	14.3	14.3	15.3	16.5	7.6
Retail Payment Systems	19,361	19,962	20,659	21,301	3.1
Check Clearing System	828	662	524	421	-19.7
Giro System	5,519	5,288	5,060	4,675	-7.6
Interbank Shared Networks	13,014	14,012	15,075	16,206	7.5
(Electronic Banking System)	7,596	8,420	9,164	10,289	12.3
(Interbank Funds Transfer System)	383	375	354	333	-5.9
(CD/ATM System)	1,860	1,925	1,883	1,796	-4.6
(CMS System)	3,057	3,164	3,563	3,691	3.6
(Regional Bank Shared System)	0.3	0.2	0.4	0.5	22.5
(E-Commerce Payment Systems)	117	126	111	95	-14.1
(EFT/POS System)	0.8	0.5	0.4	0.3	-25.5

B. Value of Settlements, by Payment System

(daily average, billions of KRW, %)

	2014	2015	2016	2017	% change
BOK-Wire+	243,915	272,260	299,780	323,048	7.8
Retail Payment Systems	56,959	61,151	61,858	62,375	0.8
Check Clearing System	12,561	10,166	9,075	8,220	-9.4
Giro System	1,006	996	991	1,009	1.8
Interbank Shared Networks	43,392	49,989	51,792	53,146	2.6
(Electronic Banking System)	37,843	43,944	45,621	46,933	2.9
(Interbank Funds Transfer System)	4,247	4,683	4,794	4,822	0.6
(CD/ATM System)	901	953	932	923	-0.9
(CMS System)	380	389	423	443	4.7
(Regional Bank Shared System)	3.5	4.1	8.2	10.4	26.7
(E-Commerce Payment Systems)	17	16	15	15	0.8
(EFT/POS System)	0.0	0.0	0.0	0.0	-28.6

C. Payments Made through BOK-Wire+

(daily average, number of transactions, billions of KRW, %)

	2014	2015	2016	2017	% change
Funds transfers between participants	13,251	13,226	14,297	15,449	8.1
Call settlement funds	1,665	847	715	680	-4.8
(Call transaction system)	1,661	846	714	680	-4.7
(General funds transfers)	4	1	1	0	-64.2
Securities settlement funds	8,033	8,803	9,598	10,709	11.6
(DvP system)	6,889	7,677	8,477	9,539	12.5
(Non-DvP funds transfers)	1,143	1,126	1,121	1,170	4.3
Foreign exchange settlement funds	810	899	797	743	-6.7
(CLS System)	30	31	34	36	8.1
(Non-PvP funds transfers)	780	868	763	707	-7.4
Institutional customer settlement funds	1,319	1,348	1,856	2,150	15.9
(Beneficiary-designated funds transfers)	926	925	735	806	9.7
(General funds transfers)	393	424	553	676	22.3
(Linked settlements)	-	-	568	667	17.5
Net settlement funds	249	254	247	245	-0.8
Others	1,176	1,075	1,084	922	-15.0
Funds transfers between BOK and participants	1,039	1,062	1,051	1,072	2.0
Treasury funds transfers ¹⁾	969	988	982	1,002	2.1
BOK loans and discounts	28	29	26	24	-7.3
Government and public bond transactions ²⁾	42	45	43	45	6.2
Total funds transfers in domestic currency	14,290	14,289	15,347	16,521	7.6
Total funds transfers in foreign currencies³⁾	6.6	6.4	6.0	7.4	23.9
Funds transfers between participants	230,267	257,425	285,231	307,712	7.9
Call settlement funds	43,933	31,405	27,689	27,234	-1.6
(Call transaction system)	43,743	31,308	27,619	27,212	-1.5
(General funds transfers)	190	96	70	22	-68.6
Securities settlement funds	93,497	115,556	143,155	167,283	16.9
(DvP system)	58,513	79,290	105,440	124,494	18.1
(Non-DvP funds transfers)	34,984	36,266	37,715	42,788	13.5
Foreign exchange settlement funds	14,883	18,439	19,314	19,334	0.1
(CLS System)	2,427	2,514	2,653	2,761	4.1
(Non-PvP funds transfers)	12,456	15,925	16,661	16,573	-0.5
Institutional customer settlement funds	35,113	41,523	37,073	42,514	14.7
(Beneficiary-designated funds transfers)	23,526	27,627	13,230	14,037	6.1
(General funds transfers)	11,587	13,896	18,445	21,442	16.2
(Linked settlements)	-	-	5,397	7,036	30.4
Net settlement funds	14,180	16,912	16,829	16,861	0.2
Others	28,661	33,590	41,169	34,487	-16.2
Funds transfers between BOK and participants	13,648	14,835	14,550	15,335	5.4
Treasury funds transfers ¹⁾	4,739	5,106	5,778	6,257	8.3
BOK loans and discounts	938	1,305	1,599	1,708	6.8
Government and public bond transactions ²⁾	7,971	8,424	7,172	7,370	2.8
Total funds transfers in domestic currency	243,915	272,260	299,780	323,048	7.8
Total funds transfers in foreign currencies (million USD)³⁾	357	529	520	531	2.0

Notes: 1) Includes transactions made through BOK-Wire+ (management and recovery of surplus funds and national tax payments)

2) Issuance and redemption of government bonds and MSBs and government and public bond sales transactions (including repurchase agreements) by The Bank of Korea

3) Includes deposits and withdrawals

D. Payments Made through the Check Clearing System

(daily average, thousands of transactions, billions of KRW, %)

		2014	2015	2016	2017	% change
VOLUME	Cashier's checks	812	650	513	412	-19.8
	Preset value	759	599	469	371	-20.9
	(KRW 100,000- denominated)	616	473	363	275	-24.0
	Non-preset value	53	51	45	41	-9.1
	Promissory notes, etc. ¹⁾	12	9	7	7	-12.1
	Others ²⁾	4	3	3	2	-12.3
	Total	828	662	524	421	-19.7
VALUE	Cashier's checks	1,870	1,860	1,539	1,413	-8.2
	Preset value	203	172	142	123	-13.6
	(KRW 100,000- denominated)	62	47	36	28	-24.0
	Non-preset value	1,667	1,688	1,397	1,291	-7.6
	Promissory notes, etc. ¹⁾	8,190	5,959	5,192	4,036	-22.3
	Others ²⁾	2,501	2,347	2,343	2,770	18.2
	Total	12,561	10,166	9,075	8,220	-9.4

Notes: 1) Includes current account checks, household checks, bills of exchange, etc.

2) Includes postal money orders, notices for call fund settlement, receipts of securities principal and interest payments, etc.

E. Payments Made through the Giro System

(daily average, thousands of transactions, billions of KRW, %)

		2014	2015	2016	2017	% change
VOLUME	Credit transfers	1,112	1,070	1,005	943	-6.2
	Direct debits ¹⁾	3,872	3,717	3,626	3,337	-8.0
	Standing orders ²⁾	224	210	136	97	-28.9
	Bulk payments ³⁾	311	291	293	299	1.8
	Total	5,519	5,288	5,060	4,675	-7.6
VALUE	Credit transfers	396	380	381	392	2.9
	Direct debits ¹⁾	365	359	365	368	0.6
	Standing orders ²⁾	63	56	33	22	-33.8
	Bulk payments ³⁾	182	201	211	227	7.5
	Total	1,006	996	991	1,009	1.8

Notes: 1) Automatic transfers from payers' deposit accounts to beneficiaries' deposit accounts on the promised dates, as a method of payment for bills charged by beneficiaries.

2) Automatic transfers from payers' bank accounts to different bank accounts on the promised dates, as a method of payment for loan principal and interest, regular installments, etc.

3) Funds transfers by batch processing from payers' deposit accounts to the deposit accounts of multiple beneficiaries, as a method of payment of wages, pensions, etc.

F. Volume of Payments, by Payment Instrument

(daily average, thousands of transactions, billions of KRW, %)

		2014	2015	2016	2017	% change
VOLUME	Checks and bills	1,263	1,021	813	655	-19.4
	Cleared via Check Clearing System	828	662	524	421	-19.7
	Presented directly at issuers' window	428	351	280	226	-19.5
	Electronic bills	7.1	8.8	8.5	8.7	2.5
	Account transfers ¹⁾	17,706	18,480	19,348	20,138	4.1
	Payment cards ³⁾	36,410	41,781	46,697	52,994	13.5
	Credit cards	24,267	26,900	29,136	32,782	12.5
	(Purchases)	23,969	26,629	28,885	32,548	12.7
	(Cash advances)	298	271	251	234	-6.8
	Check cards ³⁾	12,055	14,798	17,474	20,127	15.2
	Prepaid cards	84	77	76	68	-10.2
	Debit cards	0.8	0.5	0.4	0.3	-25.5
	IC Cash cards ²⁾	3.0	6.1	10.9	16.1	47.9
	e-Money	23	16	10	6	-37.5
VALUE	Checks and bills	24,414	22,818	21,604	20,620	-4.6
	Cleared via Check Clearing System	12,561	10,166	9,075	8,220	-9.4
	Presented directly at issuers' window	11,358	11,559	11,318	11,035	-2.5
	Electronic bills	495	1,093	1,211	1,366	12.8
	Account transfers ¹⁾	44,222	50,805	52,606	53,982	2.6
	Payment cards ³⁾	1,909	2,053	2,273	2,395	5.4
	Credit cards	1,594	1,683	1,846	1,926	4.3
	(Purchases)	1,416	1,512	1,677	1,760	4.9
	(Cash advances)	179	171	169	166	-1.7
	Check cards ³⁾	312	368	424	466	10.0
	Prepaid cards	2.7	2.3	2.2	2.1	-6.3
	Debit cards	0.0	0.0	0.0	0.0	-28.8
	IC Cash cards ²⁾	0.3	0.5	0.9	1.1	23.3
	e-Money	0.0	0.0	0.0	0.0	-46.3

Notes: 1) Excludes account transfers made via BOK-Wire+

2) A kind of debit card launched in November 2012

3) The figure in 2015, 2016 is revised by retroactively applying the number of check cards issued by securities companies.

G. Usage of Electronic Banking

(daily average; thousands of persons, transactions, and sheets; billions of KRW, %)

		2014	2015	2016	2017	% change
Internet Banking ¹⁾	Number of subscribers ²⁾³⁾	103,188	116,853	122,538	135,047	10.2
	(Individuals)	96,825	109,760	114,755	126,593	10.3
	(Corporations)	6,363	7,093	7,783	8,453	8.6
	Volume of use	66,437	78,022	87,264	94,913	8.8
	Value of use	36,854	40,287	42,309	43,465	2.7
Mobile Banking ⁴⁾	Number of subscribers ²⁾³⁾	60,107	76,561	78,362	90,893	16.0
	(smartphone-based)	48,203	64,791	74,675	90,893	21.7
	Volume of use	31,158	42,393	52,948	58,565	10.6
	(smartphone-based)	30,985	42,220	52,753	58,565	11.0
	Value of use	1,833	2,496	3,141	3,963	26.2
E-Money	(smartphone-based)	1,798	2,446	3,112	3,963	27.3
	Volume of issuance ³⁾	16,162	16,928	17,735	18,326	3.3
Electronic Bills	Value of use	0.03	0.02	0.02	0.01	-33.9
	Volume of issuance	7.6	7.9	7.7	7.5	-2.1
	Value of issuance	1,068.6	1,900.4	2,104.1	2,281.5	8.4
	Volume of discounts	1.6	1.7	1.7	1.7	-4.1
	Value of discounts	87.0	84.5	80.7	80.6	-0.1

Notes: 1) Includes mobile banking

2) Includes overlapping subscribers at 18 domestic banks (including two Internet-only banks) and Korea Post

3) Year-end basis

4) IC chip- and VM-based mobile banking were terminated in September 2016 and December 2015, respectively.

H. Usage of Easy Electronic Payment Services

(daily average, thousands of transactions, billions of KRW)

		2016	2017(1/4)	2017(2/4)	2017(3/4)	2017(4/4)	2017
Easy Payment Service ¹⁾	Volume of use ²⁾	858.8	1,333.2	1,871.7	2,434.4	2,837.9	2,124.3
	(ICT)	315.7	433.9	458.2	567.3	816.6	570.0
	(Retail and manufacturing)	543.1	899.3	1,413.5	1,867.1	2,021.3	1,554.2
	Value of use ²⁾	26.0	44.7	56.7	76.2	90.6	67.2
	(ICT)	10.4	14.3	15.0	21.6	25.9	19.2
	(Retail and manufacturing)	15.6	30.4	41.7	54.6	64.7	48.0
Easy Transfer Service ³⁾	Volume of use	143.5	311.5	586.5	964.3	858.6	682.5
	(Electronic financial business operators)	133.0	290.0	559.3	928.8	812.9	649.9
	(Financial companies)	10.4	21.4	27.3	35.5	45.8	32.6
	Value of use	6.8	17.6	27.6	39.4	55.5	35.1
	(Electronic financial business operators)	6.6	17.1	26.7	37.8	52.6	33.7
	(Financial companies)	0.2	0.5	0.8	1.6	2.9	1.5

Notes: 1) Based on 13 domestic easy payment service providers (as of end of December, 2017)

2) Limited to easy payments made using credit and check cards (excludes account transfers, payments made via mobile phones, etc.)

3) Based on transfer services provided by 13 domestic prepaid electronic payment instruments (as of end of December 2017)

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